



Ekonomická
fakulta
Faculty
of Economics

Jihočeská univerzita
v Českých Budějovicích
University of South Bohemia
in České Budějovice

Proceedings of the 17th International Scientific Conference INPROFORUM

Challenges and Opportunities in the Digital World





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2023



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Faculty of Economics

17th International Scientific Conference INPROFORUM

Challenges and Opportunities in the Digital World

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Foreword

The INPROFORUM conference is a traditional event organized by the Faculty of Economics of the University of South Bohemia in České Budějovice since 2007. It has long served as a platform for academics, students and practitioners from the fields of economics, business and administration to share their knowledge, experience, ideas and opinions on current topics.

The subtitle of the 17th annual international conference INPROFORUM 2023 was “Challenges and Opportunities in the Digital World“. This topic is crucial given the transformative impact of digital technologies on global communication, the economy, and society. Understanding these dynamics is essential to navigate the complexities of technological progress, address ethical issues, and ensure that individuals and businesses can thrive in a connected digital environment. Discussion on this topic is essential to foster innovation, address societal implications, and prepare individuals and institutions for the evolving demands of the modern age.

The theme aligns with the overall concept of the conference, which is reflected in the name Inproforum. This name is an acronym derived from the Czech words Innovation, Enterprises, Regions.

At this year's conference, we had the opportunity to welcome the following keynote speakers to the plenary session:

- Associate Professor Dorota Molek Winiarska (Faculty of of Business and Management, Wroclaw University of Economics and Business)
- Ing. Jan Kalina, Ph.D. (The Czech Academy of Sciences, Institute of Computer Science & Institute of Information Theory and Automation).

Our participants submitted 78 papers. 55 papers were presented in the following discussion forums on the following topics:

- Rural Areas and Digitalization. An Exploited Opportunity or an Obstacle to Regional Development?
- Trends in Marketing, Trade, Tourism, and Services in the Context of Digitalization
- Artificial Intelligence and Education
- Modern Trends in Management
- Digital Economy
- Mathematical-Statistical Modelling and Optimization in Practice
- Finance, Accounting, and Taxation: Current Trends
- Economics of Agriculture in Theory and Practice.

The conference INPROFORUM 2023 has been organized under the auspices of doc. RNDr. Zuzana Dvořáková Líšková, Ph.D., the Dean of the Faculty of Economics at the University of South Bohemia in České Budějovice.

We want to express our gratitude to all the conference participants, the members of the conference committee, the keynote speakers, and the organizing staff. Additionally, we would like to extend our thanks to the reviewers for their valuable feedback on the authors' articles.

On behalf of the organizing committee

doc. Ing. Ladislav Rolínek, Ph.D.

Vice-dean for Science and Research

Session:

Rural Areas and Digitalization.
An Exploited Opportunity
or an Obstacle to Regional Development?



Violence, insecurity, and the pandemic: notes on the possibilities of "virtual education" for early childhood in Tierra Caliente (Warm Land), Michoacán, Mexico

Marco Calderón Mólgora¹

Abstract: Tierra Caliente, in Michoacán, Mexico, is a region with serious problems of insecurity and violence. This is an area where agricultural production is very significant, particularly lemon cultivation, but where several organised crime groups operate. The illegal collection of quotas from agricultural producers is common. Physical aggression is also common among the various groups fighting for the collection of quotas, in addition to controlling the transfer of illegal substances. This situation has had multiple consequences, some of which are linked to the formal and informal education of girls and boys of different ages. For example, this school year, which began in September 2023, several schools were unable to start classes. On the other hand, in 2020, because of the Covid-19 pandemic, a long period of closure began, which implied the search for alternative ways of teaching classes in very complex conditions. Taking into account the problem of public insecurity as well as the situation of confinement resulting from the pandemic, the purpose of this presentation is to give an overview of the educational needs of young children and the possibilities of using virtual media for teaching. On the basis of a questionnaire applied to teachers of early childhood education, the focus is on some localities and schools in Tierra Caliente, Michoacán.

Keywords: preschool education, violence, pandemic, remote virtual education, rural areas

1 Introduction

Although I have been studying the history of rural education in Mexico for 20 years, the opportunity to participate in the conference on *Challenges and Opportunities in the Digital World* made me look for new information. I took a break to think about how I could contribute to the overall theme of this international conference. The answer was to write something about the use of digital media in early education in a very conflictive rural region where insecurity and violence are daily problems. In addition, for more than two years, schools throughout the area were closed due to the confinement resulting from Covid-19. During this time, teachers had to use their imagination and some electronic resources to continue teaching. After the pandemic, remote virtual classes prevailed, partly because of the growing problem of violence.

2 Methods and theory

To write this text, I prepared a questionnaire of eight simple questions, which was distributed through WhatsApp to preschool teachers in Tierra Caliente, Michoacán. The person in charge of this area approved the questionnaire and sent it to the teachers using WhatsApp. Within three days, I received 90 completed questionnaires. Some teachers answered directly on WhatsApp; some used a word processor or PDF format; a few wrote their answers by hand and then took pictures. I also used information from previous research and articles from local and national newspapers. I consulted conferences on the subject that appear on YouTube, as well as a bibliography on the subject cited in the final references.

There is a vast literature on the phenomenon of violence, perhaps since it is a problem that crosses the history of humanity. For this research, one basic aspect concerns the state, a subject that is a fundamental part of the history of political theory, at least from Aristotle to the present day. In relation to the state and violence, there are two classic authors who are indispensable. Thomas Hobbes argued that, in the "State of Nature", war was a daily occurrence and that the State can be conceived as the result of a "social pact" that seeks to control the exercise of daily violence among men

¹ El Colegio de Michoacán, Centro de Estudios Antropológicos, México, calderon@colmich.edu.mx

(among human beings, we would now say). Men, in renouncing their "natural right" to exercise violence, did so to protect themselves from the aggressions of others and thus achieve survival. Three centuries later, Max Weber defined the state as the "monopoly of legitimate violence". Without referring directly to Hobbes, Weber redefines a philosophical concept by a sociological concept.

With these general ideas in mind, it is possible to affirm that in the case of Mexico and other countries, despite the existence of a certain type of State, the exercise of violence between private individuals continues to take place. Different authors have reflected on the "limits" or "margins" of the State in contemporary societies, such as the remarkable collective book edited by Veena Das and Deborah Pool published in 2004. On the one hand, despite the existence of nation states, war continues; on the other hand, within nations, the use of violence is a daily occurrence even though it is illegitimate from a legal point of view. In the case of Mexico, it is notable that in the last twenty years the violence exercised by organized crime groups has generated multiple consequences in political, social, economic, and cultural terms in very diverse regions, as noted in these pages. Here, social inequality and corruption play a significant role. In this context, digitalization acquires both positive and negative characteristics.

3 Research results

I would now like to present several aspects of the research that are fundamental to contributing to the central theme of this international conference about challenges and opportunities of the digital world. As I said before, in this text I put emphasis on rural areas.

3.1 Tierra Caliente, Michoacán

Tierra Caliente is characterised by extremely high temperatures. At times, the heat reaches 50 Celsius degrees. It is a region that covers a large part of the state of Michoacán, starting in Jalisco and extending towards Guerrero. It is a strip located between the mountains that border the Pacific coast (the Southern Sierra Madre or Sierra Madre del Sur) and another mountain range, the Neovolcanic Axis (Eje Neovolcánico), which runs through much of western Mexico. There are 18 municipalities (Apatzingán, Nueva Italia, Buenavista, Parácuaro, La Huacana, Tepalcatepec, Aguililla, Coalcomán, Gabriel Zamora, Nuevo Urecho, Huetamo, Turicato, Tiquicheo, Tuzantla, Nocupétaro, Carácuaro, Churumuco, and San Lucas) in Tierra Caliente, with half a million inhabitants, in an area of 7 000 square kilometres.

The main legal cash crop is lemon. About 700 000 tonnes are produced every year on an area of 40 000 hectares.² It is the region with the highest lemon production in the country and perhaps in the world. Other agricultural products include melon, watermelon, papaya, sesame, pumpkin, tomato, and mango. Some crops are irrigated and others are rainfed. However, due to its geographical location and geological conditions, Tierra Caliente is also an area with a long tradition of producing illicit crops, such as marijuana and poppy. In addition, at some point in the late 20th century, laboratories were set up to produce synthetic drugs. To get their lemon harvest to market, growers have to pay organised crime a fee of one peso per kilo. This amounts to 700 million pesos a year. The scale of the business is enormous, not to mention other sources of income that different organised crime groups compete for.

For all these reasons, several areas of Tierra Caliente have been controlled by organised crime groups for several years. Perhaps, the first group was the Knights Templar, which at some point reorganised and gave way to the Familia Michoacana, which later gave way to the formation of Los Viagras. However, in recent years, another criminal group, the Jalisco Cartel - New Generation, has entered the fray. The process is very complex, and I do not have the conditions to give more information now. The main problem is that under these conditions, violence has increased significantly in recent years, including during the years of the pandemic.³

² <https://www.tridge.com/es/news/michoacan-is-the-first-place-in-lemon-production-a>

³ Data published in local and national newspapers.

3.2 The school sector and early childhood education

I will now give some basic information about the school zone I wish to highlight. According to the administrative criteria of the Secretary of Education of Michoacán, part of Tierra Caliente belongs to Section 10, including the municipalities of Coalcomán, Aguililla, Tepalcatepec, and Apatzingán. In total, there are 3297 students in early childhood education for the year 2023. The largest number is concentrated in the municipality of Apatzingán, with a total of 1248 children. In Tepalcatepec there are 950 children in early childhood education, while in Coalcomán and Aguililla there are 635 and 464 children, respectively.⁴ The following table shows these figures.

Municipality	Schools	Total population	Preschool students
Coalcomán	12	19633	635
Tepalcatepec	19	24074	950
Apatzingán	87	126191	1248
Aguililla	14	14754	464
Total	132	184652	3297

It is important to note that each municipality has different characteristics in terms of urban settlements and in relation to rural localities. In the municipal capitals, there are better infrastructure conditions for the provision of Internet services, while in the small rural villages, the existing service is inefficient or it is non-existent. That is why most of the questionnaires I managed to collect came from urban or semi-urban areas, while in the more remote areas there is sometimes no possibility of using WhatsApp.

During the pandemic, a number of strategies were used to continue teaching and to move forward with educational programs. In areas with better Internet service, some teachers were able to provide online lessons, but in a very irregular way. However, not all families have the necessary infrastructure or sufficient resources for children to take lessons and develop online activities. Under these circumstances, there were teachers who prepared videos or some materials so that the children could continue to work at home with the help of their parents, especially their mothers. Several teachers went to the children's homes once a week or every two weeks to distribute materials and assign homework, and to collect the materials that had already been worked on.⁵

So, teachers used WhatsApp as the most effective resource for sending videos, educational materials, homework, and exercises to do at home. Unlike the Internet, which is more readily available in small towns or semi-urban areas, information sent via WhatsApp can reach rural areas that are very isolated or poorly communicated. Still, mobile phones cannot be used in all rural areas, partly because of problems with Internet connectivity or lack of resources to make data available. Another big problem is the lack of basic infrastructure, such as computers or tablets, in the domestic space. However, for at least a year, before the vaccination campaigns began, the only alternative for most of the preschool population was to use WhatsApp to do their schoolwork.⁶

Another major problem was the fact that parents were not prepared to adequately take on the role of tutors or substitute teachers. While this was very evident in the urban areas of many cities in Michoacán and in Mexico in general, the problem was more pronounced in rural areas, where mothers and fathers have a very low level of schooling. Still, despite the confinement, infants in rural areas were able to socialise with other infants outside their homes.

3.3 After the pandemic

After the pandemic "ended", the problems continued. Returning to school was very complex. Many parents feared getting infected. On the other hand, before the pandemic, many schools were in very poor condition in terms of infrastructure. During the two years of lockdown, the schools deteriorated. It is still necessary to take stock of this problem.⁷

Another major problem was the increase in public insecurity and violence resulting from disputes between organised crime groups, as I mentioned earlier. Here are some facts. It is estimated that in 2022, the homicide rate in Tierra Caliente was 51 per 100 000 inhabitants, one of the highest rates in Mexico and in the world. There is also a significant number of

⁴ Official data from the Ministry of Public Education on the State of Michoacán.

⁵ Data collected through the questionnaire applied to prepare this text.

⁶ Data collected through the questionnaire applied to prepare this text.

⁷ Data collected through the questionnaire applied to prepare this text.

forced displacements: 13,151 people were displaced from their homes, in 2021. Only in June 2023, at least 800 people from Apatzingán were displaced in less than a week.⁸ One-third of the displaced are children and adolescents. According to a non-governmental organisation, there are about 2648 displaced families in Michoacán, a quarter of them from Tierra Caliente and the coast of Michoacán.⁹

3.4 Education in violent times

In some schools in Tierra Caliente, it was not possible to start school in September 2023. It is no longer a question of the pandemic, but of public insecurity and the increase in violence resulting from the fight between organised crime groups for the collection of quotas for the transport of lemons to the market. According to the teachers who responded to the questionnaire, parents' main fear is the increase in violent conflicts. The irruption of different groups is a daily occurrence. Many teachers are afraid, too, not only because they have to go to work, but also because children may be in danger, as several schools are located in conflict areas.¹⁰ It is important to note that in recent months the conflict has involved the use of drones with homemade bombs to attack the enemy. It seems that sometimes these bombs do not reach their original target, but hit people or property belonging to people who are not part of the criminal groups.

3.5 Economic problems

During and after the pandemic, the family economy was negatively affected. First, displaced families had to find new places to live in, as well as new activities that would allow them to earn income and function as a household unit. Many of them are still in transit and their fate is uncertain. Apparently, many of these families are at the US border hoping to obtain legal permission to establish there. Secondly, the prices of basic survival products in Tierra Caliente have risen at a very high rate, much higher than the national average inflation rate. Armed conflicts between organised crime groups in the region prevent the arrival of several products in the daily diet. Even the price of petrol has increased much more than the national average. As a result, the household economy has been severely disrupted. It is at this level, the family household, that the social, cultural, and political impact needs to be assessed. Both the pandemic and the violence continue. Most important, school attendance is declining, especially in areas where violence tends to increase.

3.6 Impact on Civic Education

More information is needed to understand the long-term social and political impact of both the lockdown due to the Covid-19 pandemic, and violence on the lives of the children I have referred to. The children now face multiple learning difficulties. Several teachers have reported cognitive problems. Many children are shy and anxious; others, on the contrary, are aggressive and unwilling to follow the guidelines set by the teachers. Lack of attention appears to be a common trait, and fear would be at the root of the difficulties children show when they try to engage with schoolwork. In several schools, teachers have established some protocols so that children know how to act in case of a violent assault. It is important to emphasise that school attendance both of teachers and students has decreased due to insecurity and forced displacements. Parents are afraid to send their children to school.¹¹

⁸ <https://www.infobae.com/mexico/2023/07/01/michoacan-bajo-el-control-del-narco-estas-son-las-organizaciones-criminales-que-se-disputan-el-estado/>

⁹ Acompañamiento a Desplazados de Michoacán (Tierra Caliente), Julio Franco
<https://www.youtube.com/watch?v=OnJEuMwoMg4&t=2870s>

¹⁰ Data collected through the questionnaire applied to prepare this text.

¹¹ Data collected through the questionnaire applied to prepare this text.

4 Conclusions

As I have pointed out, the problem is very complex and the whole process deserves further investigation. Given the general theme of this congress, it is important to conclude with some thoughts on the opportunities and difficulties of remote education via the Internet for young children in rural areas, a modality that overcomes the limitations of connectivity and infrastructure that prevent participation in virtual classes.

Despite all the problems, WhatsApp has been a very important resource in trying to mitigate the negative effects of the pandemic in terms of formal education. However, the difficulties are enormous, mainly due to violence, insecurity, social inequality, and economic problems. Another major problem stems from the forms of socialisation fostered by these conditions, which have been exacerbated by, among other factors, the absence of an effective state.

I am looking forward to the opportunity to get feedback on this work from the teachers who responded to the questionnaire, and thus be able to formulate some changes and specify other elements.

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Municipality websites as a communication channel

Jaroslav Čmejrek¹

Abstract: The research on the digitalisation of public administration is crucial in the case of the Czech Republic and its rural areas due to the nature of the Czech settlement structure with many small rural municipalities. The article deals with the development of e-government in the Czech Republic from the perspective of rural development. The paper's starting point is a characterisation of the digitalisation process of state and local government in the last quarter of a century. The paper focuses on developing municipal websites, which represent a crucial communication channel in the rural environment. The paper also discusses the possibilities and limits of e-democracy in rural development.

Keywords: digital divide, public administration reform, rural development, municipality websites, e-democracy.

JEL Classification: H10, H75, H79, R58

1 Introduction

Since the 1990s, Czech society has been undergoing a transformation process associated with creating a pluralistic democracy and transitioning to a market economy. The public administration was in many respects provisional in character, and the concept of its reform developed hesitantly. Decision-making mechanisms at the local and regional level suffered in the 1990s from an incomplete territorial hierarchy of state and local government, unclear competence relations between individual institutions and subjects in the decision-making process, and an inefficient system of local government whose competencies overlapped with those of the state administration. The introduction of new information technologies and the formation of an information society have long been neglected by governments in the Czech Republic. A specific turnaround occurred only in 1999 when the government approved the first comprehensive concept of the state policy of building the information society in the Czech Republic and the concept of building public administration information systems. At the same time, the reform of territorial public administration began to take on a more solid shape.

In the 1990s, the Czech countryside had difficulty recovering from the effects of the social and political transformations of the second half of the 20th century. The emergence of collectivist forms of economic life in the post-war period led to the disintegration of traditional local communities, networks, and ties. On the other hand, there was an increased emphasis on cooperation and the spontaneous participation of citizens in public life was encouraged, but only within controlled limits. As in other totalitarian systems, a sharp dichotomy gradually developed between public space, where people play their "roles" according to imposed rules, and private and family activities, seen as an escape and a real place of personal self-realisation. All this began to change only after 1989. The transformation processes of the 1990s then opened the space for efforts to renew rural areas in the Czech Republic. This process included using information and communication technologies, efforts to overcome the digital divide and introducing e-government tools at the level of rural municipalities. This paper focuses on municipal websites and aims to show how they have evolved over two decades. Particular attention is paid to using municipality websites for communication between the local government and citizens. Related to this is the question of the use of e-government in the political space of rural municipalities.

2 Methods

In considering the digital aspects of rural municipality development, the paper focuses on information, communication, or transactional services, representing the three levels of e-government. In the area of information services, the main concern is the availability of documents, especially those related to development projects; in communication services, it is a discussion forum where citizens can express their views on current municipal development issues. The options for transactional services are not yet significant, but that is a general problem. The paper is inspired by research and theoretical discussions focused on the impact of information technology on the development of rural space in European countries after 2000. The issue was discussed at the World Congress of Rural Sociology in Trondheim in 2004 (IRSA 2004) and the Congress of the European Society for Rural Sociology in Keszthely in 2005 (ESRS 2005), and inspiring research has

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taken place in the UK (Warren, 2006). In the Czech Republic, too, after 2000, at the height of the reform of territorial public administration, the issue of e-government was investigated, also in the context of rural development. Within the framework of a comprehensive research project of the PEF ČZU called Information and Knowledge Support for Strategic Management, conducted in 2005-2011, the issue of development of territorial self-government and implementation of e-government was investigated. The second project, supported by GA CR, focused on research on citizens' participation in public life of rural municipalities in the Czech Republic (Čmejrek et al., 2010). Valuable data were obtained from competitions concentrated on projects in the digitalisation of public administration and on web presentations of municipalities and regions (the Czech Zavináč, the Gold Coat of Arms, the Objev roku). A large amount of data was provided by community studies prepared in seminars by Public Administration and Regional Development students at the Faculty of Economics and Management of the ČZU. The selection of the surveyed municipalities was controlled so that the work covered the settlement structure of the Czech Republic from several aspects: size of municipalities, distance from the centre, position in the public administration system, etc. In addition to basic information about the municipality, each study included data on the local political process (political parties, elections, interest groups, involvement in regional projects) and citizens' political participation. One of the areas monitored was the web presence of the municipality, communication between the local government and citizens, and citizen discussion forums on the web. With a gap of ten or fifteen years, this paper refocuses on the data and findings and contrasts them with the current situation. This is especially the current form of municipal websites and local government portals examined after 2000. The comparison should show how these Internet tools have changed regarding information availability and communication between local governments and citizens.

3 Research results

The Digitalisation of Public Administration

The situation at the time of the Czech Republic's accession to the EU is well characterised by a strategic and conceptual document called the State Information and Communication Policy (e-Česko 2006, 2004), which the Czech government approved in the spring of 2004. In the attached SWOT analysis, the strengths of the Czech Republic included high penetration of mobile communication (above the average of EU Member States), high general literacy of the population, advanced infrastructure, even territory settlement, and unencumbered by obsolete systems and technologies. Weaknesses of the Czech Republic in this area included low penetration of information technologies in households and high relative costs of their acquisition and operation, low penetration of high-speed access to the Internet, insufficient administrative capacity for the use of EU funds, underestimation of the role and potential of information technologies in the development of society, inconsistency in political support for the development of information policy, low computer literacy of the public and insufficient motivation to use modern technologies. The document saw opportunities in integrating the Czech Republic into the EU, in the high penetration of information and communication technologies in the business sector and public administration, as well as in public administration reform and financial reform. On the other hand, threats included the unfinished liberalisation of telecommunications, slow implementation of national legislation, inefficient spending on projects, insufficient coordination of projects, persistent resorts and poor vertical cooperation, inadequate involvement of new technologies in teaching, underestimation of the role of research and innovation, and erosion of security and privacy in the use of information and communication technologies (e-Česko 2006: 25).

The expansion of computer literacy has become an integral part of the state policy of building an information society. In February 2003, the National Computer Literacy Programme was launched to provide beginners with basic computer and Internet skills. The project was based on public-private partnerships (PPP projects). The introduction of eGovernment in the Czech Republic 20 years ago consisted of computerising newly established regional and municipal authorities (Public Administration in the Czech Republic 2004, p. 75f.). Part of this process included establishing and interconnection electronic portals, especially the portal of local governments ePUSA (<http://www.epusa.cz>). Support actions have been of great importance in the development of digitisation. These included the annual international conference on the Internet in state and local government, which brings together representatives of public administration, the professional community and business entities. The panel also regularly includes the Czech Zavináč, a competition for the best project in the computerisation of administration. An analogous competition is the Gold Coat of Arms (Zlatý erb). This competition evaluates the level of web presentations of municipalities, cities, and regions. The results of these competitions are a valuable data source for research on the problematics to date.

Exciting information is provided by research from the period before the Czech Republic acceded to the EU, in particular the Analysis of the Information Needs of the Public and the Evaluation of Public Satisfaction with Public Administration Information Services, which has been carried out under the responsibility of the Ministry of the Interior of the Czech Republic since 2000. Research has shown that citizens' interest in public administration information is more

declarative than urgent; citizens mainly use national media and private family sources to obtain information on public administration, and only a minimum of citizens draw information from the Internet. The most challenging information is those that directly affect citizens - information about citizens' rights and obligations, laws and orders, the functioning of authorities, taxes and fees, or health care—about a quarter of citizens had terrible experiences obtaining this information. According to the survey, only 9 per cent of households could use the Internet, and a quarter of adult citizens could connect to the Internet, most often at work. Four per cent of citizens used the internet daily, and another five per cent visited it at least several times a week. More than half of the Internet population repeatedly saw the websites of public institutions, with the most frequent being the websites of municipal and city authorities. However, the websites of the commercial register, ministries and financial authorities had high traffic. Higher traffic levels were also recorded on the websites of employment offices (Analýza, etc., 2000).

In this context, it is essential to consider the lack of information technology equipment for citizens and households two decades ago. According to the document e-Czech Republic 2006, only a quarter of households (about 26 %) had a fixed telephone line or mobile phone and a computer. However, of these households with potential Internet access, only 16.4 % used this option. The main reasons for not using the Internet were that families did not need the Internet (67 %). Respondents also cited the high cost of the equipment (36 %), the prohibitive price of Internet access (21 %), lack of computer skills (17 %) and the possibility of accessing the Internet elsewhere (13 %). The growth of household Internet access in the Czech Republic up to 2002 was slower than in EU Member States (e-Česko 2006, p. 26). The situation today is quite different.

The digitisation of territorial public administration depended on state policy and, to a large extent, on the activities of municipalities, regions, and their organisations. Twenty years ago, the level of information and communication technology equipment of local government officials was higher than that of the population. After the year 2000, the Internet has already become a fixed part of the functioning of local government. The number of municipal websites has steadily increased. This applied to large towns and small rural municipalities, many of which have acquired more than one website. Local government websites were registered by several portals, which were also largely grassroots initiatives but which naturally work with the central public administration. This is also the case with the ePUSA local government portal, created as a regional initiative of the former Pilsen North District Office (<http://www.epusa.cz>). Later, the portal, which provides contacts with regions and municipalities, became a joint project of the Association of Regions of the Czech Republic and the Ministry of the Interior. The Cities and Municipalities Online portal has gained significant importance. The portal creates a publishing environment for municipalities and towns and tries to develop user-friendly services to improve communication between public administration and citizens (formerly <http://www.mool.cz>, now <https://mesta.obce.cz/>). The Towns and Municipalities Online portal shares its data with the ePUSA portal.

The current state of digitisation of public administration shows that the digitisation of local government has been more successful than that of state administration. Even in 2023, it was possible to read reports such as, "Healthcare electronization is lagging, and key areas are not functional." We find a similar situation in other state administration departments. Local governments are more successful in digitalisation because they can rely on grassroots initiatives.

Municipality Websites as a Communication Channel

The establishment of municipal websites, which began over two decades ago, was initially spontaneous. Twenty years ago, many municipal websites were clustered around rural micro-regions, which groups of municipalities set up to implement joint regional projects, often including projects seeking to make greater use of information technology and digitalisation. The websites of the micro-regions and their member municipalities provided exciting information on regional development in their respective areas. The breadth and diversity of the websites of the municipalities and micro-regions also revealed numerous problems with the use of information technology at the local and regional level, particularly problems with updating information. From this point of view, there were significant differences between the websites of the individual municipalities or regions from the outset.

What can be achieved by using information technology was shown, for example, by the municipality of Okříšky, which was awarded the Golden Coat of Arms in the competition for the best websites and electronic services of towns and municipalities in 2004 (Zlatý erb). This municipality in the Bohemian-Moravian Highlands, with about five hundred houses and 2,000 inhabitants, was impressed with the information it provided on its website to the public, businesses, tourists and interested parties from elsewhere. In addition to information about the municipality's history, interesting places in the region, and rich cultural life, it was information about the general binding ordinances and regulations of the municipality, news and business contacts. The municipality's website was regularly updated (Okřísky, official website).

Two decades ago, however, contradictory examples could be found in abundance. Many were located near the distinguished municipality, even in the same micro-region. The Černé lesy micro-region was founded by 18 municipalities, which have acquired websites within the framework of a joint project (Černé lesy website). Twenty years ago, the website of the municipality of Okříšky was a shining example within the micro-region. The other municipalities had their websites but with poor and un-updated content. The websites usually contained only basic information, and the menus were mostly empty. For example, on the website of the municipality of Bransouze, one could still read at the beginning of the summer that the municipal authority wished the citizens a Merry Christmas. More recent statements were not there.

How can we explain such stark differences within the same micro-region? Introducing information technology in municipalities and regions is business and entrepreneurship. Business companies try to sell hardware and software. They must convince municipal governments and mayors of the merits of introducing information technology, connecting to the Internet, and setting up websites. Introducing information technology requires financial resources, projects, and the support of the local community and entrepreneurs. The success of such projects depends on the capacity of local citizens and interest groups. Initially, good websites were created by those municipalities whose citizens were interested in them, used them as a source of information, participated in discussions on the website, responded to calls, answered surveys, etc. In some places, however, a website was set up as part of the project implementation, but then the whole thing went to sleep, and the introduction of modern technologies had no effect. However, the situation is quite different if we look at the Černé lesy micro-region today (it still exists). All municipalities of the micro-region have websites of excellent professional standards and are regularly updated.

In the early phase of the digitalisation of territorial public administration, the information and the communication level of e-government developed. The website of the municipality of Okříšky, which was awarded the Golden Coat of Arms in 2004, attracted attention primarily because it became a forum for a broad dialogue between citizens and the municipal government. By the spring of 2007, 1,285 posts had been made to the discussion forum on the municipality's website. The discussion forum on the Okříšky municipality website had by far the most considerable number of posts on topics directly related to the introduction of information technology. From November 2003 to April 2006, 92 posts, some very extensive, were made on cable television and Internet connection, and 163 posts were made on the topic of the municipality's information system. Incidentally, the introduction of information technology is often the reason for the association of municipalities with rural micro-regions.

Two decades ago, information technology already served to sustain the cultural life of rural communities. Dolní Vilémovice (Třebíč district, 398 inhabitants) has become a characteristic example. The municipality tried to maintain a school in the village with too few pupils by providing the citizens with lifelong learning and other services. The municipality promoted the "Community School in a Small Village" project online. The project included online courses to improve citizens' access to information and education, facilitate communication with the authorities, and find employment (Dolní Vilémovice website). Another remarkable example in this respect is the village of Mokré in the Hradec Králové Region. It is a small rural village with only about 160 inhabitants and 74 houses. Nevertheless, the municipality has been remarkably successful in the use of information technology. In 2007, it won three prizes in the regional round of the Golden Coat of Arms competition: second place in the category of the best website of the Hradec Králové Region, second place in the type of the best electronic service of the Hradec Králové Region and the Public Prize of the Hradec Králové Region (Mokré website). The village had no school, post office, or medical facilities, only a very agile municipal library with Internet for the public. Its website has become an excellent example of the use of information technology in providing cultural life in a small rural village (Knihovna U Mokřinky website). Municipal websites play an irreplaceable role in promoting cultural events. Closely related to this is the development of the tourism potential of rural areas. A significant part of the websites of rural municipalities and micro-regions is oriented in this direction.

Municipal websites are nowadays an obvious part of the presentation of municipalities. The websites are of a professional standard and are regularly updated. However, a comparison with the situation ten or fifteen years ago shows one significant difference. Today, municipal websites do not have discussion forums to the extent that they used to. Communication between town halls and citizens has moved to other platforms.

E-democracy and Rural Development

The formation of modern representative democracy and its institutions was firmly anchored in the historical context of the development of the nation-state. However, in the current development of representative democracy, one cannot overlook the disturbing phenomena manifested in the persistent decline of citizen participation in the democratic process, especially in elections. The transformation of contemporary political partisanship and the tendency towards cartelising

party systems can also be considered worrying. The membership base of political parties is depopulating, and communication between the membership base and the party leadership is failing (Klíma, 2015). In the conditions of the Czech Republic, political parties are weakly represented in rural municipalities. There is usually no full spectrum of political parties in municipalities with up to 2,000 inhabitants (90 % of the Czech Republic's municipalities). In comparison, there are often no political parties in municipalities with up to 1,000 inhabitants (80 % of the Czech Republic's municipalities) (Čmejrek et al., 2010).

The decline in political participation of citizens threatens the very foundations of the democratic process. This is particularly evident in elections, which citizens perceive as secondary. In the conditions of the Czech Republic, these are senate elections and elections to the European Parliament. However, in the long term, participation in elections to the Chamber of Deputies is also declining. Can modern information and communication technologies eliminate the worrying phenomena threatening the democratic process?

In the concept of e-government, the digitisation of the democratic process represents a separate pillar, which is referred to as e-democracy (alongside e-administration and e-services). In terms of the levels of e-government, the first two levels of e-democracy, i.e., the information level and the communication level, have been developed mainly in the last two decades. The third, transactional level has stagnated, but this is a worldwide phenomenon. Fulfilling the transactional level with full functionality means implementing the electoral process via the Internet as a full-fledged alternative to traditional voting in polling stations, so-called remote voting. This is still far off (Brunclík and Novák et al. 2014). As the political discussions among parliamentary parties after 2021 show, introducing a simple postal vote, which has long been commonplace in many countries, will be a significant problem in the Czech Republic.

On the other hand, remote voting is an option that Czech rural municipalities cannot miss. Rural municipalities are characterised by high voter turnout. However, remote voting could be used in local referendums, which often fail to achieve the necessary turnout for the referendum results to come into force. Regarding the democratic process, the benefits of digitisation are unlikely to be directly reflected in the third pillar of e-government but rather in the development of social networks. Today, there is no doubt that social networks divide society. On the other hand, they open up opportunities for the development of civil society. This is particularly important in the rural areas.

4 Conclusions

A fundamental advantage of modern information technology and the Internet in public administration and the political process is that it makes it much easier for citizens to access information and public services, authorities, and political institutions. Digitisation thus represents a significant improvement in representative democracy and local self-government, as it breaks down the traditional opposition between the centre and the periphery. Regarding rural areas, the digitisation of public administration and elements of eGovernment enable rural populations to overcome their conventional disadvantageous position at the system's margins.

A comparison of today's situation with the situation two decades ago, when the reform of the territorial public administration was at its peak, and its digitalisation began, showed three main conclusions:

1. Although the digitalisation of public administration started vigorously more than two decades ago (there was even a Ministry of Informatics for some time), it is still an ongoing task. This is confirmed both by the recent difficulties of the state, e.g., in the COVID-19 pandemic, and by the programmatic goals of some parliamentary parties. Local self-government is more successful in digitalisation than the state administration.
2. Websites of rural municipalities, created at first to some extent spontaneously and often amateurishly, now have a professional level and help municipalities in their development. In this sense, what is often referred to in the literature as the digital divide has been overcome.
3. The contribution of municipal websites to the communication between municipalities and citizens is undeniable. However, on the other hand, we no longer see such broad discussion forums on municipal websites as we did two decades ago. The question arises as to whether this is a consequence of the spread of communication on social networks.

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Real consequences of the necessity of digitalization in rural Mexico

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Abstract: The export of agricultural products is currently Mexico's most important source of foreign exchange, exceeding revenues from oil exports and tourism. Historically, agricultural export chains have been formed since colonial times, e.g. tobacco, coffee, bananas, cocoa or cotton. Avocados, berries and fresh vegetables, as well as alcoholic beverages (beer and tequila) are at the forefront currently. The target country is primarily the United States of America. Today's rural Mexico faces new challenges because it must comply with obligations derived from the T-MEC agreement, which was signed on July 1, 2020. It was preceded in 1994 by the North American Free Trade Agreement (NAFTA) between the United States, Mexico and Canada, which created the largest free trade region in the world. One of the main points of the agreement is to support the digitization of international trade and strengthen consumer protection with complete data at every stage of the production chain. An important point for agricultural workers is also the commitment to strengthen and expand the protection of workers' rights. The fulfillment of these obligations can be translated as greater supervision of companies will be able to meet such demands? Does the agreement ultimately lead to a greater concentration of access to water and land in the hands of large firms with foreign capital? Are SMEs (small and medium enterprises) still able to export? What challenges does the rural labor market face?

Keywords: agriculture, value chains, certification, georeferencing

JEL Classification: Q17, F15, F18

1 Introduction

The primary sector is the predominant one in the state of Michoacán and is of utmost importance, since it extends over an extensive space, requires a huge amount of natural resources (especially water) and the work of hundreds of thousands of inhabitants. In the case of Michoacán, agricultural production presents a surplus in several crops, that is, the food produced in the state covers the demand of the inhabitants and also supplies the national and international markets.

The transformations of the Michoacán countryside are framed in processes of globalization, competition, openness, flexibility of labor, but also unequal access to land and water, and discriminatory agricultural policies for the majority of farmers. The current Michoacán countryside has two faces: one of powerful businessmen and agro-exports that blowup after the signing of trade agreements to facilitate international exchange, such as NAFTA and the T-MEC, and another of small producers and farmers who resist practicing traditional agriculture. If on the one hand Michoacán is the first producer of avocado, strawberries, blackberries and lemon and second in raspberries, it is also the first national place in lentil cultivation, third place in rice, fourth place in sorghum and wheat and the fifth most important in production of corn. The first products require a complex organization in long value chains and are aimed at the foreign market (mostly United States), while the second contribute to the food self-sufficiency of the Mexican population.

Agricultural products require specific agro-climatic conditions, financial investments, knowledge, technologies and organizational-business capacity. Because the harvest is done manually, these crops are very demanding in terms of labor from agricultural laborers. The productive practices of protected agriculture with a high consumption of plastics and agrochemicals necessarily involve the banking sector that promotes access to capital.

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2 Methods

Mainly mathematical-statistical methods were used to analyze secondary, official data from the following sources: INEGI (National System of Statistical and Geographical Information), SIAP (Agri-food and Fishing Information Service), ITC (International Trade Center) – TradeMap. Own research was also carried out in the area of northwestern Michoacán, which included semi-structured interviews, observations and ethnographic methods.

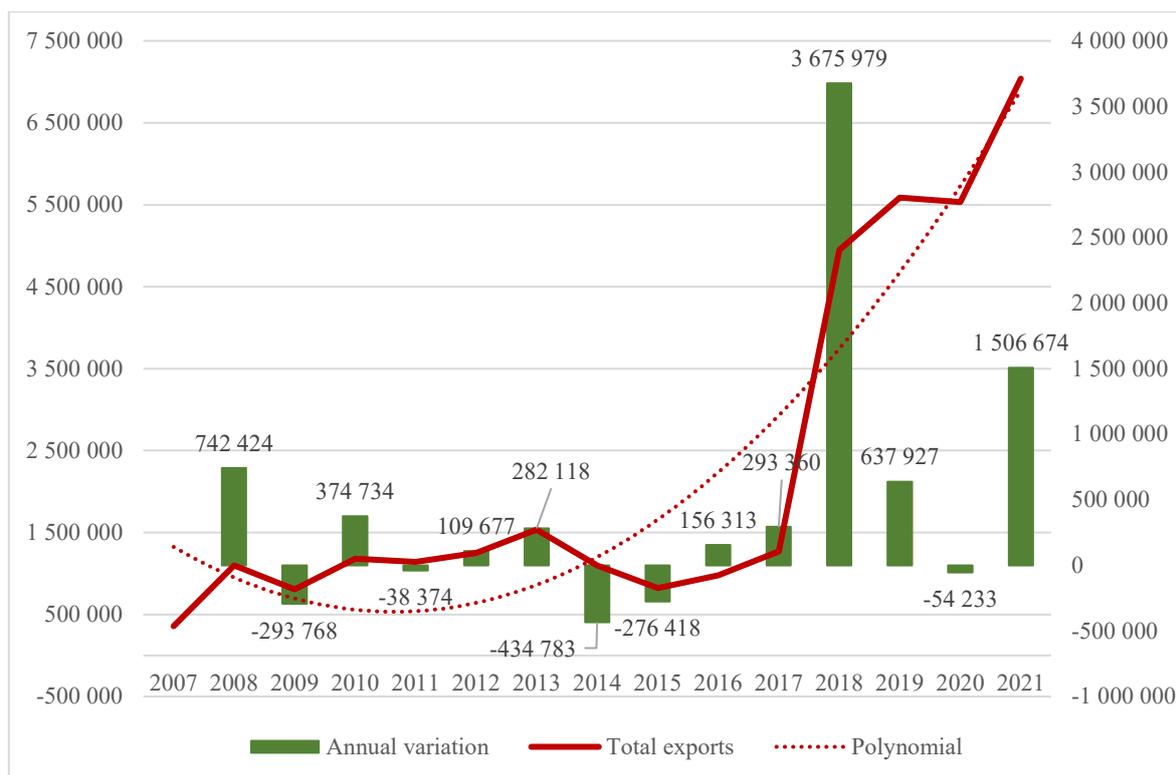
3 Research results

The main Michoacán agro-export chains have demonstrated their continuity and competitiveness in the last 15 years when production has remained in the first national places. In the economic history of Michoacán we can detect the emergence of new very relevant crops such as blackberries, blueberries or raspberries that, far from being traditional Mexican crops, have become established, consolidated and are generating new competitive exports. In these cases, these are local learning processes that, although initially reserved for a small group of entrepreneurs, spread and stimulate other new actors to join the boom.

The particularity of Michoacán is that exports originate mainly in rural areas, since neither the metropolitan area of Morelia nor the other two metropolitan areas (La Piedad-Santa Ana, Gto. and Zamora-Jacona) have industries that exceed the agricultural production. Only 22 subsectors have relevant exports, of these 20 are within the primary sector (fruits, vegetables, wood) or closely linked to it (fruit juices, preserves, frozen foods).

The United States is the main trading partner of Mexican agricultural exports, with a concentration in the destination of 86 %. The concentration in the product is also very high: 68 % of total foreign sales derived from only 20 food products, among which are beer, avocado, berries, tomatoes and tequila (Cairó and Cortés, 2022). The growth of Michoacán exports in the form of a polynomial function that practically copies the demand function for avocados by US consumers (see Figure 1). According to the University of Texas (Reuters, 2022) they amount to 4 billion dollars (2022), while two years ago they were 2.5 billion dollars. The average annual per capita consumption of Mexican avocados is over 4 kg (in 1990 it was 450 grams). Although previously the largest consumers of avocado have been Hispanics, today the fruit is appreciated by Americans of all origins.

Figure 1 Exports, Michoacán (USD)



Source: INEGI

The huge increase in exports in 2018 was due to a combination of factors such as an increase in US demand and poor agro-climatic conditions in California and the subsequent low harvest, which had to be replaced by imports from Mexico. The advantage of this export structure is that it is not affected as much by global crises, such as the financial crisis in 2008-2009 or the 2020-2021 pandemic (a slight reduction in the first half of 2020 was due to the initial shock of export chains in response to Covid and exchange rate instability, but demand and volume of exports increased). In 2021, Michoacán had record exports, with an increase of 27% and 7 billion dollars in economic benefits (Mexicoexport, 2022). Agricultural exports then become very important sources of foreign currency at the national level, while tourism income in these periods suffered dramatic falls and the oil sector experienced high volatility.

In the case of Michoacán crops there is a bipolarity between *commodity* and *specialty*. On the one hand, the exported products (berries, avocados, vegetables) must satisfy the requirements of quality and the global palate, on the other hand, the traditional crops of Michoacán land are the basis of the regional culinary culture that excels nationally and globally: it was declared an intangible heritage of humanity by UNESCO in 2010. In general, and for all crops, a frightful varietal narrowing is observed, when the genetic material is provided by transnational companies and often developed outside of Mexico (in the case of berries, maize and some vegetables) or when the majority of the production is concentrated on a single variety (Hass avocado or blue Weber agave). This affects not only genetic agrobiodiversity, but also the diversity of techniques and local know-how that characterizes small production. The decline of varieties thus also means social losses and loss of farmers' autonomy.

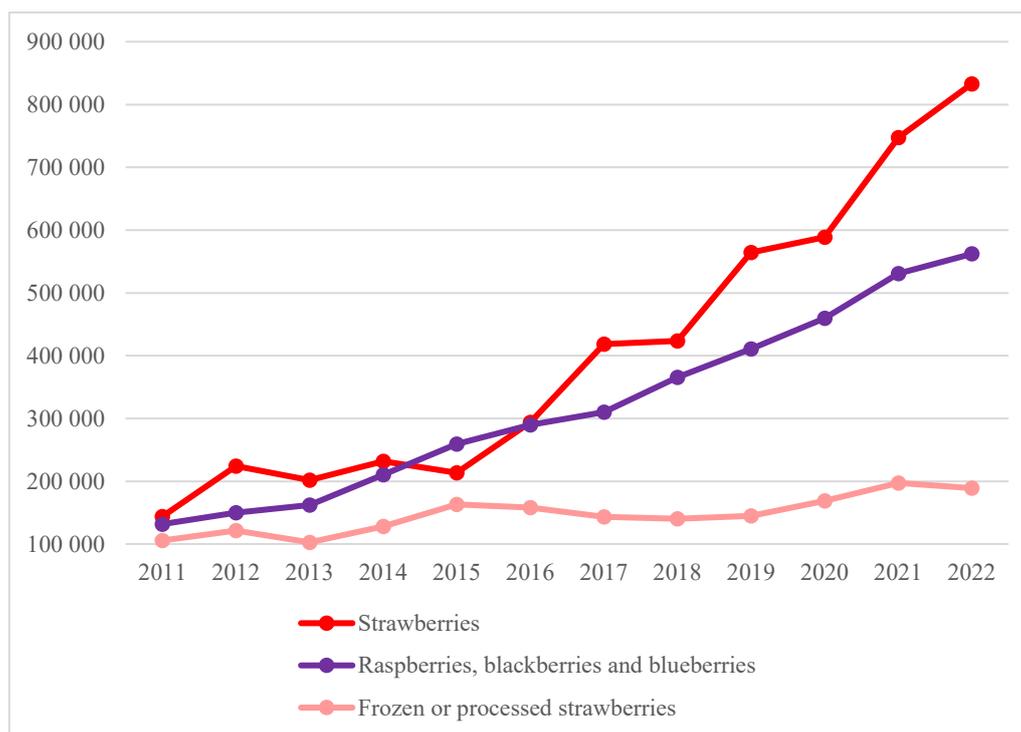
The agricultural sector of perennial crops and fruits yields the highest profits because production is paid in dollars. It is also the most demanding in terms of safety and quality. Products such as avocados or berries cannot present defects, since this would cause very significant discounts from packers and exporters. Thus, the demands of the commercial link are transferred down the chain, imposing the standardization of numerous practices, forcing small and medium-sized producers to apply a technological package prescribed by the foreign company. Likewise, there are requirements for minimum volumes, strict parameters of sensory quality (color, smell, flavor) and fruit size, storage and packaging conditions.

For small farms these standards are difficult to meet and their harvest is frequently rejected or depreciated. Another pressing issue is the difficulty of hiring sufficient labor at the exact moment of maturity, a problem that has already been

observed before the pandemic but that became more acute with it. All these obstacles lead to higher concentration of land and water in a few large export firms, which mostly gain access to land and water concessions through leases (sometimes even entire *ejidos*).

Economically, the greatest weight is given to the avocado and berry crops (see figure 2). The value of avocado exports was 34 billion pesos and 5.5 billion for blackberries. The total spillover of the two products, calculated based on the export multiplier, would be 44.4 million pesos. The economic benefit generated by avocado exports was greater than the GDP of the entire Michoacán industrial sector in 2016 (Crespo-Stupkova, 2018). Although we can point to these agricultural sectors as the engines of regional and state economic dynamism, the greatest economic benefits are for a few companies, mostly multinational or with foreign capital.

Figure 2 Exports of strawberries and other berries (thousands of USD)



Source: ITC, Trademap

Avocado is the emblematic fruit of Michoacán, the state remains the first national producer since the 80s of the last century. Mexico supplied more than 80% of avocados consumed in the U.S. Since 2003, the tariff for Mexican agricultural exports to the USA has been canceled. Another boost to exports has been the marketing that positioned avocado as a food consumed during the Super Bowl. The socioeconomic effects are not minor: foreign exchange earnings for thousands of producers and employment for tens of thousands of day laborers.

At the same time, this tree is controversial due to the environmental effects of its uncontrolled expansion. Deforestation, decrease in aquifers and contamination by agrochemicals are some of the negative externalities with which this production leaves its mark on the territory. Despite warnings from biologists, ecologists and forestry engineers, the area planted with avocado has grown steadily in the last decade. Another problem linked to the production of “green gold” is the attraction that the economic benefits have for organized crime groups (whose members extort producers) and consequently a serious situation of insecurity in the state.

SMEs avocado o berry farmers cannot export their production directly; they must be part of the APEAM or Aneberries. APEAM, A.C. is the Association of Avocado Producers and Packers Exporters of Mexico. It was founded in 1997 and represents 34,857 producers and 84 packers. It is the only Mexican cooperating partner in the United States, as well as with USDA-APHIS (U.S. Department of Agriculture-Animal and Plant Health Inspection Service) for the export of avocados from Mexico. It is also responsible for promoting the fruit in other countries, always under the “Avocados from Mexico” brand (APEAM, 2023). Previously, only Michoacán had certification to export to the USA, that changed in June 2022 and the state of Jalisco was also included. 46% of avocado exports from Mexico are packed by subsidiaries of U.S.

companies (Opportimes, 2020). Aneberries was founded in 2009 and represents Mexico's berry growing sector, including strawberries, blackberries, blueberries and raspberries. States that berry sector generates 470 thousand jobs and brings together the 28 most important producers and exporters, for example: Driscolls, Giddings, Sunopta, California Giant, Agrana Fruit, Berries Paradise, Berrymex, Confrusa, Expoberries, Fall Creek, Gold Fruit Farm, Fresh Kampo, Naturberry, Latin Berry Plants, Hortifrut, Planasa, Splendor (Aneberries, 2023).

The most important certificates in the field of berries and avocados are: GlobalGAP (Good Agricultural Practices), National Organic Program NOP EU, Primus GFS, SMETA (SEDEX), DEALTI (Distinctive Agricultural Company Free of Child Labor), ESR distinctive, USDA Organic and KMD México (Kosher). Obtaining them is very financially and procedurally demanding for SMEs farmers: checks are frequent and based on details such as the maximum height of grass in avocado orchards or the complete absence of wild fauna. From the point of view of environmental responsibility, the emphasis is mainly on zero deforestation and low greenhouse gas production. Social responsibility includes the necessity of health insurance for workers and zero tolerance of child labor (limit 15 years).

Digitalization is present throughout the agri-food system, from the production stage, distribution and marketing, to consumption. For example, geotraceability (combining geographical information with conventional traceability data), an essential process to track each product from the orchard where it was grown in Mexico to its final destination. The public policy instruments in the digitalization of the agricultural sector were implemented mainly by the Mexican Ministry of Agriculture and Rural Development, which has developed technological systems at the service of producers such as the Computer System for Traceability of Agricultural, Aquaculture and Fishing Goods; georeferenced field work with GPS systems, geospatial analysis with Geographic Information Systems (GIS), and satellite analysis with high spatial resolution images. Digitalization includes precision agriculture systems, robotics, and decision-making by artificial intelligence supported by devices to process enormous volumes of data generated by sensors on climate, crops, soil and water (p. e. temperature, humidity, conductivity, weather conditions, hydrogen potential, pH, pests or diseases). However, it is used by a small percentage of highly capitalized farmers, primarily exporters of lucrative crops, while only 5.5 percent of Mexican farmers used a computer and 7.8 percent used the Internet (INEGI, National Agricultural Survey, 2019). Thus, the possibilities of most small and medium-sized farmers for obtaining certificates necessary for exports are fundamentally limited.

4 Conclusions

The state of Michoacán is called "the giant agricultural exporter." Nonetheless, the path to success has not been an evolutionary process and is far from being a progressive and linear development. Rather, it has been characterized by a series of vicissitudes that successively hindered and relaunched it. The agricultural-export sector has to face high risks of different kinds, such as climatic, pest and disease, as well as market risks (and the last one is the most complicated). The enormous increase in input prices (especially fertilizers, plastics and energy) and the fact that the current socio-productive paradigm requires strict logistical and standardization requirements, deepens the tension in agro-export chains. Alliances between transnational agribusinesses with large Mexican producers have generated spectacular fortunes but only for a handful of the strongest players. Small and medium-sized farmers face serious difficulties in integrating into a profitable agri-food model.

Critical voices warn that the rural space will become a "cheap back garden" of the United States (cheap if the generated environmental footprint is not taken into account). Apart from the more "classic" difficulties of family agricultural farms such as the lack of generational replacement, increasing migration, unequal access to water and land and insufficient capital that are also present.

Acknowledgement

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Functional analysis in R: A new approach to sustainability indicators in the context of regional development

Antonín Hořčica¹

Abstract: Digitalisation, together with new possibilities for data analysis, is currently gaining importance for regional development. This study focusses on the use of advanced statistical methods in R software, such as generalised linear models (GLM) and envelope methods from the GET package, to analyse time series of sustainability indicators in EU regions at the NUTS level. Analysis of selected sustainability indicators, such as the Human Development Index in its variants from the United Nations and the EU, compared to GDP shows that these methods enable effective identification of key trends and differences between groups of regions, while also identifying regions with similar trajectories. They also allow for advanced visualisation of the results, illustrating the effectiveness of EU cohesion policies at the regional level and their impact on reducing regional disparities. The analysis shows that functional analysis tools in R can be used for further research on sustainability in EU regions.

Keywords: functional analysis, statistics in R, sustainability, sustainability indicators, GDP, regional development, NUTS, GET.

JEL Classification: C14, Q01, R11, R58

1 Introduction

In the modern digital era, new data analysis capabilities are gaining prominence for regional development. This article introduces the use of R statistics for evaluating sustainability indicators, which is becoming increasingly important to assess the implementation status of sustainability strategies at both national and regional levels.

The concept of sustainable development, created in response to addressing environmental and social issues in the second half of the twentieth century, states that development should "*meet the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987, p. 41). Sustainability, developed further at UN conferences (UNCED, 1992; United Nations, 2002; United Nations, 2012), has become a global discourse, especially after the adoption of the 2030 Agenda and 17 Sustainable Development Goals (SDGs) in 2015 (United Nations, 2015).

With the development of the concept of sustainability, indicators are used to verify the achievement of the set goals. The United Nations developed a set of Sustainable Development Indicators (SDGs) that assess progress at the country level. Gross Domestic Product (GDP), although still used as a universal indicator of economic success and prosperity, has proven inadequate for measuring sustainable development (Costanza, 2014). The most important alternative indicators include HDI (Human Development Index), ISEW (Sustainable Economic Well-Being), and GPI (Genuine Progress Index). In the EU, a regional variant of the HDI, the Regional Human Development Index (RHDI), has been developed for which data are available for NUTS2 regions in EUROSTAT databases (Hardeman & Dijkstra, 2014).

In European Union practise, sustainability manifests itself through models such as the green economy, the bioeconomy, and the circular economy (D'Amato & Korhonen, 2021). These models are integrated into the current European-wide plan known as the Green Deal for Europe (2019). The EU has developed its own tools to implement its strategies and policies, including the NUTS (Nomenclature of Units for Territorial Statistics) nomenclature managed by EUROSTAT, which allows monitoring of progress on sustainable development at the EU regional level.

This paper will present the statistical methods used in the analysis of regional development. Examples of time series data processing of the HDI, its regional variant RHDI, and GDP for the EU countries and their NUTS2 regions will be used to present the possibilities of functional analysis. The statistical methods provided by the open-source software tool R are used. The analysis presented in this paper demonstrates the potential of R to assess sustainability in regions.

This work aims to find an answer to the question of how advanced statistical methods such as generalised linear models (GLMs) and envelope methods can effectively enhance the analysis and interpretation of time-series data of sustainability indicators in the context of regional development. In this regard, a working hypothesis can be formulated

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in the sense that these advanced statistical methods provide better opportunities for the analysis of time series of sustainability indicators at the regional level.

2 Methods

This chapter will begin with descriptive statistical methods for data overview and trend identification. It will then dive into advanced statistical techniques, including generalised linear models (GLMs) and envelope methods, to better understand sustainability indicator dynamics and improve data interpretation. Finally, the use of statistical software R will be described.

2.1 Descriptive statistical methods

In statistical analysis, commonly used methods allow deeper insight into the data examined, providing a foundation for informed decisions and strategies. Basic descriptive statistics serve as the initial step in data analysis, enabling researchers to quickly comprehend the fundamental characteristics of a dataset.

The key characteristics of descriptive statistics include measures of central tendency, such as mean, median, and modus, along with measures of variability, such as variance, standard deviation, and range. Position measures, such as quartiles and percentiles, are also vital. Visualisation tools used in descriptive statistics include histograms, graphs, and box plots, which display data ranges and their quartiles, allowing rapid identification of key data characteristics.

Higher levels of analysis involve regression analysis and hypothesis testing. Although descriptive statistics are essential for understanding the basic properties of datasets, advanced statistical methods are necessary for a deeper understanding of extensive data sets, such as time series of sustainability indicators at the regional level.

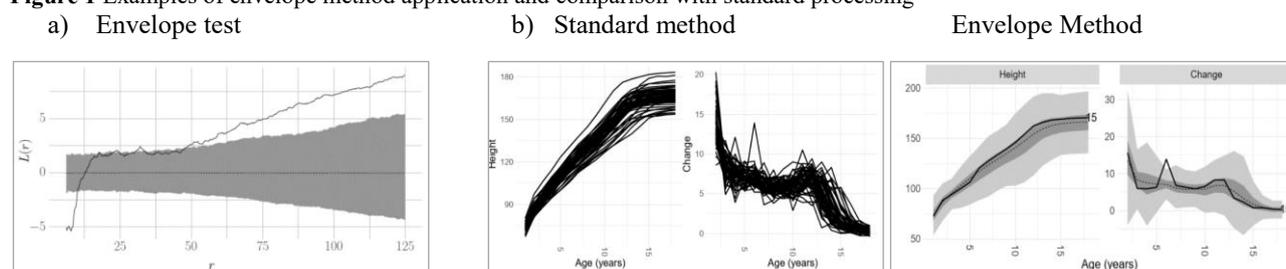
2.2 Generalised linear models and envelope methods

Time-series analysis is used to monitor the evolution of sustainability indicators at the regional level. These time series show linear or nonlinear functions over time. Advanced approaches using functional statistical methods and generalised linear models (GLMs) are used to process the time series, focussing on functional analysis and data structures.

Global envelope methods are a technique used in conjunction with GLM to test hypotheses about the data structure. These methods create an "envelope" around expected data values, and subsequently examine whether the actual data fall within this envelope. If the data falls outside the envelope, it may indicate that the model is not suitable for the data and the null hypothesis about the data and model agreement should be rejected. Figure 1a shows an example of an envelope test of the null hypothesis for a Poisson process, where the grey area defines a 95% global envelope based on simulations.

Myllymäki and Mrkvička (2020) provide several examples of utilising global envelopes from the GET package in R. Figure 1b shows one such example, highlighting the difference between visualisation using standard methods (left) and the envelope method (right). This study used the annual height of girls, evaluating their growth trajectories from 1 to 18 years, and compared annual heights and year-over-year changes, underscoring the advantage of the envelope method.

Figure 1 Examples of envelope method application and comparison with standard processing



Source a) Mrkvička, 2017

Source b) Myllymäki a Mrkvička, 2020

The use of global envelopes in functional data analysis and generalised linear models serves as a valuable tool for identifying the central region ("normal values"), comparing data with a reference distribution, performing tests between groups, and creating confidence intervals. Functional cluster analysis, proposed as another GLM method, is discussed in the work of Dai et al. (2022). This method can be used to identify groups of countries and regions with similar economic trends with respect to sustainability indicators, helping to predict economic developments and planning strategies.

2.3 Statistics in R

The open-source software R is widely recognised for its ability to perform a wide range of statistical methods, including descriptive statistics. For this work, methods related to functional statistics were used. R provides a number of tools and methods for performing these analyses and is a popular tool for scientists and analysts around the world to work

with data. According to the website of R: *The R Project for Statistical Computing*, R is a statistical software that was developed in 1995 at Bell Laboratories under the direction of John Chambers and his team.

RStudio serves as the interface that allows users to work with R. It is user-friendly and contains tools to work efficiently with R, including a code editor, a console for direct access from R to the file manager, and visualisation tools. RStudio can be downloaded from the Posit website. Source packages for various applications and tasks can be found at CRAN (n.d.), a detailed description is given in *'The R Book'* by Crawley (2013).

The R software tool provides basic descriptive statistics and data visualisation tools. Basic functions include:

- Basic functions: **mean()**, **median()**, **sd()**, **var()**, **min()**, **max()**, **quantile()**, **summary()**, **IQR()** interquartile range for the identification of outlier values, and for determining order, the functions **sort()** or **order**.
- Visualisation of data using graphs: **plot()**, **barplot()**, **boxplot()**, **hist()**,
- Graphic packages: **graphics**, **ggplot2**, **lattice**, **plotly** and tools for 3D visualisation and geospatial analysis,
- The **eurostat** package serves for working with data from EUROSTAT, see Lahti et al. (2017) or the tutorials (Tutorial for the Eurostat R Package, n.d.; Stavroudis, n.d.).

In addition, a number of specialised packages can be used for various analyses. One of them is the GET package, which contains tools to analyse functions according to GLM. A description of this package can be found in Myllymäki & Mrkvička (2020) and Mrkvička (2017). The concept of envelope methods can be used to detect outliers and anomalies in time series and to test hypotheses about the fit of a statistical model. Another method is the Functional Clustering Method (FCM), described in Dai et al. (2022), which is used to identify groups of similar functions.

3 Research results

Initially, basic statistical calculations were performed using descriptive statistics and basic visualisation functions. Subsequently, functional analysis methods were applied. The basic statistics were derived from data for the EU27 member states for the UN HDI, obtained from the UNDP database. Data for GDP per capita and the calculated RHDI indicator from the Eurostat database were also used for functional analysis.

3.1. Basic statistics and visualisation in R

The **summary** function provides overall statistics for the entire data set (minimum, maximum, 1st quartile, median, mean, and 3rd quartile) - see Table 1. The **aggregate** (data, summary) function yields basic statistics for individual years, with only the first five displayed here, achievable with the head command - see Table 2.

Table 1 Example of summary function output

Indicator	Min.	1st Qu.	Median	Mean	3rd Qu	Max.
UN HDI	0.6790	0.7993	0.8515	0.8414	0.8920	0.9480

Source: Own processing in R from UNDP data from UNDP data (HDI values are dimensionless).

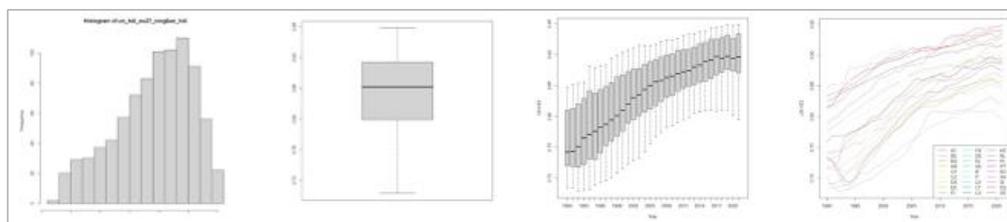
Table 2 Example of the output of the summary function

Indicator	Year	Min.	1st Qu.	Median	Mean	3rd Qu	Max.
UN HDI:	1990	0.6840	0.7200	0.7420	0.7593	0.8100	0.8470
	1991	0.6840	0.7190	0.7430	0.7615	0.8130	0.8520
	1992	0.6790	0.7180	0.7510	0.7640	0.8200	0.8530
	1993	0.6800	0.7220	0.7650	0.7703	0.8200	0.8550
	1994	0.6820	0.7310	0.7710	0.7780	0.8410	0.8810

Source: Own processing in R from data from UNDP and EUROSTAT (HDI values are dimensionless).

Furthermore, graphical processing of the UN HDI was carried out using the **hist** function to construct a histogram for the whole period and a boxplot for the whole period and for each year and using the **plot** and **boxplot** functions to plot the values over the monitoring period for each EU country. The graphs are shown in Figure 2.

Figure 2 Graphical visualisation in R for the UN HDI for EU countries



Source: Own processing in R from data from UNDP and EUROSTAT

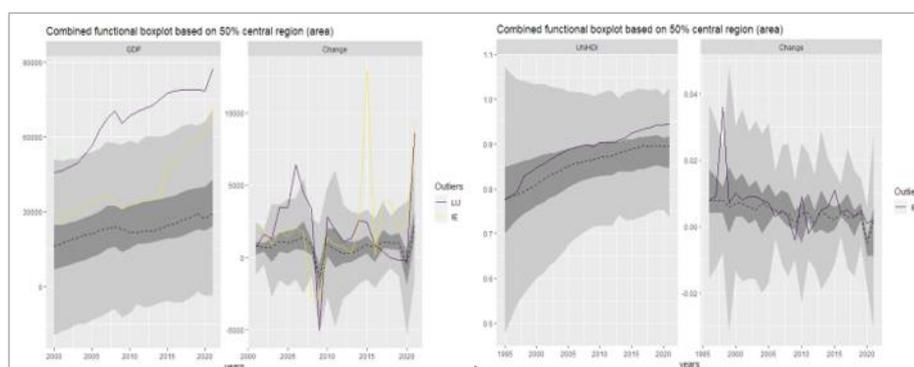
3.2. Functional statistics in R

To test the feasibility of using functional statistical methods, the methodologies described in Mrkvička (2017) and Myllymäki and Mrkvička (2020) were used.

3.2.1 Functional boxplot for aggregate indicator values

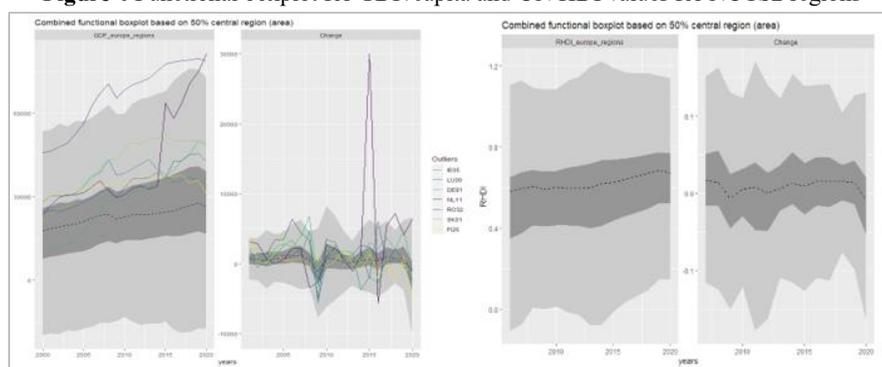
Figures 3 and 4 illustrate the application of the envelope method to analyse time series of values and annual changes in GDP, UN HDI, and RHDI using a functional boxplot (via the `create_curve_set` function). The median value (dashed line), a dark grey area representing 50%, a light grey envelope for 'normal' values, and coloured outliers are shown.

Figure 3 Functional boxplot for GDP per capita and UN HDI values for EU countries



Source: Own processing in R from data from UNDP and EUROSTAT

Figure 4 Functional boxplot for GDP/capita and UN HDI values for NUTS2 regions

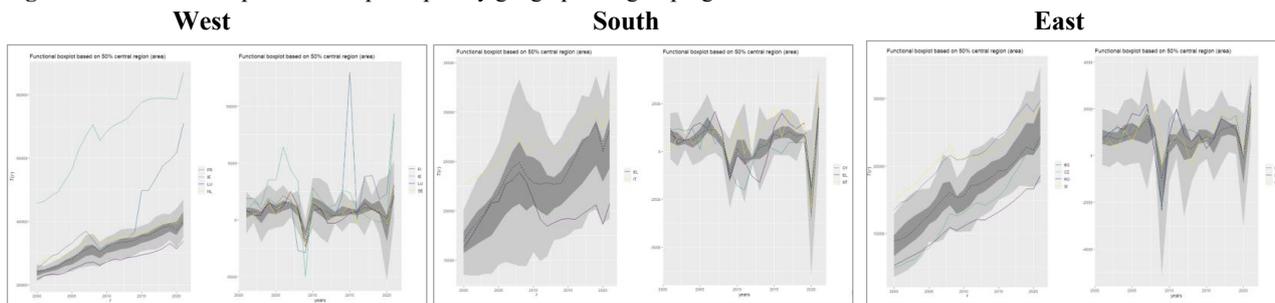


Source: Own processing in R from data from UNDP and EUROSTAT

From the graphs in Figure 4 can be deduced:

- different trends for different indicators, but also the level of hierarchical ranking of regions,
- to identify outlying trends for countries or regions,
- the shape of the envelope suggests a tendency towards convergence, i.e. whether there is a reduction of disparities;
- outliers can be found in the visualisation for countries and for regions,
- for year-on-year change, we can see fluctuations around 2008 (financial crisis) and after 2019 (covid pandemic).

Figure 5 Functional boxplot of GDP per capita by geographical grouping



Source: Own processing in R from data of EUROSTAT

3.2.2 Functional boxplot for geographical groups of countries

Geographical groups of EU countries were created; for simplicity, the Baltic countries were grouped in the east, and the Scandinavian countries in the west. The analysis was carried out as a demonstration of the possibility of functional analysis for the GDP per capita indicator. The geographical breakdown of the EU countries is as follows:

- West (+ North): Belgium (BE), France (FR), Ireland (IE), Luxembourg (LU), Denmark (DK), Finland (FI), Sweden (SE), Austria (AT), Germany (DE), Netherlands (NL),
- South: Cyprus (CY), Malta (MT), Greece (EL), Italy (IT), Portugal (PT), Spain (ES),
- East: Bulgaria (BG), Czech Republic (CZ), Hungary (HU), Poland (PL), Romania (RO), Slovenia (SI), Croatia (HR), Lithuania (LT), Latvia (LV), Estonia (EE).

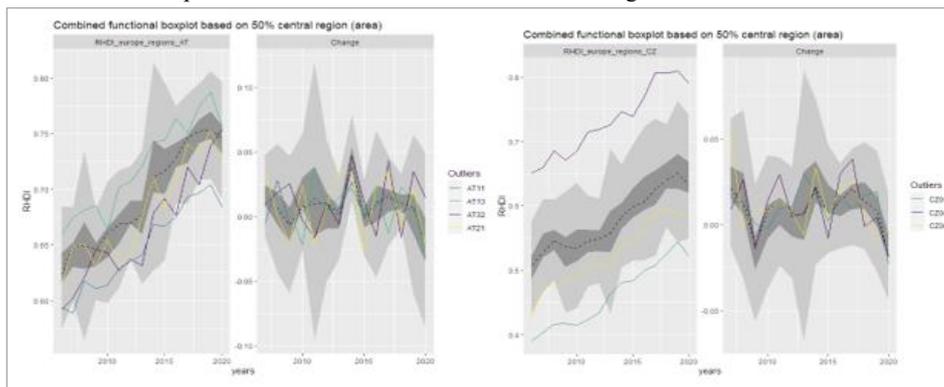
The results are shown in Figure 9, they are analogous to those of the previous case. From the graphs, it can be deduced:

- within each geographic group of countries, countries as outliers can be identified,
- the median curves for all groups are growing, but their character is different; the west showing a steady rise, the south showing a distinct peak, and the east showing a steep increase with a smaller peak than the south,
- the shape of the envelopes varies quite a lot, it is not possible to clearly conclude on convergence or divergence in each group, the shapes of the envelopes change quite a lot during the observed period,
- there are also significant differences between year-on-year changes, there are clear fluctuations around 2008 and 2019 as before, but not the same for each group of countries.

3.2.3 Functional boxplot for NUTS2 regions within a country

Figure 6 shows the time series for the RHDH indicator in a NUTS 2 region within a country. For the demonstration, two neighbouring countries, namely Austria and the Czech Republic, were chosen.

Figure 6 Functional boxplot for RHDH indicator values for NUTS 2 regions of Austria and the Czech Republic



Source: Own processing in R from data from UNDP and EUROSTAT

It is possible to complement the previously identified deductions to derive more region-specific findings. For example,

- regions AT13 Wien and CZ01 Praha show above-average deviations in the development of RHDH, and
- regions AT11 Burgenland, AT21 Kärnten, AT22 Steiermark in Austria, and CZ04 Severozápad and CZ08 Moravskoslezsko in the Czech Republic deviate below the average,
- From the graphs, it is evident, except for CZ01 Praha, that Austrian regions achieve a better RHDH level than Czech regions, but the latter do not manage to significantly reduce the gap,
- no clear convergence or divergence can be inferred for both countries,

- From the year-on-year changes can be deduced that the impact of 2008 was more significant in the Czech Republic than in Austria, the impact of COVID was similar, other significant fluctuations require more detailed analysis.

4 Conclusions

In this paper, the descriptive and functional statistics tools in R have been used to analyse regional development. Time series of the UN HDI and RHDI indicators, supplemented with a GDP indicator, were used for both EU countries and their regions at the NUTS2 level. Statistics in R, including methods of descriptive statistics and generalised linear models with the innovative envelope method, allow in-depth data analysis and visualisation, identifying key trends and data characteristics for EU countries and regions.

This study focused on answering the basic question. How can advanced statistical methods, such as generalised linear models (GLM) and envelope methods, improve the analysis and interpretation of sustainability indicators' time series in the context of regional development? Based on the results, it could be stated that the use of these methods can significantly contribute to a deeper and more accurate understanding of sustainability dynamics at the regional level. In particular, the innovative envelope method from the GET package provides intuitive and easily interpretable outputs, which are valuable for broader discussions and communication of research results. This method allows application for countries, groups of countries, or NUTS regions, revealing specificities and general trends crucial to understanding interregional disparities and development within countries.

At the same time, it can be stated that our working hypothesis that advanced statistical methods provide better options for analysing time series of sustainability indicators was supported. For example, analysing the RHDI indicator in Austria and the Czech Republic reveals specifics for each country and simultaneously identifies general trends, which are key to understanding regional disparities and developments within countries.

Although this paper does not encompass the entire scope of sustainability indicators' time series analysis, it opens new possibilities and provides a scope for further research. Future research directions might include using cluster analysis and functional ANOVA to assess statistical differences between regions and employing advanced visualisation techniques in R, such as 3D graphs and geospatial analysis, to gain more insight into the spatial aspects of research and visualisation of regional and national trends and differences in sustainability.

Acknowledgement:

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Agroextractivism and land grabbing in the production of *Agave tequilana* Weber Blue variety in Penjamo, Guanajuato, Mexico

Ana Gabriela Morales Ventura¹, Lucie Crespo Stupková², Claudio Garibay Orozco³, Pedro Sergio Urquijo Torres⁴

Abstract: Historically, tequila has been one of the preferred spirits in Mexico. Since 2018, tequila production in this country has grown exponentially. One of the main reasons is the capital investments, by multinational alcoholic beverage corporations towards the main Mexican tequila companies. The entry of multinationals facilitated the positioning of tequila in international markets and increased demand. The commercial logic of corporations has impacted the amount of agricultural, forestry, and rangeland land for the plantation of *Agave tequilana* Weber blue variety, in local productive dynamics, in customary agreements of access to land, causing techno-productive, economic, political, social, environmental and cultural in the territories where the monoculture plantation is carried out. This article analyzes the problem from political ecology, directing attention towards agroextractivism and land grabbing via leasing and sharecropping in the municipality of Penjamo, Guanajuato, Mexico. The methodology involves field trips, participant observation, interviews, georeferencing of the plots, and statistical and documentary analysis. It is concluded that agroextractivism and land grabbing for agave plantations accentuate economic, territorial, political, and environmental inequality at a local scale and affect pre-existing activities, such as grain production and livestock farming.

Keywords: land lease, inequality, local scale

YEL classification: P17

1 Introduction

Historically, tequila has been one of the favorite spirits nationwide. Mainly recognized for being a symbol of Mexican identity since the second half of the 19th century and to a greater extent in the mid-20th century. The period in which it had a greater presence in the foreign market was due to the decrease in the production of other distillates, mainly whiskey as an effect of the Second World War (Rodríguez, 2007 and Crespo et al. 2022).

In turn, the Mexican miracle, migration to the United States, and international trade agreements in the early 1990s, such as the North American Free Trade Agreement (NAFTA). Historical, social, economic, and political phenomena have driven the gradual growth of tequila production and export. However, none of these events influenced production to grow exponentially, as has happened in the last five years from 2018 to 2023. One of the main reasons for this growth is the capital investments and participation by multinational alcoholic beverage corporations (Bacardi Corporation, Fortune Brands, Brown-Forman, and Diageo) towards the main tequila companies (José Cuervo, Patrón, Casa Sauza, Herradura, Cazadores, Don Julio, and Madrileña). The entry of corporations macroeconomically boosted the positioning of tequila in international markets, increased demand, and with it the expansion and price of the raw material in local spaces, such as the case of the municipality of Penjamo, Guanajuato.

Graph 1 shows the increase in tequila production in millions of liters in 24 years. In the last 5 years, the production of liters of tequila and exports grew exponentially, in the year 2022, 651 produced million liters of tequila, of which 419 million were exported.

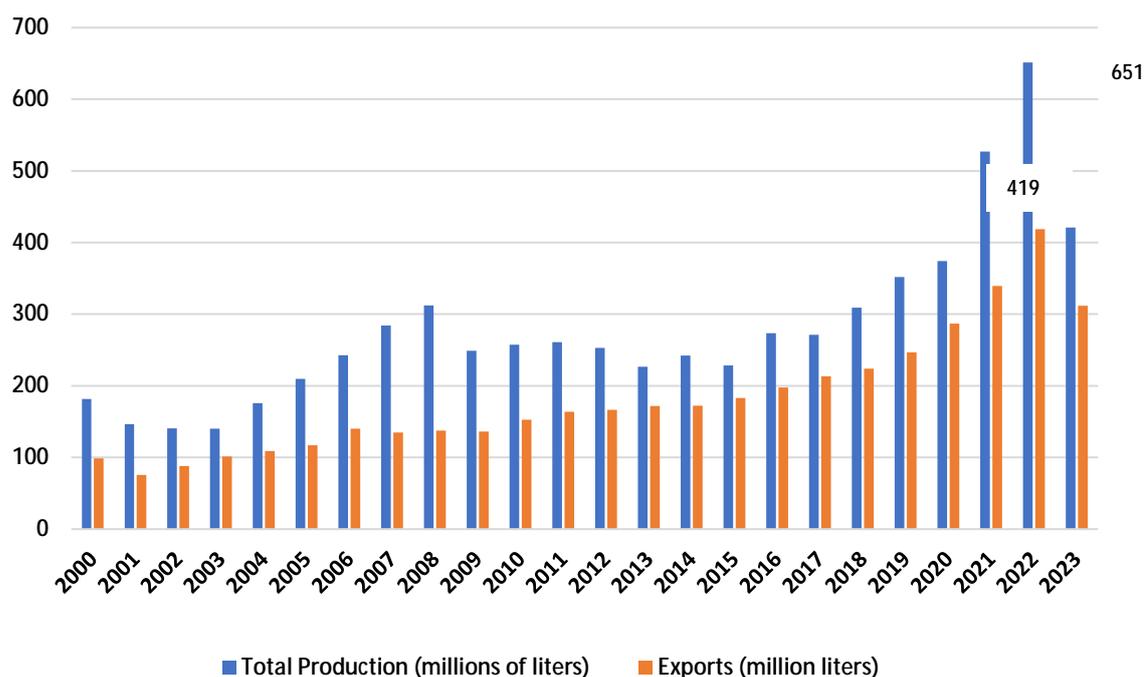
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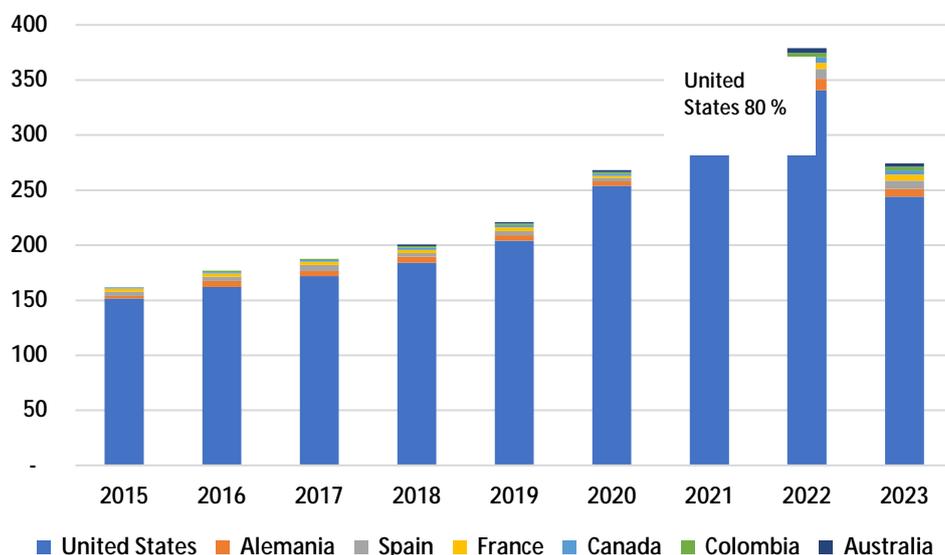
Graph 1 Tequila production and exports in Mexico (millions of liters) Years 2000-2023



Source: Own elaboration with data from the Tequila Regulatory Council (CRT, 2023).

Graph 2 shows the main tequila-consuming countries. The United States consumed 80% of exports in 2022 with 341 million liters of tequila. It is worth mentioning that of every 10 liters of tequila produced in Mexico, seven are sold abroad.

Graph 2 Main tequila-consuming countries (millions of liters) Years 2000-2023



Source: Own elaboration with information from the Tequila Regulatory Council (CRT, 2023)

2 Methodology

The methodology involves field trips in the mountains, valleys, and south of the municipality of Pénjamo. Subsequently, we georeferenced the agave plots by taking 115 control points with GPS to know the occupied surface of the agave. We conducted 12 semi-structured interviews and participant observation with grain, livestock, and agave producers. The following interviewees were selected under the criteria:

- producers who have access to land via lease,
- grain and/or livestock and agave producers
- temporality in their pre-existing practices (generationally),
- producers who have been affected in their pre-existing activities due to the agave plantation.

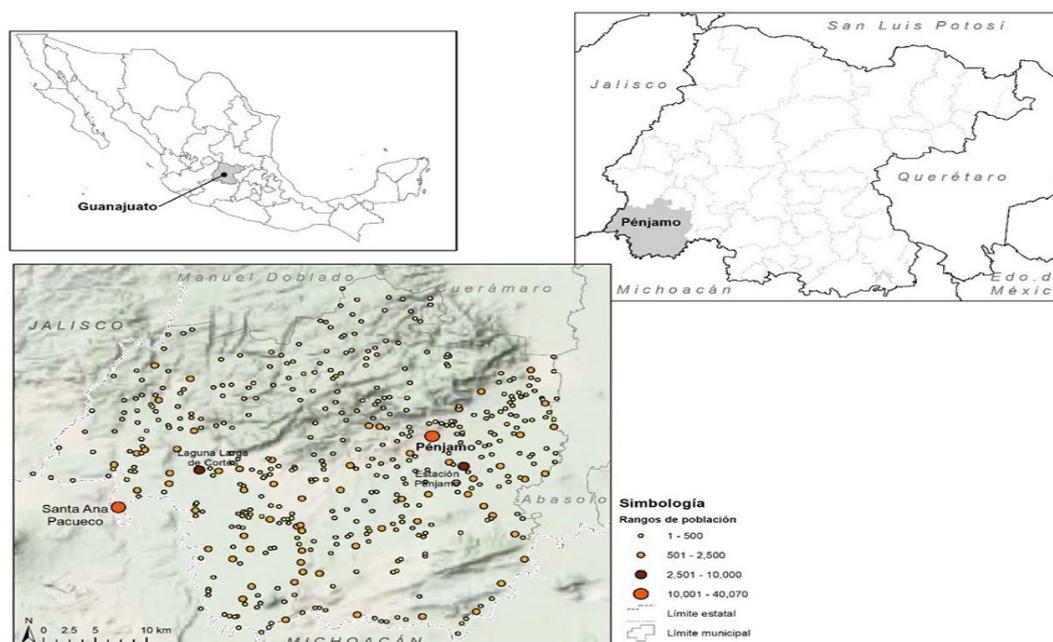
We carry out statistical and documentary analyses on the production, exports, and global consumption of tequila.

3 Results at the Local Scale

3.1 Land leasing and sharecropping in the municipality of Pénjamo

The municipality of Pénjamo is located in the southwest of the state of Guanajuato, it has a territorial area of 1565.516 square kilometers, it has a population of 154,960 inhabitants, there are 819 rural localities where 76 percent of the population is concentrated, ranging from 1 to 2,000 residents (INEGI, 2020). Figure 1 shows the location of the municipality and the rural population ranges.

Figure 1 Population ranges by the number of inhabitants in the Pénjamo ranches

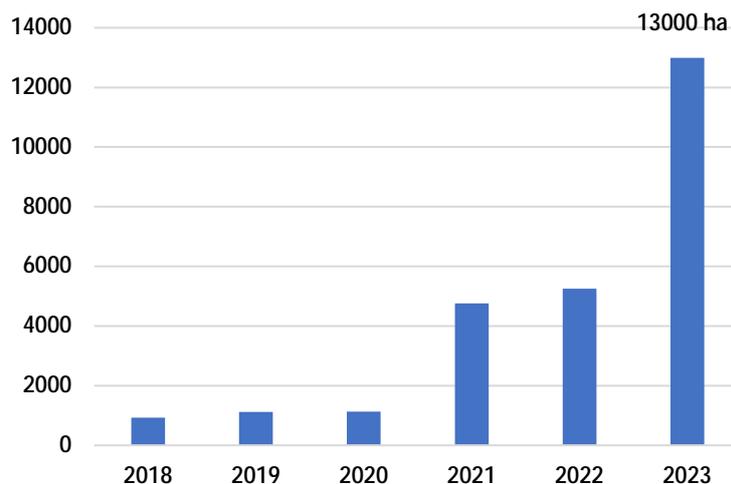


Source: Own elaboration with data from INEGI, 2020

In this municipality, land leasing and sharecropping have been carried out since colonial times and until today, as a mechanism for accessing land to produce grains and livestock to feed the local population. This type of leasing has been carried out by ranchers and peasants “out of habit” on a generational basis through the transmission of knowledge and family work (Morales and Keilbach, 2021).

In 2018, with the increase in international demand for tequila, these sharecroppers were affected by the expansion of *Agave tequilana*, because the owners of the properties decided to lease their lands to land grabbers, who offer an increase in land rent by up to 900% to plant agave. Graph 3 shows the approximate increase in the last 5 years in the number of hectares with *Agave tequilana* plantations in Pénjamo, from 2022 to 2023 there was an increase of 247%.

Graph 3 Number of hectares with tequila agave plantations in Penjamo, Guanajuato (thousands of hectares) 2018-2023



Source: Own elaboration with information from the Agri-Food and Fisheries Information Service (SIAP, 2023)

3.2 Small grain and livestock producers affected by agave monoculture

The production of the monoculture of *Agave tequilana* is oriented towards the accumulation of capital through global markets, they care little about the future of local territories and the environmental and social consequences. They alter cultural landscapes, their uses, and covers, under a neoliberal logic of negative reciprocity, in which they seek to “receive the most by giving the least” (Lomnitz, 2005).

The land grabbers manage to convince the owners of the properties, without specifying in the lease contracts the changes that their plots will have, the agrochemicals that will be applied to their lands, and how the agave will be planted. In most cases, planting is carried out in the direction of the topography, without contour lines, causing soil erosion.

Small producers are displaced from the local territories that they have rented for decades, from generation to generation. They are forced to look for smaller properties far from their homes. If they do not find spaces to continue the production of grains and livestock, they decide to reduce their production of grains and livestock:

“Not everyone produces grains and takes care of cows, it takes work, time, and not spending too much, waiting for the money to arrive in each cycle, not getting into debt, and with agave, many have bad lands and they are bad for working, they the agave fell and they made money, people who were screwed got better.” (Interview Jesús Rojas, grain and livestock producer, Pénjamo, October 9, 2021).

Mr. Francisco Hernández, owner and grain producer, has a ranch and a deep water well. Approximately two years ago he rented 80 hectares of irrigated land from the José Cuervo company for the agave plantation and observed that his lands were beginning to erode. Expresses disagreement with the contract he signed:

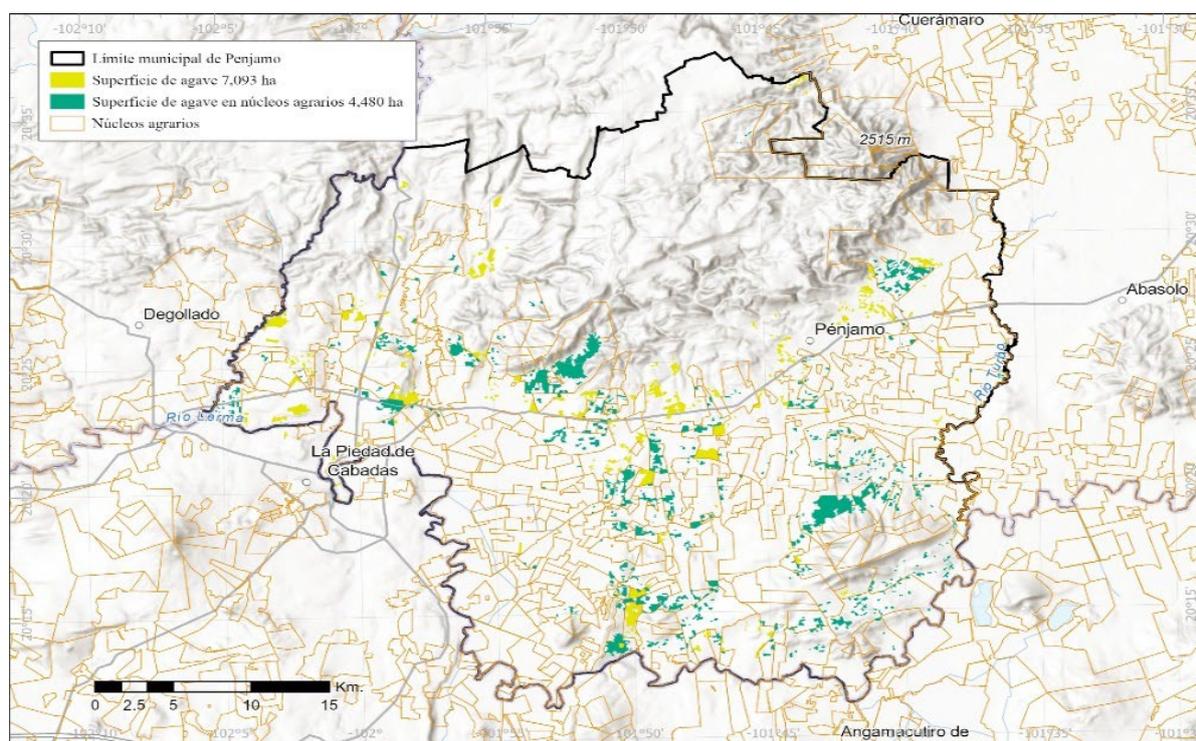
“A company arrived, José Cuervo tequila, and we made the decision to make a deal with the tequila company and that forced us, more than anything because of the labor and apart from the fact that the grain was very cheap, and the inputs were very expensive. What, if I see it wrong, is that it is a crop that they bring their program to four years to five years. The detail is that the agave sheds its leaves, it does not cover its surface and when it rains, the earth erodes, it washes away, that is the detail that I see as the most serious, now the other one is the environment that I see, it is the ecology, the fauna, that many companies that arrived destroy everything, huizaches, mesquites, these nopales, even there on the ranch there were about 200 to 300 hectares around the ranch that were like ecosystems, these companies arrived and destroyed them (Interview with FH held in Penjamo, November 6, 2021)”.

3.3 Area occupied by agave plantations in the municipality of Pénjamo

We carried out field trips in the municipality of Pénjamo and found that there is a greater number of agave plantations in the valleys and fewer plantations in the mountains. Subsequently, we georeferenced the agave plots by taking control points in different areas of the municipality, information that helped us make the following map (figure 2), where we show that in 2022 the agave surface was 7093 hectares, the largest plantation is concentrated in the ownership of ejidal land with 4,480 hectares and the rest is in small property ownership.

This means that the ejidatarios of these agrarian centers have decided to stop producing grains and livestock and now rent their lands for monoculture or they produce agave. Although, in the agrarian nuclei, decisions are made by consensus where there is resistance from those who do not agree with the agave plantation, the leaders of the ejidos are increasingly convinced and convince the members of the ejido to change the production.

Figure 2 The surface occupied with agave plantations in agricultural centers and small properties, Pénjamo, Guanajuato 2022



Source: Authors: Ana Gabriela Morales Ventura, Lucie Crespo Stupková, and Jesús Medina Rodríguez (research assistant at the Center for Human Geography Studies of El Colegio de Michoacán). Information obtained on field trips.

4 Conclusions

The increase in the planting of Agave tequilana Weber blue variety increased the cost of land rent in the municipality of Pénjamo, Guanajuato, Mexico by up to 900%, this affects grain and livestock producers who for centuries have been sharecroppers, tenants in the municipality. This causes producers to reduce the production of grains and livestock that contribute to local nutrition. Grabbing agricultural and forest lands with agave plantations increased by 247%. The institutions that are in charge of regulating the change in land use and coverage have been flexible mechanisms that determined the territories for monoculture planting. The formation of the Denomination of Origin of Tequila was formed with a view to the international market. It is concluded that agroextractivism and land grabbing for agave plantations accentuate economic, territorial, political, and environmental inequality at a local scale and affect pre-existing activities, such as grain production and livestock farming.

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Marketing challenges and opportunities of agriculture cooperatives in Mountain Dang Valley of Nepal

Ghanshyam Pandey¹

Abstract: The agriculture sector in Nepal has been weak over the past two and a half decades, and it faces both structural and new challenges, including poor access to technology, inputs, and credit, and the emerging challenge of climate change. The major challenge faced by farmers is a lack of marketing opportunities. The main objective of this study will be to design remedies to the main problems of agriculture co-operatives, explore other alternatives, and analyzed the institutional structures of the formal existing institutions and stakeholders, and their role in the development of the cooperatives in the rural settings, and how rural cooperatives can function on coping the circular bio-based economy. The path forward for cooperative societies lies in a holistic approach that encompasses a well-structured value chain supply, strategic government assistance, bio-based economic solution, the unwavering commitment and active participation of stakeholders, rigorous and regular audits, robust financial credibility, and stringent internal controls.

Keywords: bio-economy, cooperatives, institutional challenges, marketing opportunities

YEL classification: J54, P13, Q13, Q57

1 Introduction

The agricultural sector, in Nepal has been significantly impacted by the changes caused by globalization and climate change affecting its sustainability and competitiveness. It is worth noting that agriculture plays a role in the livelihood of 90% of Nepal's population. However, the country has experienced a food deficit for the 26 years. To address this challenge it is imperative for farmers to come together as a group and take action to enhance their livelihoods and improve agriculture practices (Poudel, 2007). Rural enterprises face challenges, including the effects of global market fluctuations on food production and profitability. However, cooperatives whether single-purpose or multipurpose originated, provides a wide range of services especially to the rural communities, for instances; savings services, loan products of cooperatives, insurance services, and non-financial services as well (Simkhada, 2017). Additionally, they also deal with periods of floods and droughts which negatively impact their productivity (Thapa et al., 2019).

Although agriculture cooperatives are classified primarily as marketing, farm supply, and agriculture related-service cooperatives in most of the available literature (Poudel, 2007; Simkhada, 2017; V. Valentinov, 2007; V. L. Valentinov, 2005), various development activities in agriculture, small industry marketing and processing, distribution and supplies are now carried on through co-operatives e.g. Dairy, on and off-farm agriculture. Tulsipur Sub-metropolitan city encompasses 160 cooperatives comprising a total of 12,851 (Male: 7319, and Female: 5532) members and have been providing direct employment opportunities to 68 individuals.(Department of Survey, 2020). In areas, the agriculture co-operative societies in fact are playing multi-functional roles both in rural and urban areas dealing agriculture and non-agriculture services and credit/finance.

Bioeconomy (BE) could be a major opportunity for former agricultural and local communities and their food producing cooperatives to change their specialization using local resources potential and develop a thriving circular bio-based economy. It is a great chance to create new jobs and improve economic competitiveness of cooperatives in comparison with former traditional ones with mainly agricultural production. The GoN, (2015) recognizes cooperatives as one of the three pillars, along with the public and private sector, for development of the national economy(NEFSCUN, 2020). The bio-economy to govern holistic approach is essential for balancing three pillars of sustainability: social, economic and environment. It was suggested that small and fragmented agricultural markets are conducive for development of agricultural cooperatives, which, apart from correcting the market failures, also perform social and farmer-specific economic roles (Bonus, 1986; V. Valentinov, 2007; V. Valentinov & Curtiss, 2005).

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2 Methods

2.1. Methodological Procedure

The study consists of both primary and secondary data including a household/cooperative leaders survey, literature review, participatory rural appraisal tools including, focus group discussions, economic performance mapping of co-operative and a review of relevant literature.

2.1.1. Household/cooperative survey: A systemic stratified sampling approach was used for the household survey. A total of 194 households, corresponding to different cooperatives were approached for sampling, whereas for cooperative survey, 21 cooperatives representatives were selected. Stratification was done according to the active, moderate and passive farmers of co-operative those are involved in the production, packaging and marketing as well.

For the cooperative leaders, the questionnaires were usually filled either by directors themselves or by cooperative members close to directors in the presence of researchers for data gathering. After data was compiled into a database, a number of cooperative directors was interviewed about the most interesting (or otherwise unclear) aspects of information obtained through the questionnaire. Financial data was collected from the currently most reliable co-operative which was supplemented by the data from the database of the Cooperative Association in Tulsipur areas contains information on 166 cooperatives, the total 21 co-operatives data was taken in a comprehensive way and to establish whether these cooperatives are active or not and tele-communication, focus groups discussions (FGDs) and Key Informant Interview (KII) was conducted by the researcher with all listed cooperatives.

2.1.2. Selection of sample: The random sample criteria for criteria for selection of traditional and contemporary cooperatives was proposed and 5 cooperatives from each group was selected. In additionally, other 5 private enterprises were selected as control sample in order to compare the cooperativeness. In each cooperative, the cooperativeness, governance system including planning, decision-making process and market functionality, employment opportunity, attitudes of leaders of village community, cooperative, landowner and farmers, use of technology etc. was investigated. The 194-household questionnaire survey, 20 key informants' interview and 10 focus group discussions (FGDs) was done for gathering primary data with detailing information on the organizational structure, financial performance, and decision-making processes.

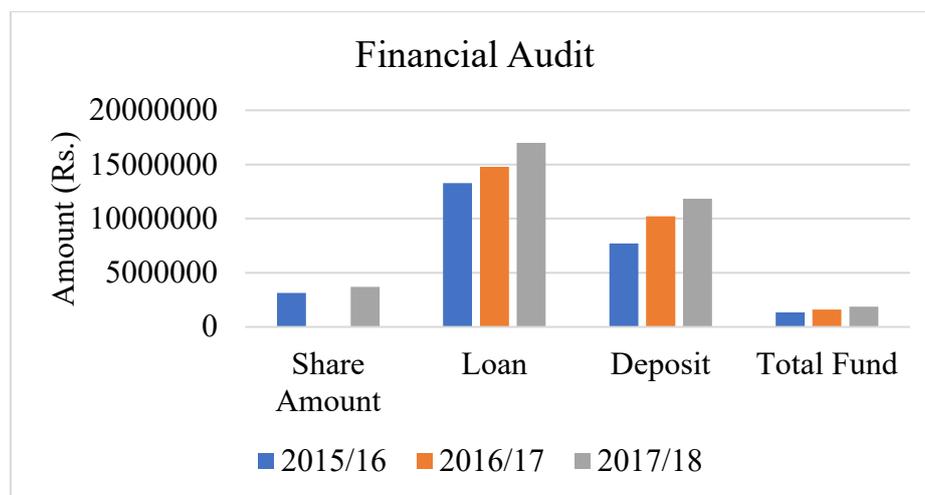
2.2 Data Analysis

Data obtained from the field were very heterogeneous. For the simplicity of analysis, the processing was done by editing and coding, so edited and coded data were tabulated under required headings and subheadings. The survey questionnaires were coded, cross-checked, and cleaned where necessary. Household survey data was entered into a data-entry mask designed using the SPSS Statistics software package 16.0 version.

3 Results and Discussion

Altogether, 21 cooperatives were selected for in-depth overview of the cooperative economic sustainability. They were approached with providing the financial audit data for the consecutive years starting from 2015/16 to 2017/18. Provided data encompassed share amount, loan deposit, liquid assets, deposit amount, interest amount, tax deducted amount, total fund allocated amount and so on. The data showed a progressive growth in the share amount, loan acquisition amount and deposit amount fashionably increasing the total fund transaction in the following years. The result is demonstrated in the figure below.

Figure 1 Financial Audit tracking down from 2015/16 to 2017/18.



3.1 Loan

Altogether 194 individuals were sought for questionnaire survey and the loan disbursement was divided into short term, mid-term, long-term and no loan acquired data set. The data visualized 21 individuals sought 21 short-term loan, 41 individuals undertook mid-term loan, 8 individuals acquired long-term loan whereas 114 individuals were found to take no loan at all. With the country facing economic crisis, the individuals are afraid to take risk regarding loan acquisition and withdrawal from the cooperatives. Respondents that were found to seek short term loan responded the requirement of financial aid for agricultural and livestock purpose, whereas, mid-term loan seeker were found to be acquiring loan for business purpose.

3.2 Cooperatives decision

Stakeholders' involvement in the cooperatives overall functioning is crucial for the economic sustainability of the cooperatives. Stakeholders meeting are the means to an end for determining the progress in the trend of the growth of cooperatives. However, the respondents are found to be missing those meetings which results in the delay in the result disposition. Cooperative decision regarding hiring and firing employees are done in the stakeholders meeting, though the decision takers are found to be Executive committee in the majority of the General Assembly. Dispute resolution on the proper functioning of the sustainability of the cooperatives were found to be conducted using consensus or qualified majority methods in the General Assembly.

3.3 Problems in Cooperatives

The KII respondents and focus group discussion groups were approached with a predetermined setoff semi-structured questionnaire and were asked to expressed the present scenario and problems that resides deeply in the cooperatives of Tulsipur.

- i. Lack of clarity about mission, national vision, and adequate monitoring on the part of government with respect to cooperative movement.
- ii. Lack of managerial skills, and professionalism, sound planning and implementation.
- iii. Lack of working capital, appropriate research extension and education about cooperative.
- iv. Lack of credibility, lagging behind from institutional developments.
- v. Contributions are not measured in national accounts, dormant members.
- vi. Inadequately trained human resources, lack of strategic direction.
- vii. Very little or no intervention in digitization.
- viii. Weak portfolio. low risk management, liquidity crunch in the financial system.

3.4 Bio-economy and rural development

The respondents from KII were engaged in a capacity building workshop as part of the community teaching where they were asked a series of questionnaire and they were responsible to deduce the response of the respective queries regarding how the cooperatives conceptualize bioeconomy and how that is being adapted.

Table 1 Respondents visualization of Bioeconomy as a tool for rural development.

Conceptualizing Bio-economy	An approach to become independent from sources of income through simple production, conservation and consumption of natural resources.
Adaptation	By facilitating skills and capacity development trainings and exhibition. By adapting savings, investment and employment approach and understanding market management. And by enabling equal access to all.
Delivery	The current policy and government structure is unable to deliver the bio-economy approach in the cooperatives. Middlemen existence as a mediator pushes the value addition as much by 5x for the final consumer. Unscientific use of imported fertilizers has increased, displacing pesticides, chemical fertilizers and artificial fertilizers.

4 Conclusions

As the research quantify the economic sustainability of the cooperative based on the financial auditing and how progressive the growth it achieved, the loan acquisition remarks the mobilization of human resource and cooperatives decision exhibiting its way forward on the upcoming challenges the cooperatives face, in short, the economic sustainability in the agricultural cooperatives in Tulsipur sub-metropolitan city embarks on a long-lasting journey. However, with the COVID-19 impacts, and Russia-Ukraine war faceted the economic crisis globally, Nepal cannot be remained untouched, and the data acquired in 2018/19 might not represent and may flaunt before the crisis data in general. Many cooperatives have succumbed before the crisis resulting in the overall economic sustainability of the cooperatives and now must seek options for their existence.

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The digitalisation of agriculture: The case of the South Bohemian Region

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Abstract: For rural areas, the digitalisation of agriculture has great potential in terms of production efficiency, and regional competitiveness, and also significantly complements the objectives that lead to sustainable development. In addition to these positives, digitalisation can have an impact on the differences between those who implement elements of digitalisation and those who do not. For example, there may be a gap between small and large enterprises due to differences in capital endowment. How do agricultural enterprises or private farmers in the South Bohemian Region perceive the issue of digitalisation in agriculture? To what extent are elements of digitisation already implemented?

The aim of the paper will be to find out how farmers in the South Bohemian Region perceive the digitalisation of agriculture. The current state of implementation of digitalisation in agriculture will be determined through a pilot survey based on qualitative research. Furthermore, the expected benefits and challenges for farmers will be identified. In the end, a picture will emerge of how a group heavily involved in the appearance and creation of the rural area will perceive this development trend.

Keywords: Agriculture, Digitalisation, Grounded theory, Rural area, South Bohemian Region, Czech Republic

JEL Classification: O13, Q10, Q55

1 Introduction

The development and diffusion of digital technologies encounter the reality of everyday life in modern societies. The ongoing digitalisation based on automation, robotics, artificial intelligence (AI) and smart tools plays an important role in transformations of various processes and systems, including the agri-food system (Forney, Dwiartama and Bentia, 2023). The agriculture is expected to undergo intensive digitalisation with the hope that the changes brought by the implementation of various sensors and intelligent machines will enable precise farming and better timely decision-making based on data collected by the equipment in the fields followed by modelling leading to accurate predictions on when to plant, seed, spray, or harvest the crops (Lajoie-O'Malley et al., 2020). The reliability of precise smart farming is supported not only by one technology, but a toolkit of various technologies combined, e.g., the aforementioned sensors, but also GPS, machine learning, AI, 5 G, internet of things, cloud computing, as well as robotics (Ingram and Maye, 2020; Lowenberg-DeBoer and Erickson, 2019; Numa, Wolf and Pastore, 2023). Rural areas are going through a deep technological modernization and digital transformation that affects the primary sectors, not only agriculture but also forestry, to fishery (Ferrari et al., 2022; Kostrikova and Yafasov, 2022).

The European Union recognizes the potential of this transformation to bring a renaissance to the European agricultural sector and support its efficiency, competitiveness, and sustainability while addressing challenges such as food security and climate change through the adoption of new technologies (European Commission, 2023). Currently, there are two major trends in agricultural transformation worldwide. Apart from digitalisation, it is ecologisation that includes organic and sustainable farming. Interestingly, both trends are perceived as either antagonistic or convergent (Schnebelin, Labarthe and Touzard, 2021). Considering the fact, that there are different business models within the agricultural practice that tend rather to an intensification of farming leading to higher yields, yet with negative effects such as increased pollution, resource depletion, soil degradation and biodiversity loss, or to alternative farming focused on tackling sustainability issues coming at price with lower yields, the transition presents a challenge in finding the feasible balance. The results may vary in complexity and complementarity of various approaches (Plumecocq et al., 2018). While many recognize the role of digitalisation in enabling the transition towards a sustainable future in agriculture and rural areas, there is also some scepticism and doubts about its unrevealed consequences including the economic, environmental, social, ethical, and institutional impacts and relations (Rijswijk et al., 2021; Shepherd et al., 2020). The potential

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contribution of agricultural digitalisation to the United Nations' Sustainable Development Goals remains unknown. Furthermore, there is the issue of ensuring responsible ways of digitalisation (Metta et al., 2022). Whatsoever, the advancement of technologies seems inevitable in order to produce more feed and food sustainably for a growing population on a planet going through climate change and a demographic explosion that may lead to an unprecedented hunger crisis (Shepherd et al., 2020; Numa, Wolf and Pastore, 2023).

South Bohemian Region (Czech Republic) can be characterized as a rural area with the important role of primary sector including agriculture, forestry and fishery. South Bohemia has great potential for the development of a regional circular bioeconomy due to existing activities with a vision of building linkages and value chains by connecting traditional resources and branches with new high-value-added sustainable technologies. However, there is also an emphasis on waste management and utilization of non-traditional resources (Szarka et al., 2023).

The aim of this paper is to examine, how representatives of conventional agriculture within the South Bohemian Region perceive the development of the process of its digitalisation, to what content they participate, and which benefits or risks they see in further implementation of digital technologies in farming including the expected (or observed) effects on yields and environment. For this purpose, two research questions were set as follows:

- 1) How do the representatives of conventional agriculture perceive the current state of digitalisation in agriculture?
- 2) Which changes, opportunities and threats of digitalisation in agriculture do they expect in future?

2 Methods

The aim of the paper is to find out how farmers in the South Bohemian Region perceive the digitalisation of agriculture.

The subject of the analytical part of the paper is a pilot survey, which is based on a qualitative approach, since due to the nature of the pilot survey, the aim is to create a new understanding of the topic or a new theory (Disman, 2011). The inspiration for the qualitative pilot survey was grounded theory, considered one of the most widely used qualitative research methods aimed at creating new theories (Strauss and Corbin, 1997; Oktay, 2012). The main reason for this is that the resulting theory can be tested with other research methods that will be part of further research in this area (Oktay, 2012). The most appropriate use is to analyse a process in which participants construct meaning from intersubjective experience. It is equally important to respect key assumptions about the social reality under study (Suddaby, 2006).

The chosen method for data collection is semi-structured interviews. Prior to the actual data direction, the questions were categorized into three discussion themes.

- Basic ideas about the digitalisation of agriculture
- Current status of digitization of agriculture
- The future of agriculture in the context of digitalisation

Selected farmers from the South Bohemia Region were chosen as respondents. A total of 4 interviews were conducted. The survey achieved a satisfactory spatial distribution, as a total of three districts of the South Bohemian Region - Strakonice, Písek, and Jindřichův Hradec. Transcribed interviews were used for open coding of the data. Codes were assigned to sections of text, which were then categorised and interpreted according to their relevance to the phenomenon (Strauss and Corbinová, 1999).

3 Research results

The open coding resulted in sub-codes which were then categorised into the following categories: Associations with the term "digitalisation of agriculture", Reasons that lead enterprises to digitalisation, Personal experience, Economic and environmental benefits of digitalisation, Threats and challenges, Most affected sectors, The role of the state.

3.1 Associations with the term "digitalisation of agriculture"

The opening question in the interviews was about the associations that respondents generally associate with the digitisation of agriculture. Respondents' perceptions are homogeneous. All interviewees associate digitalisation in agriculture with modern technology. The next mentioned were mainly specialized software. In one case, artificial intelligence was also mentioned as an important element shaping the transition to digitalised production. *"By that, I imagine the use of modern technology, some software and artificial intelligence"* (Martin, 20.9.2023). *"I imagine the connection of those computers with those machines, technology, something like that"* (Petr, 26.9.2023).

The views of half of the respondents that digitalisation represents a form of saving the industry or popularising it in the context of a new generation can be considered an interesting contribution. *"Digitalisation is also a form of popularization of agriculture so that we can pull those younger people back into a relatively conservative industry, which itself is as conservative as it can be"* (Barbora, 21.9.2023)

The issue of generational change was also mentioned in connection with the question of whether it is necessary to digitise agriculture. The age structure can also be a barrier here, as the respondent states. *"Digitalisation of agriculture is only possible to the extent that most employees can handle it and most employees are often over 40 years old"* (Martin, 26.9.2023) Conversely, digitalisation may attract younger people to work in the sector. *"If intelligent people are going to enter this agriculture, they need it to be as digitised as other worlds are digitised because our kids just live with these modern technologies"* (Terezie, 21.9.2023).

In the ensuing discussion, it was necessary to specify with what frequency respondents encounter the sub-elements of digitisation. Artificial intelligence was mentioned in a total of three cases. In one case, it was even specified that it is significantly used by the State Agricultural Intervention Fund. Robotics was encountered by all respondents. In two cases, it was mentioned that it is currently most significant in dairy cattle farming. In a total of three cases, respondents were able to describe 5G. Only one respondent had encountered IoT in agriculture.

3.2 Reasons that lead enterprises to digitalisation

When asked what reasons generally lead enterprises to digitise their activities, all respondents stated the same. There is a shortage of people in agriculture and modern technologies are not labour intensive. *"First of all, I would say it's a lack of people, a lack of employees"* (Martin, 20.9.2023). In two cases, significant cost reductions were also mentioned. *"The other thing is like precision farming is reducing costs and increasing yields by applying those products in the best possible way"* (Martin, 20.9.2023). The same frequency, i.e. 2, was the opinion that the sector would be more attractive to the younger generation. *"It's just easier and less labour intensive and more "cool" for the upcoming generation. That's absolutely crucial"* (Terezie, 21.9.2023).

3.3 Personal experience

The personal experiences of the respondents with digitalisation are varied, but the common denominator is that all of them have encountered and used digitalisation in their enterprises. In two cases, the software in use is specific to manufacturing or agricultural machinery. *"I have computers in my machines. I use some things, but I haven't quite got it all the way through. I've just bought a tractor that already has automatic guidance. I don't have to drive it, but I might buy more machinery for it next year..."* (Petr, 26.9.2023). Communication with the state was also mentioned in two cases. *".....all communication with the state at the moment is digitalised. We have been running on the ELPIS portal for a long time and this year the AMS portal and the GTFoto portal have been introduced"* (Terezie, 21.9.2023). Land management was also mentioned where digitization helps significantly. In total, there were two statements from respondents. *"Several companies came with offers. We will make it more user-friendly and more for you so that you can have more information about your own land..."* (Barbora, 21.9.2023). The link to precision agriculture was also mentioned once.

3.4 Economic and environmental benefits of digitalisation

All respondents interviewed agree that digitalisation can lead to greater revenues. In two cases it was also specified that it is a tool that is still subject to significant management decisions. *"I think every other tool that is used to lead or to move the business in some way is exactly what you make it"* (Barbora, 21.9.2023). The responses are similar in the case of the environmental impact of digitalisation. All interviewees underline the positive impact on the environment. *"It can (have positive environmental impact). It depends on how these people know how to use it. It's due to precision. It's more controllable than the human factor"* (Petr, 26.9.2023). *"I think that by allowing you to have that data multiply, absolutely multiply, the digitisation can at that point benefit environmental protection absolutely significantly"* (Terezie, 21.9.2023).

3.5 Threats and challenges

In a total of three cases, the challenge of changing the conservative mindset in agriculture and the reluctance of the older generation in particular to embrace innovation was mentioned. *"At the moment, I think the thing about agriculture is that a relatively large percentage of people who work in agriculture are so not capable of that digitalisation"* (Barbora, 21.9.2023). *"The biggest challenge I think will be just to reduce those costs of acquiring those technologies and to teach that to the older generation or to wait until they are replaced"* (Martin, 20.9.2023). Equally numerous was the view that all technology is vulnerable to external interference and threats. The concern that people may start to over-rely on technology was mentioned. *"It's still just a machine, and it's good to remember that you have to take care of living things, living animals, plants and nature"* (Barbora, 21.9.2023). *"It threatens me that a mistake can be made just like the human factor"* (Petr, 26.9.2023). The challenge of the high cost of these technologies was also mentioned once. In one case, the

threat regarding the lack of know-how in the future was also described. *"The threat is, as I mentioned, there are already about 2% of people in agriculture, and if there will be even fewer people, due to digitalisation, I would see it as a threat that there will not be enough people who have the know-how"* (Martin, 20.9.2023).

3.6 Most affected sectors

All the respondents agreed that crop production - fruit and vegetable growing - is the most affected by digitalisation. *"...I think it is vegetables and just labour-intensive plants"* (Terezie, 21.9.2023). *"...if those modern farming machines take hold, it will be in the growing of plants"* (Martin, 20.9.2023). Dairy production was identified as the second area most affected by digitalisation in a total of three cases. *"...it's going to go to the industries and the places that have that cash flow and who know that they're going to get those amounts back to make it worthwhile, which is exactly anything that is labour intensive in terms of quantity and human labour, and that's exactly vegetables and milk"* (Barbora, 21.9.2023).

3.7 The role of the state

The last category is the role of the state in the digitalisation of agriculture. All respondents report that the state supports digitalisation and actively introduces new features. It was pointed out that subsidies are mainly targeted at precision agriculture. It was also mentioned that there are strict conditions and many farmers do not get access to subsidy funds. *"Well, given that I mentioned subsidies that didn't come out this year, but they are counted on, I would say that the state and therefore the EU is probably supporting digitalisation, but I didn't notice that there was any really like massive support"* (Martin, 20.9.2023). In two cases, the view was expressed that there is a lot of potential to improve the state's interaction with farmers in terms of support and approach. *"We meant well and it worked out as it always does"* (Terezie, 21.9.2023). *"...it's the people who are trying to do it right that will take it the most, and that it's terribly counterproductive in the end, but like we'll hope and trust that they can balance it out and that it will get better..."* (Barbora, 21.9.2023).

4 Conclusions

This era can be characterized by rapid technological advancements that shape the transformation of various industries and societies. The digitalisation of agriculture, driven by cutting-edge modern technologies, data utilization, and connectivity of the digital and real world, is an upcoming phenomenon that changes agricultural practices towards precise farming and smart agribusiness that enhances both efficiency and sustainability. Greater yields, improved firm economy, popularization of agriculture and better working conditions for farmers, as well as reduced environmental impact, are promising outcomes of the ongoing digitalisation process recognized by the representatives of conventional agriculture in the South Bohemian Region.

The farmers perceive many benefits derived from the implementation of modern technologies, software, and even artificial intelligence in agriculture. They have been currently introducing several digital technologies and features, including the Internet of Things sensors, drones, robotics, computers used in manufacturing and machinery, systems of navigation and automatic guidance, software for land management, as well as digital portals, some of which are used for the communication with state administration. The technologies utilized by the representatives of conventional farming related to crop farming, livestock management and manufacturing processes help them with the overall economic performance and overcoming problems such as lack of labour force, optimizing costs, increasing revenues, yields, and reducing environmental impacts. All respondents perceive crop production as the most affected agricultural sector by digitalisation followed by dairy production. They realize that the state is supporting the digital transformation of agriculture, mainly through subsidies on precision farming, but mentioned strict conditions and rules that many farmers can not meet.

As for the future expectations, some of them are already thinking about introducing new digital technologies. Concerns included the challenges related to a conservative mindset, the reluctance of the older generation and the lack of know-how of middle-aged people when it comes to innovation and handling modern systems and technologies, initial costs of acquiring those technologies, and the threats in the form of over-relying on technologies and vulnerability to external influences. The farmers note that the state administration has the potential to transform agriculture if it interacts more with the practitioners and supports them adequately.

Acknowledgement

The authors solemnly declare that all respondents have signed a *"Consent to Participate in Research"* and have given permission for their first name to be used. At this point, the authors would like to thank all respondents for being willing to provide valuable information and their personal experiences.

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Session:

Trends in Marketing, Trade,
Tourism, and Services
in the Context of Digitalization



Post-Brexit UK in Asia-Pacific: Early comments on FTAs

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Abstract: Having lived through a narrow win for the Brexit movement, the UK now finds itself in the world of reality, one that apparently sees the nation's economy contracting and its sphere of international influence diminished around the globe. This paper explores recent attempts by the UK to re-write itself as somewhat of a dominant power beyond the borders of the EU. We concentrate on efforts the UK is making in the Asia-Pacific region, with particular attention to the Australia-UK Free Trade Agreement (AUKFTA) and, to a lesser extent, the recently announced agreement to allow the UK to join the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). We conclude that the UK has no guarantee of success in re-inventing its relevance on the world trade scene, and it is unlikely that any imminent Free Trade Agreement deals will bring great economic prosperity in the near future. Perhaps it may have been best for the UK to have remained as an EU member state after all.

Keywords: Post-Brexit, Free Trade Agreements, Asia-Pacific and UK FTAs.

JEL Classification: F 13, P 33, P45, Q17, Q37

1 Introduction

Free Trade Agreements (FTA) have become the norm post the establishment of the World Trade Organisation, mainly due to the stalling of further progress in liberalising markets post the Doha Round. The reason for the 'explosion' of FTA has simply been due to the fact that it is much easier for a smaller group of people to arrive at an agreement, and much more complicated as the number of negotiating parties join the table, such as during WTO negotiations. In fact, the majority of FTA currently in force are bilateral, that is between two nations, and to a much lesser extent, regional agreements that comprise a number of nations.

FTA are not, as the words imply, free at all. They are agreements that provide more beneficial access to markets of signatory nations through concessional (preferential) processes, be they via tariff reductions, investments, the provisions of services, or the movement of people. At times FTA provide benefits on commencement, but at other times only over a number of years through successive tariff reductions. Additionally, FTA do not necessarily comprise all goods/services available in a market as, at times, certain products/services considered to be strategic, or of vital economic importance are excluded from FTA negotiations. Consequently, FTA should be viewed as market controlling agreements, not 'free' as such, in the ordinary sense of the word. Whilst this may seem semantic, we consider this to be an important consideration, because it is through negotiations that concessions are given to open up local markets to foreign competition.

Brexit was a momentous occasions, not only for the European Union (EU) and the United Kingdom (UK), but also for other nations with which the UK may want to forge independent ties in the future. No longer negotiating as part of the central EU bloc, the UK must stand alone in negotiating new FTA in the future, but without the expertise to do so in the short run. This has seemingly resulted in the UK not being able to fulfill the claims of former UK Prime Ministers that were boasting Brexit would deliver a 'Global Britain', as the nations was 'unchained' from EU constraints. According to Hutton (2021) „so much of the case for Brexit is false“. These falsehoods have included: an impending tsunami of illegal immigrants who would steal local jobs; a £350 million weekly boost to the National Health Scheme as a result of leaving the EU; and that EU rules were compromising UK sovereignty (a curiously selective notion given the Irish situation). Additional to the Brexit withdrawal, there were also somewhat contradictory expectations from the UK about its future involvement in EU institutions. Both the European Medicine Agency (EMA) and the European Central Bank (ECB) were based in the UK pre-Brexit, with the UK expecting the status quo, post cessation of EU membership. This is somewhat like wanting to be inside the tent after you have walked out of it – you cannot have it both ways. This apparent contradiction was highlighted by Michael Barnier (the EU's chief negotiator on Brexit), in noting that „the same people who argue for setting the UK free also argue that the UK should remain in some EU agencies“ (Rankin, 2017). The EMA moved to Amsterdam and the ECB to Paris, and the loss of both agencies would of course mean a loss of local jobs,

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expertise, and prestige. In summary, we believe Brexit has largely been a failure, except for those who remain tied to an ideology not reflecting reality.

Has an independent Post-Brexit UK delivered on its promise to become a more global player with concomitant influence? What benefits have been derived so far for the UK via FTA? In order to answer these questions we consider the examples of the only two new FTA the UK has concluded at the time of writing, that is: the Australia-UK Free Trade Agreement (AUKFTA) that took effect on 31 May 2023 and, to a much lesser degree, the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), to become effective in the near future.

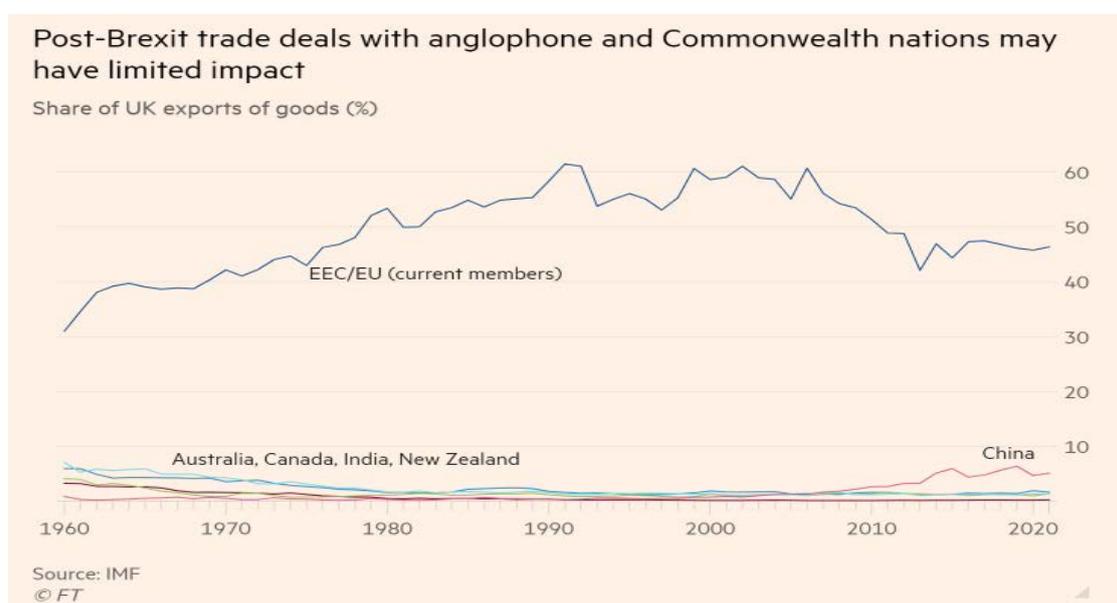
2 Methods

The method employed for this research is a review of current information on the Australia-UK Free Trade Agreement (AUKFTA) which came into effect on 31 May 2023, with the aim of quantifying the benefits that may be derived by both signatory nations. This is followed by very brief comments on the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), effective since 2018, that the UK has been allowed to join in 2023. As there is a dearth of academic literature on AUKFTA, most likely due to its recent enactment, reliance on information has been mostly through government sources, web pages and the media. The CPTPP accession for the UK is a very recent occurrence and as such, also lacks academic literature. Furthermore, at the time of writing, this agreement has not been ratified by member nations and is not yet in force. Consequently, a formal literature review has not been provided, preferring instead to quote relevant sources as appropriate.

3 Research results

According to Payne, Foster, and Evans (2022) the UK's future economic success is likely to lie outside the anglosphere and that in a Post-Brexit environment, the gaze should be beyond the Commonwealth, as shown in Figure 1. In terms of Figure 1 nations, their world economic standing based on GDP (World Bank, 2022), has the UK ranked number six, whereas Australia ranks 13, Canada nine, and New Zealand 50. The larger economies lie outside the anglosphere, with India at number five and China at number two, and these data appear to support the claims by Payne et al. (2022).

Figure 1 Likely impact of Post-Brexit trade deals



Source: Payne et al. (2022)

It is known that, in general terms, in FTA the greatest benefit in outcomes tends to be derived by the lower economic ranking nation. In this respect we can predict that for AUKFTA and CPTPP, the UK may make lesser gains. We examine trade flows for AUKFTA in the next section and outline the main gains from this agreement.

3.1 AUKFTA

Australia's 10 most valuable products exported to the UK in 2022 are summarised at Table 1 and Australia's 10 most valuable products imported from the UK are summarised in Table 2.

We can ascertain that Australia has a trade deficit with the UK, mainly with machinery, vehicles and pharmaceuticals. There is no longer an automotive industry in Australia and motor vehicles manufactured in the UK are readily sold in Australia, in global competition from other foreign manufacturers.

Table 1 Australia's exports to the UK 2022 (Unit: US Dollar thousand)

Product label	Australia's exports to the United Kingdom 2022
Lead and articles thereof	348035
Beverages, spirits and vinegar	310188
Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical	303027
Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral	155272
Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television	124092
Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	118138
Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal	109736
Meat and edible meat offal	94481
Ores, slag and ash	49171
Natural or cultured pearls, precious or semi-precious stones, precious metals, metals cladding	44148
All products	2116550

Source: International Trade Centre and own elaboration

Although Australia excels in the scientific field, its production of pharmaceutical products is miniscule, with the concentration of efforts focused on research and development, rather than commercialising discoveries. This is both a function of a small domestic market, leading to low demand and the lack of investor/government support for such activities. By contrast, the UK is a considerable producer of pharmaceutical products. The trade in beverages is almost equal, and there is a trade deficit with the import of printed matter, plastics and precious stones and cultured pearls.

Table 2 Australia's imports from the UK 2022 (Unit: US Dollar thousand)

Product label	Australia's imports from the United Kingdom 2022
Machinery, mechanical appliances, nuclear reactors, boilers; parts thereof	976824
Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	681298
Pharmaceutical products	538272
Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical	346379
Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television	338897
Beverages, spirits and vinegar	296153
Miscellaneous chemical products	199607
Printed books, newspapers, pictures and other products of the printing industry; manuscripts,	157144
Plastics and articles thereof	141520
Natural or cultured pearls, precious or semi-precious stones, precious metals, metals cladding	116653
All products	5074272

Source: International Trade Centre and own elaboration

In order to place the relative size of Australia's trade with the UK, we can consider the UK's global merchandise trade relationships as shown at Figure 2. It can be observed that Australia is not a high ranking trading partner, featuring at number 20 (1.2%) for an export destination and number 30 (0.5%) as an import source (Department of Foreign Affairs and Trade, 2022).

Australia and the UK can, therefore, be considered to be minor partners in world terms, despite the claims by former Prime Minister Boris Johnston that „this is global Britain at its best - looking outwards and striking deals that deepen our alliances and help ensure every part of the country builds back better from the pandemic“ (McGuinness, 2021) – perhaps this was merely political bluster, rather than a frank economic assessment. Indeed:

The International Trade Committee, a cross-party committee of UK members of parliament, has warned the government against “overselling” its free trade agreement (FTA) with Australia, saying that „flat-footed negotiating“ has led to significant concessions without securing all possible benefits in return (Wragg, 2022). It seems that in the UK the agreement has not been well received by some, as Mr Eustice [former environment secretary], who helped secure the agreement, told a Commons debate that it was „not actually a very good deal for the UK“ (Sowersby, 2022). It is difficult to see how grandiose AUKFTA may become for the UK when trade flows are quite low, and if this is global Britain at its best, then the future cannot look so bright for it in the FTA space.

Figure 2 UK global merchandise trade relationship 2021

United Kingdom's global merchandise trade relationships, 2021 <small>Source: Various international sources</small>					
Principal export destinations			Principal import sources		
Destination	Share	Rank	Destination	Share	Rank
United States	12.8%	1	China	13.3%	1
Germany	8.7%	2	Germany	10.9%	2
Switzerland	8.5%	3	United States	8.7%	3
Netherlands	7.5%	4	Netherlands	6.2%	4
Ireland	6.2%	5	Norway	5.2%	5
Australia	1.2%	20	Australia	0.5%	30

Source: Department of Foreign Affairs and Trade (2022)

Perhaps the results of AUKFTA reflect the UK's „lack of negotiating expertise and experience“ (Payne et al., 2022). It must be remembered that the EU trades as a bloc, and past negotiations, whilst the UK was an EU member state, were conducted from Brussels, not London. Table 3 provides a summary of the main benefits for Australian exporters, resulting from AUKFTA, with the greatest benefits, as anticipated (Abbott, 2019), being for food products. Indeed, it has been claimed that „easier Australian exports of agricultural goods to the U.K. could undermine the economic future of British farmers“ (Gross, 2022). In support of this the „National Sheep Association CEO Phil Stocker warned it offered “no real benefit” to British farmers and would lead to “an unlevel playing field” in favour of competitors Down Under [Australia]“ (Roughneen, 2022). These sentiments were echoed by the British Meat Processors Association's trade policy advisor Peter Hardwick, arguing „Australia could already be exporting “damaging volumes” of high-grade beef and lamb “without ever getting anywhere near the safeguard trigger levels” ... [because] some safeguards as [regarded] “completely useless” as they would only “kick in” after 11 years“ (Roughneen, 2022). It should be noted that, as shown in Table 3, a number of tariffs reduce over time, ranging from 3 to 10 years, before they become completely duty free.

Table 3: Australia's gains from AUKFTA

Wine	Elimination of tariffs on entry into force (EIF), saving around AUD37 million annually in duties (based on 2002 trade).
Beef	Elimination of tariffs after 10 years with immediate access to duty free transitional quotas.
Sheep meat	Elimination of tariffs after 10 years with immediate access to duty free transitional quotas.
Sugar	Elimination of tariffs over 8 years, with immediate access to a duty-free quota during the transition period.
Dairy	Elimination of tariffs over 5 years, with immediate access to duty-free quotas for dairy products during the transition period.
Rice	Elimination of tariffs for short and medium grain milled rice on EIF. Elimination of tariffs on broken rice over 4 years, with immediate access to a duty-free transitional quota. Access to a permanent annual duty-free quota for long grain milled rice.
Seafood	Elimination of tariffs on most products on EIF, and remaining tariffs over 3 years. Tariffs eliminated on EIF include those on all finfish and the 12% tariff on fresh and frozen rock lobster.
Honey	Elimination of the 16% tariff on EIF.
Horticulture	Elimination of tariffs on most fruits and vegetables on EIF, with tariffs on other products of Australian export interests eliminated over 3 years and all remaining tariffs eliminated over 7 years.
Wheat, Barley and Other cereals	Elimination of tariffs over 4 years. Immediate access to a duty-free quota of 80,000 tonnes per year for wheat, and a duty-free quota of 7,000 tonnes per year for barley.
Processed foods	Elimination of tariffs on most of processed foods on EIF.
Industrial products	Elimination of tariffs on all Australian origin industrial goods, except ammonia and aluminium where tariffs of up to 6% will be eliminated over 3 years.

Source: Department of Foreign Affairs and Trade (2023)

From the UK perspective, AUKFTA delivers tariff-free trade for British exports and greater access for services, investment, and access to government contracts, with an ease of restrictions for business travellers, and it will be easier for young Britons to travel and work in Australia (Department for Business and Trade and Department for International Trade, 2021). The UK government claims AUKFTA „will unlock £10.4bn of additional bilateral trade, support economic growth in every part of the UK and deliver for the 15,300 businesses already exporting goods to Australia“ (Wragg, 2022). Even if these assertions are accepted, it is unlikely that AUKFTA can be considered such a great deal. It may certainly double exports to Australia, based on the figures from Table 2, however, this would only potentially increase the share of Australia as an import source to approximately one per cent – hardly what one may regard as a landmark agreement. It is also not clear over what period of time the unlocking of these benefits for existing UK exporters may materialize. If it is over the same period of tariff reductions, then it would be approximately a decade away, and these estimates are based

on the UK maintaining an internationally competitive advantage on the products/services in question during this period. Indeed, the UK government's own Department for Business and Trade and Department for International Trade impact assessment portrays a rather different picture of the benefits of AUKFTA to its economy, as it estimates „the long-run effect of the agreement will be to increase UK GDP by 0.08% or £2.3 billion a year by 2035“ (2022). Regardless of whichever data source is accepted, we argue this is not the big deal for the UK that politicians claim it to be.

Hampering efforts for UK expansion are a considerable number of restrictions that remain in force for a range of products preventing the export of UK products into Australia, particularly in the agricultural sector. AUKFTA neither overrides or exempts these government regulatory controls. As an example, Australia's biosecurity requirements do not currently allow the import of beef meat from the UK, reflecting concern for local agriculture due to the successive outbreaks of Foot and Mouth disease, as well as the outbreak of Bovine Spongiform Encephalopathy - BSE - or mad cow disease. In fact, on examination of the import conditions for beef meat originating from the UK, the Australian Biosecurity Import Conditions database (BICON) reported the following „an import policy has not been developed for this specific commodity and situation“ (Department of Agriculture, 2023). This means the import of beef meat must undergo a future separate import risk assessment, „because Australia has strict import conditions in place, the introduction of FMD through the legal importation of these commodities [that is, livestock products and by-products, including genetic material] is very unlikely“ (Business Queensland, 2022). Consequently, whilst Australian meat will be increasingly able to enter the UK market, there is currently no possibility for two-way trade under AUKFTA, due to Australia's tough import rules. We can, therefore, demonstrate that, at least in this sector, it is not the UK that exerted influence, rather that Australia gained the upper hand.

3.2 CPTPP

The 2022 trade balance between the UK and the CPTPP partners is shown in Table 4.

Table 4 UK's trade balance with CPTPP partners

Australia	Brunei	Canada	Chile	Japan	Malaysia
2,584,409	33,103	-9,389,019	-403,163	-6,052,825	-2,585,901
Mexico	New Zealand	Peru	Singapore	Vietnam	Total Balance
-3,862,376	103,731	-3,437,626	5,369,990	-8,055,943	-25,695,620

Source: Intracen (2023)

In relation to the UK joining the CPTPP, it would seem that the projected gains do not amount to much at all.

Although the government called the agreement its „biggest trade deal since Brexit,“ its own estimates show that joining the CPTPP will increase UK economic output by less than 0.1% in the long run, or over approximately 15 years. „We are at our heart an open and free-trading nation, and this deal demonstrates the real economic benefits of our post-Brexit freedoms,“ British Prime Minister Rishi Sunak said Friday [31 March, 2023] (Rios & Toh, 2023).

It is almost laughable, in economic terms, to applaud a deal that takes 15 years to increase economic output by less than 0.1% - is this really the ‚Global Britain‘ that UK citizens were voting for? How does this correlate with the claims of grandioseness and world influencing economic deals that were central to the YES Brexit campaign? One has to wonder just how much bluster and ‚talking up‘ a politician can do. We do know that politicians are prone to skew facts to suit their particular immediate needs, at times even resorting to tell the truth. In this case the comments made by PM Sunak appear to have a ‚touch of Brexit‘ stretching reality in an attempt to manufacture a perception of grandeur, no doubt for political gain.

4 Conclusions

Brexit was probably the biggest controversial decision made by an EU member nation in the history of that institution. UK citizens were asked to vote against a backdrop of national hysteria, augmented by, at best truth stretching statements, and at worse, outright lies. The fallout and the impact of Brexit is likely to continue for some time. Whilst the UK has arguably achieved independence from the EU, the reality is that in an interconnected trading world, no nation can operate in isolation and concessions are inevitably required to access foreign markets.

In the agreements referred to in this paper, it is clear that the UK is not in a strong position in negotiating new FTA, be they bilateral or regional. Returning to our research questions: Has an independent Post-Brexit UK delivered on its promise to become a more global player with concomitant influence? What benefits have been derived so far for the UK via FTA? We conclude the following:

- The idea of a Global Britain that can wield power across the globe is perhaps reminiscent of a nostalgic empire, one that no longer exists. The notion that the UK could be as powerful as the EU globally is not realistic. Based

on the FTA considered in this paper, the UK has not demonstrated itself to be a global player with any significant influence;

- Both AUKFTA and the CPTPP make it vastly clear that there are only very marginal gains accruing to the UK, and this is over the long run. The gains from CPTPP are insignificant in the long term. AUKFTA has demonstrated a lack of expertise in negotiating these agreements, with seemingly much more accruing to Australia than the UK;

In the future, the UK needs to look beyond the nglosphere nations in order to forge more economically meaningful FTA, but it should do so with due diligence, and not be in a rush to conclude deals merely to meet self-imposed deadlines, so as to appear to be 'getting on with the job'. FTA are complex and their negotiations can span across a number of years before a final agreement is reached.

There is scope for further research in this area in the future as FTA negotiations between the UK and other nations unfold. It would be of interest to discover the full impact of Brexit on international trade flows, and what a future UK-EU trading environment may look like.

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Consumer preferences for wellness vacations destinations in the Czech Republic

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Abstract: The development of the wellness travel industry has been propelled by the rising concerns of an overworked population faced with both physical and mental health issues. Wellness vacation enables travellers to rejuvenate themselves after a long working period due to burnout, stress, and feeling overwhelmed, especially after the recent COVID-19 pandemic. As the traits and preferences of Czech travellers could have been impacted by the recent pandemic lockdown, and as there are scarce published works that have documented their recent preferences for vacation destinations; this study investigates the traits and behaviours of Czech tourists in selecting wellness vacation destinations in the Czech Republic (CR). Data was collected using a self-administered questionnaire survey, and participants who are familiar with wellness vacations in CR and at least visit a wellness vacation destination once a year were invited to participate in the study. Two hundred and sixteen respondents participated and 182 responses were finalised for data analysis after removing incomplete responses. Data analysis was conducted using Statistical Package for the Social Sciences (SPSS) software version 25, and description analysis was carried out to tabulate travellers' gender, age and income of participants, frequency of wellness vacation visits per year, intention to travel and willingness to travel based on distance. Findings show Czech travellers of both genders have similar preferences when it comes to wellness destinations. The result also shows most Czech travellers are willing to travel far distances (of more than 200km) to visit wellness destinations, which suggests that wellness destinations do not have to be concerned about the location if they are providing quality products and services to their visitors. The study also makes several suggestions and recommendations based on the results, including innovative ideas for future wellness vacation retreats to target both genders and age categories, especially for Millennials who work in busy cities where services such as digital detox would appeal to this market segment.

Keywords: wellness vacation, mental health, Czech Republic, post pandemic, competitive advantages

JEL Classification: D1, I12, M30, P46

1 Introduction

Wellness refers to a way of life that emphasises achieving the highest levels of health and happiness and unifying the body and mind. Self-responsibility, physical activity, aesthetic care, good food, relaxation, meditation, mental activity, education, and social interactions can all be viewed as essential components of wellness, which can be defined as a state of wellbeing that integrates the harmony of the body, mind, and spirit (Muhi & Durkovic, 2020). Wellness service offering such as dietetics and antistress regimens has been practiced with varying degrees of popularity making destinations in Europe like Spain, Germany, Hungary, and the Czech Republic (CR) drawing more and more travellers from across the world. This is also an expanding practice in Asia region such as China that includes seawater, mud, and seaweed therapy (C.S.Heung & Kucukusta, 2013).

Attracting 10.6 million international visitors arriving in 2018, the CR, one of Europe's top tourist attractions for the past 30 years, equalled its own population. With Spain, Italy, and France at the top of the list of EU tourist attractions, the nation comes in at number 10. The most significant forms of tourism in the CR are leisure travel, particularly active vacations (such as cycling and winter sports) and sightseeing travel. Tourism related to spas

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and conventions has always been significant (Muhi & Durkovic, 2020). The Association of Spa Resorts of the Czech Republic (SLL), which uses natural resources, has 36 spa resorts under its umbrella at the moment. These resorts are categorised into thermal, mud, radon, climatic, and mineral baths. Guests have a variety of options, including the style of bath, as well as the length of stay, lodging or dining arrangements, and wellness and relaxation therapies. Additionally, visitors can partake in a variety of cultural pursuits or go on excursions around the spa.

The spa towns provide visitors a chance to enjoy comfort together with age-old medicinal techniques in addition to their unmistakable architectural appeal. Fitness, preventive healthcare, and so-called wellness spa stays are currently rising in popularity. Wellness spas in CR are one of the main forms of active tourism in the country because of the customs and reputation of Czech spa resorts as a wellness destination. CR also has a sizeable market segment from the upper middle class, who are willing to spend for wellness tourism compared to foreigners. As shown in Table 1, 60% of overnight stays in wellness spas in CR are local travellers.

Table 1 Spa Resorts in the Czech Republic – Bed Capacity and Attendance 2015

Number of beds	Number of guests	of Number of overnight stays	of % overnight stays of foreigners	Average overnight stays
51,960	1,309	8,104	40	6.2

Source: (Vystoupil, Sauer, & Bobkova, Spa, Spa Tourism and Wellness Tourism in the Czech Republic, 2017)

A "benefits of wellness tourism scale" (BWTS) was mentioned in (K.Dillette, C.Douglas, & Andrzejewski, 2020) (J.Backman, Huang, Lee, Chen, & Che, 2023), pointing to six different roles of wellness, including transcendence, physical health and appearance, escape and relaxation, novelty, essential people, and re-establishing confidence and indulgence. However, there is a lack of published papers that has recently examined the traits of local tourist visiting wellness destination in the CR. Hence, this paper aims to investigate the traits and behaviour of Czech tourists in selecting wellness vacation destinations in the CR.

2 Literature Review

Wellness tourism has grown significantly over time in the tourism business (Yeung & Johnston, 2016), and it keeps expanding yearly despite the current weak global economy (Kazakov & Oyner, 2020) (Pyke, Hartwell, Blake, & Hemingway, 2016). The global wellness tourism market reached a value of US\$822.44 billion in 2021 and growing at a rate of 6.5% annually from 2015-2017, which is more than double the 3.2% annual growth rate of all tourism (Institute G. W., 2018) (Newswire, 2022). According to a recent analysis by Vision Research Reports, it is anticipated to be worth almost US\$ 1.10 trillion by 2028 while analysis done by Globe Newswire indicate US\$1250 billion by 2027 with CAGR of 7.23% during 2021-2027 (Wellness Tourism Market - Global Industry Analysis, Size, Share, Growth, Trends, Regional Outlook, and Forecast 2022-2030, 2021) (Newswire, 2022). Therefore, it is crucial to assess consumer behaviour and traveller preferences when they are choosing a wellness location in order to utilise and maximise the potential of wellness tourism. A new approach to the multifaceted concept of wellness and health has been developed as a result of the birth of wellness intertwined with tourism (Medina-Munoz & Medina-Munoz, 2013). The conceptual paradigm has been evaluated and changed from a traditional view of health to a holistic wellness orientation (Kazakov & Oyner, 2020) (K.Dillette, C.Douglas, & Andrzejewski, 2020). A number of researchers concur that tourist experiences and transformations must incorporate both hedonistic factors, such as fleeting pleasure, and eudemonic features, like self-realisation, personal expression, growth, and goals (Filep & Deery, 2010) (Lee & Jeong, 2020). As a result, wellness tourism should work to satisfy the constantly shifting needs of visitors who seek out hedonistic and eudemonic experiences as well as transformative goods and services (Mackenzie & Raymond, 2020).

Previous research has attempted to categorise wellness tourists into the supply and demand sides in an effort to better conceptualise and plan the growth of wellness tourism (Hekmat, et al., 2022). According to the demand side by Kim (2016) and Lim (2015), travellers need holistic wellness itineraries that encompass a variety of wellness activities and services (Lim, Kim, & J.Lee, 2015) (Kim, Chiang, & Tang, 2016). Studies by Voigt and Pforr (2017) classify travellers into different groups based on a variety of factors, including the characteristics of the destination, Thal (2017) the tourism industry, or the push and pull factors that influence travel decisions (Thal & Hudson, 2017) (Voigt & Pforr, 2017) (Damijanac, 2020). Other studies examined the factors that influence

travellers' initial destination decisions and their reasons for returning to the same place is local flora and fauna as well as prominent local attractions (Lim, Kim, & J.Lee, 2015). Besides that, destinations now have a new chance to create cutting-edge wellness products thanks to the recent rise in demand for wellness experiences. According to the Institute of Global Wellness, wellness tourism can happen in any location, across a range of industries, and at any time of the year (Institute G. W., International Wellness Tourism Growing Much Faster than Domestic, 2015). However, Turner (2019), contends that in accordance with the Wellness Tourism Association (WTA), the ability to use the title "wellness destination" should be accompanied by particular obligations (Turner, 2019). As a result, she has developed the list of requirements that each wellness destination must adhere to: a perceivably and realistically safe environment, a clean and sanitary infrastructure for travellers and locals, a high standard of living for locals who gain from tourism. Natural resources such as hot springs, mountains, lakes, and forests, a choice of hotels and independent restaurants serving healthy food (Bodeker & Cohen, 2010) and collaborating with regional growers (Wellness Tourism Market - Global Industry Analysis, Size, Share, Growth, Trends, Regional Outlook, and Forecast 2022-2030, 2021); the availability of a variety of activities and excursions (yoga, hiking, cycling, fitness classes, etc.); and a tranquil setting free from the clamour of modern life. Although there is some overlap between these criteria and Morrison (2014) 10 A's system, it is still feasible to discern the additional demands that wellness tourism places on the site (Morrison, 2014).

The need to stimulate and increase the value of tourist locations has been caused by tourism development, which places an emphasis on creative tourism activities to set these destinations apart from others (Gato, Dias, Pereira, Costa, & Goncalves, 2022). The comparative and competitive benefits of wellness tourism locations are mentioned by (Voigt & Pforr, 2014). The resources that a destination offers (such as scenery, nature, protected areas, cultural heritage, and infrastructure) are referred to as comparative advantages, whereas competitive (i.e., competitive) advantages refer to the capacity to use resources to produce goods that outperform those of rivals and the capacity to satisfy consumer expectations. Consequently, if a location with a comparative advantage is unable to secure a competitive edge, it may cease to be so. A site with access to mineralised waters but no wellness items have a hidden comparative advantage but no competitive advantage in the area of wellness. By purchasing resources and adding value to them, a destination can get a competitive advantage even when it may not have a comparative advantage based on organic resources (Voigt & Pforr, 2014). High-quality and varied lodging options and wellness services, for instance, might serve as a competitive advantage in wellness tourism.

One of competitive advantage can be found in wellness hotels and services although it does not specifically draw tourists, but does offer support services, a vital component of tourism (Dutt). The most common classification used for lodging facilities is between group and individual (Vystoupil, Sauer, & Novotna, 2017). However, lodging facilities can also be divided into year-round and seasonal, hotel-type and other, commercial and non-commercial, and other categories. The significance of lodging and other physical components of the tourism infrastructure is mentioned by Hudson (Focus, 2018). Customers frequently use the actual surroundings of a lodging establishment, like a hotel, as a concrete indicator of the quality of a service before making a purchase. Hudson uses the Swedish Icehotel as an illustration, which is composed of ice and snow and provides guests with an unforgettable experience. This implies that even accommodations might be an attraction in and of themselves, which slightly refutes Dutt's assertion. This is an intriguing discovery for wellness tourism as well, which in the Czech Republic is mostly focused on hotels as a form of lodging. Researchers Randhawa, Miran & Ronald (2017) found that managers saw an increase in engagement after renovating various hotel properties and assets, including the golf courses, kitchens, and dining rooms. Two managers gave an overview of some of their actions which result in revenue and utilisation peaked such as renovating their pool cabana complex, bar service and providing better food and bar service, they renovated the pool cabana complex. Not only that, four outdoor dining verandas that can accommodate 200 people at once were built as part of the refurbishment and were frequently packed on summer evenings (Randhawa, Kim, & F.Cichy, 2017). By giving customers a higher perceived value in the improved facilities, renovation helped the hotel draw in new customers and encourage its existing ones to use the facilities more frequently. The wellness hotel successfully has raised consumer expectation. Thus, most travellers may be disappointed by the lack of these services (Yfantidou, Spyridopoulou, Chatzigeorgiou, & Malliou, 2019). The advantages of hotel wellness amenities can be considered as a value-added component that helps hotels generate cash.

The wellness and spa industries have been significantly impacted by the recent COVID-19 pandemic, which has had an unprecedented effect on the tourism sector. Both negative (government regulations, business closures, etc.) as well as positive (people realising the value of their health) effects have been seen in the wellness setting. They started paying more attention to their health and wellbeing, which, together with their desire to travel, directly benefits wellness tourism (Choudhary & Qadir, 2021). The pandemic, according to Global Wellness Institute (2022), has caused "digital wellness" to reach a turning point, and wellness activities that bring people together in

real life are currently popular (Institute G. W., Digital Wellness Initiative 2022 Trends, 2022). There will be an increase in the number of 26 social wellness clubs, where social interaction and wellness activities will take centre stage. Another trend is the growing significance of "baby boomers" for wellness tourism, as this kind of service is advantageous for their health, wellbeing, and social perspective. The emphasis on holistic self-care has increased in recent years, particularly as individuals get older. In an effort to satisfy their need to feel young, many older travellers are exploring alternate forms of health treatment, such as going to wellness centres. The "baby boomer" demographic has distinct needs, which are essentially balance and spiritual relaxation (Patterson & Balderas, 2022). This trend should be mirrored in product offers.

3 Research Methodology

This study gathered primary information to learn about the characteristics and travel habits of Czech tourists in the CR when choosing wellness destinations. Participants in the online survey are chosen based on their familiarity with wellness vacations. The questionnaire was originally designed in Czech by a certified native Czech researcher and then translated into English by native speaker. The questionnaire comprises of sections on general demographics of the respondents, including gender, age, education, income range, region, frequency of wellness vacations, as well as personal preferences for wellness destinations.

Questionnaires were distributed among tourist who visit wellness destinations in CR. Only questionnaires from respondents who take wellness vacations at least once a year will be considered valid, and of the 216 respondents, 34 are disregarded for this reason. Data were collected by a CAWI method, using the service of the system Survio. The respondents were attracted in thematical groups and mainly at the web portal spa.cz where the link to the questionnaire was distributed as a newsletter.

4 Result

Table 2 shows the respondents' age distribution. The age group of 61-70 has a higher percentage (23.6%), followed by the age group 51-60 and 71 or more are represented by 23.1%. **Table 3** displays the gender of respondents and the frequency of wellness stays in the Czech Republic. It demonstrates that women (61.5%) are more committed to wellness than men (38.5%).

Table 1 Respondents' age category

Age	centage (%)
0 – 20	1.1
21 – 30	3.3
31 – 40	8.8
41 – 50	17.0
51 – 60	23.1
61 – 70	23.6
71 or more	23.1

Table 2 Frequency of Wellness according to Gender

Gender	N	Percentage (%)
Man	70	38.5
Woman	112	61.5

The respondents' monthly earnings are shown in **Table 4**. The majority of respondents (39.6%) reported having a monthly income between 20 001 – 40 000 CZK, followed by 40 001 – 60 000 CZK (28%).

Table 3 Respondents' Monthly Income

Income (CZK)	N	Percentage (%)
0 – 20 000	13	7.1
20 001 – 40 000	72	39.6
40 001 – 60 000	51	28.0
60 001 – 80 000	26	14.3
80 001 – 100 000	10	5.5
100 000 and more	10	5.5

According to the result in **Table 5**, the majority of men and women travel primarily to refresh and reenergise themselves before moving on to discover new places. However, there is no statistical difference between male and female with their intention to visit a wellness destination. Both genders are found to have similar motivations when visiting a wellness location. Not only that, both genders are seemed to have the least interest in discovering new activity and techniques, improving lifestyle and physical appearance which require each wellness vacation to minimise this attraction. Eventually, these findings show our misinterpretation on traveller's intention thus more improvement can be made in the future.

Table 4 Gender and Intention to Travel

Intention to Travel	Man		Woman	
	Yes	No	Yes	No
Recharge & energise	57	13	95	17
To Know New Place	28	42	56	56
To Discover New Activity & Techniques	2	68	7	105
To Improve Lifestyle	6	64	10	102
To Get Rid of Stress	20	50	39	73
To Meet New People	3	67	6	106
To Improve Health	26	44	44	68
To Improve Physical Appearance	2	68	1	111

Table 6 shows that most of participants in each region of Czech Republic are willing to travel more than 201km to a wellness destination (38.5%) followed people who are willing to travel up to 200km (26.3%).

Table 5 Participant Region x Willingness to Travel

Willingness to Travel Participant Region	Up to 50km	Up to 100km	Up to 150km	Up to 200km	201km and more
Central Bohemian	0	6	2	8	10
Usti	0	4	1	3	8
Pardubice	0	1	2	1	7
South Moravian	0	4	5	5	5
Highlands	0	0	0	6	3
Capital City of Prague	0	2	7	4	11
Kalovy Vary	1	0	1	0	1
Olomouc	0	2	2	3	4
Zlin	0	1	2	4	1
Moravian-Silesian	0	2	2	2	4
Liberec	0	0	1	2	6
Pilsen	0	2	2	2	1
South Bohemian	2	5	5	6	7
Hradec Kralove	0	0	0	2	2
Total	3	29	32	48	70

5 Conclusion and Recommendations

Recent study shows there was an increase of over 300% in corporate employees stating their mental health has worsened because of burnout and workplace-related stress (UK, 2022). Poll by Retreat Away (2022), shows that 53% of workers found it more difficult to unplug and take time away from their work. Wellness vacations have been a much sought after vacation for people who wants to rest and rejuvenate. In this study, we examined the characteristics of travellers and what they look for in a wellbeing destination in CR.

Based on the findings, the study concludes that women between the ages of 51 and above are more likely than men between the ages of 51 and above to participate in wellness stays with the goal of rejuvenating or reenergising themselves. Therefore, aiming for wellness during a vacation that includes resting, relaxing, and having a pleasant place to sleep is a wise choice for wellness service providers. Besides finding relaxing at a spa as rejuvenating, some travellers might prefer a warm day by the pool or a hike amid breath taking sceneries. Hence, it will be beneficial to allow visitors access to solitary environments such as yoga and meditation in the wellness locations (Rosen, 2023).

The study also found that going on wellness retreats on a regular basis can lower instances of stress and sadness because they have a mood-lifting effect and improve both mental and physical health. In addition, Health and Fitness Travel (2023) noted that a change in routine that improves one's health can have a lasting positive effect on one's wellbeing, since good vacations give people the inspirations, they need to maintain their regime back home (Travel, 2023).

Based on the findings, we found more female respondents participated in this study. We would recommend for wellness stays to expand their strategy in attracting various age groups and gender categories of travellers, since male employment rate (81.6%) is higher than female employment rate (68.8%) in CR (Office, 2023). Additionally, destinations could target more Millennials for their destinations by modernising and providing personalised packages that will interest this age group. The employment rate of the Millennial age group of 30-49 years (88.4%) is higher than the age group of 50-64 years old (80.2%) (Office, 2023). Hence targeting Millennials, with innovative services such as attracting working Millennials from the big cities and giving them spa packages to get-away from the busy city, digital detox at spa and etc. would be favourable for working Millennials (Beauty, n.d.).

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Influence of external and internal factors on the tourism development in the Khorezm region

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Abstract: The aim of the article is to assess the development of the tourism in Khorezm region in the context of the measures taken and the external factors influencing the tourism sector and travelling. Due to his historical development and character of natural attractions, the Khorezm region is one of the most important tourism destination in Uzbekistan. Based on the available statistical data, we evaluate the recent development of number of tourists in the context of the support provided to the tourism development recently, external factors, like the pandemics and development of the tourism infrastructure in the destination.

Keywords: tourism development, influencing factors, Khorezm region

JEL Classification: L83, R58, Z32

1 Introduction

Tourism in Uzbekistan has not yet reached the level of development adequate to their abilities (Sobirov, 2018). In 2019, tourism contributed by 4.1% to the GDP of this country (Teshabaeva, & Yulchiev, 2022). Khorezm region is one of the most ancient and beautiful regions of Uzbekistan (Komilova et al. (2021). Together with Bukhara, Samarkand, Tashkent regions and the city of Tashkent, Khorezm is one of the most important tourism destination in Uzbekistan. The above cited tourism destinations attract 76% of the total flow of tourists to Uzbekistan (Azimovna et al., 2022). Khorezm is a land of ancient history with a rich cultural heritage located on the Great Silk Road (Ikramovna, 2023). The word Khorezm was first mentioned in the sacred book of Zoroastrians (fire worshipers) "Avesta". The natural potential of the region within its historical borders is determined by Amu-Darya, including its delta, steppe and deserat areas, Üst-Yurt plateau between the Capian and Aral Sea in the west, the northern part of the Qara-qum desert; oases along the norther rim of the Khorasanian mountains in the south and the Qizil-qum desert up to the Sir-Darya delta in the northeast (Munis & Agahi, 2021). The historical region overcomes, naturally the official frontiers of Uzbekistan.

According Vaisov (2023), there are sufficient resources for the development of tourism in the region it is important to study its specific aspects in a comparative manner. National and universal values brought up in the spirit of modernizing the country and building a modern democratic society a new generation of personnel capable of performing complex and wide-scale tasks, to bring up children who can adequately continue the great work they have started will remain an important task (Vaisov, 2023). There are many historical monuments in this area: 18 archaeological and 134 architectural monuments, 66 sculptures, 40 sacred sites. Currently, a unified register of cultural heritage objects of ancient Khorezm has been created, which contains a passport of each object and information about its historical and cultural significance. In 2019, more than 420 thousand foreign tourists chose Khorezm region as their holiday destination, where as total number of domestic tourists to the region exceeded 2.2 million (Ikramovna, 2023).

Tourism development support

Various measures have been adopted recently to support the development of the tourism infrastructure in Uzbekistan and in the Khorezm region and to support both domestic and foreing tourism. The President of the Republic of Uzbekistan Sh.M. Mirziyoev's December 2, 2016 Decree "On Measures to Ensure Rapid Development of the Tourism Industry of the Republic of Uzbekistan" served as an important basis for the development of this sector to a new level (Sobirov, 2018). It has been followed by the Program of specific measures for the implementation of the Development Concept tourism industry of the Republic of Uzbekistan in 2017–2021 (Dekhkanbaeva, 2021). In 2018, the Uzbek government decided restrictions in the tourism sector. Thus, it was to simplify its visa policy for 39 countries from February 2019 by completely lifting all tourist visas to seven countries (Yalinkiliçli, 2018). Finally, a visa-free regime has been introduced for 30 days for citizens of 65 countries.

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The programme of development of tourism development in Khorezm region for 2019-2021 was seen as an important element of the socio-economic development. It brought measures with a potential for this region to achieve world tourism standards. These measures, which can ensure that tourism is fully brought up to world standards, cover a wide range of tasks, from demonstrating the country's potential in the international tourism market to training qualified specialists (Firdavsbek, 2023). Various measures have been adopted to support the development of the tourism infrastructure and to support both domestic and foreign tourism. Khorezm boasts several historically significant sites, especially in the city of Khiva, which is a UNESCO World Heritage site. The region has witnessed developments in transportation, accommodation, and other tourist-related amenities. This includes road improvements and a focus on enhancing the quality of services in hotels. Tourism in Khorezm, like many other parts globally, was affected by the COVID-19 pandemic, which disrupted the incoming tourism. Efforts have been ongoing to revive the sector and promote domestic tourism as an interim solution.

2 Methods

The aim of the article is to assess the development of the tourism in Khorezm region in the context of the measures taken and the external factors influencing the tourism sector and travelling. We are analysing statistical data on development of infrastructure and number of tourists that should be influenced by the supporting programmes and measures but can also be affected by the pandemic period. The data were sourced from a Report on the work done to develop the tourism industry in Khorezm region in 2021.

3 Research results

The support to the tourism development brought some important results. For example, there was 21 modern tourist class vehicles available in the Khorezm region in 2017. In 2018, augmented to the 34, then to 133 in 2019, to 293 in 2020, finally, 303 tourist class vehicles were registered in 2021. This indicator has increased 14 times compared to 2017, 8.6 times compared to 2018, and 2.2 times compared to 2019.

In 2017, the number of guides with relevant certificates was 89 in the region, 103 in 2018, and 114 in 2019. Currently, 138 guide-excursion schools are providing services to tourists with appropriate certificates. This indicator increased by 1.5 times compared to 2017, 1.3 times compared to 2018, and 1.2 times compared to 2019.

The Khorezm region lived an important increase of both domestic and foreign tourists in the period 2017-2019. This positive development was seriously interrupted by the Covid-19 pandemics in 2020. The situation partially recovered in 2021 in case of the citizens of Uzbekistan, whereas the foreign citizens were still limited by worldwide travel restrictions. We can see also that despite some limiting measures, the number of domestic tourists (citizens of Uzbekistan), the number of domestic tourists was higher in 2021 than in 2017 (see Table 1).

Table 1. The number of tourists who visited Khorezm region in 2017-2021

No	Foreign tourists visiting the region	2017	2018	2019	2020	2021
	<i>Total</i>	1 160 700	1 653 665	2 646 597	360 500	1 297 542
1.	Number of foreign citizens	60 700	123 210	420 828	23 050	39 805
2.	Number of citizens of Uzbekistan	1 100 000	1 530 455	2 225 769	337 450	1 257 737

Shortly before the pandemics, the region has experienced developments in transportation, accommodation, and other tourist-related amenities. This includes road improvements and a focus on enhancing the quality of services in hotels. The support was translated, for instance into an important increase of accommodation establishments, particularly from 2018 to 2019 (see Figure 1).

Figure 1. The graph of the growth of the number of accommodation establishments during the years 2017-2021³



4 Conclusions

According to the general aspects of approaches to the concept of infrastructure, it is appropriate to consider this category as a set of objects and services that provide the conditions created by man, the general conditions of production and social development for the effective organization of production processes. That is, the tourism infrastructure consists of a system of material objects and activities to provide tourist services to the population, strengthen their health, and increase their income.

The development of tourism infrastructure is an important factor in ensuring the development of the region, and it is a dynamic process aimed at increasing the number of objects necessary for the development of tourism and providing tourist services and improving the services offered by them. The objective necessity of development of tourism infrastructure is manifested in increasing the potential of tourism infrastructure enterprises, improving their structural structure, improving the quality of services, creating new elements and objects. Final statistics from the 2022 are still not available. We can assume some decrease of the domestic tourists and, at the same time, the increase of foreign tourists coming to the region. At the same time, we have to consider expectation of some retreat behaviour of tourists that manifests for instance in manifests in behaviors such as maintaining social distancing from other travelers, avoiding overly popular tourism destinations, choosing less-known tourism destinations, and preferring regional travels (Miao et al., 2022). This behaviour can imply for the Khorezm region a different structure of international tourists as in the period until the year 2020. Two trends can take place – one is the growing preference for this region as the tourists can look for less crowded destinations, another is the expected tendency of not to travel as far from their domicile. The forecast of the inbound tourism in Uzbekistan for the years 2022-2026 suggest an increase to reach the number of the year 2019 but does suggest a rather cyclic development expecting weaker years from that point of view (Safarov et al., 2022). The Khoresm region should be ready to compete with other attractive destination within the Uzbekistan and the closest countries.

The capacity of accommodation kept increasing even during the pandemics, which can potentially bring a higher number of overnights. However, there are no statistics about projects of new accommodation establishments started recently.

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Changes in logistics performance indexes of European Union countries for 2023 to the period before the Covid-19 pandemic

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Abstract: The main objective of the paper is to find out, based on the secondary investigation carried out by the author, how the logistics performance of the countries of the European Union changed in 2023 in comparison with the year 2018, i.e. with the period before the Covid-19 pandemic, when author also commented on the possibilities of increasing logistics performance through the European Parliament of its committees. Logistics performance is expressed in the contribution using the country logistics performance indexes for 2023 and 2018, which have been published by the World Bank since 2017. Here, not only changes in the overall LPI indexes are monitored, but also changes in their six sub-criteria, which are Customs, Infrastructure, International Shipments, Logistics Competence and Equality, Timeliness, Tracking and Tracing. As a result, the author analyses which countries of the European Union have improved in terms of logistics performance compared to 2018, which have worsened, and which sub-parameters have the main influence on the detected positive or negative change in overall logistics performance.

Keywords: logistic performance, European Union, Covid-19 pandemic, World Bank, Logistics Performance Index.

JEL Classification: F15, F21, F23, M16

1 Introduction

The logistics performance of a country or a certain group of countries is an important prerequisite for its successful involvement in international trade and thus also a guarantee of its further economic prosperity. "Typical indicators of logistics performance are delivery times, reliability of deliveries, completeness of deliveries and logistics productivity. This leads to consider the logistics performance as one of the key factors of international trade." (Medina, Selva & Menendez, 2014, p. 77) Therefore, since 2007, the World Bank has also focused on evaluating the logistics performance of countries that presented using the Logistics Performance Index (LPI). The last published values of that index come from 2023, when the WHO announced the end of the pandemic. "The LPI is an interactive benchmarking tool created to help countries identify the challenges and opportunities they face in the performance on trade logistics and what they can do to improve their performance. The LPI 2023 allows for comparisons across 139 countries." (The World Bank, 2023). The penultimate evaluation by this index took place in 2018, that is, in the period relatively close to the onset of the Covid-19 pandemic. The corona crisis meant a period of great and unprecedented changes for logistics. The impact of the Covid-19 pandemic has been particularly sensitive for supply chains, as the situation, where demand greatly exceeds supply and stocks are running low, appeared to be highly unusual until this time. It thus meant a significant burden for the supply process as a whole, and not only on the health and hygiene needs market.

The European Union has and should function as an integrated whole. Therefore, it is quite logical that the European Parliament (its Committee on Transport and Tourism and Committee on the Environment, Public Health and Food Safety) deals with increasing the logistic performance of the countries of the European Union, which, among other things, in 2018:

1. Emphasizes that in order to develop the internal market, prosperity and economic, social and territorial cohesion of the European Union, it is important to ensure the free movement of people, goods and services, also through an efficient and sustainable freight transport system.
2. Is concerned about the negative impact that the closure of internal borders related to the humanitarian and migration crisis and the threat of terrorist attacks in the European Union has on the logistics sector and thus on regional development and growth.

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3. Emphasizes that logistics plays a key role in ensuring efficient and sustainable freight transport operations in the European Union.

4. Emphasizes that the implementation of the TEN-T network, with special emphasis on cross-border connections and within the set deadlines with completion by 2030, will lead to the elimination of bottlenecks, improve interoperability between individual modes of transport and contribute to the realization of a model of integrated multimodal freight transport in the European union.

5. Notes that national planning of the global network must be in place in line with the core network to integrate it with national, regional and local infrastructure, which should be completed by 2050 at the latest.

6. It notes that if there is no effective harmonization and timely implementation of relevant activities by member states and if there is no balanced political cooperation between neighbouring member states, this can seriously complicate cross-border projects.

7. Points to the key role of multimodality in freight logistics and therefore calls for multimodal platforms to be more involved in the planning of member states and in the further development of corridors.

8. Points out that member states too often decide on their national infrastructure plans without regard to the TEN-T objectives.

9. It emphasizes that the transport infrastructure not only needs reconstruction and modernization, but must also be regularly maintained.

10. Asks the Commission to report regularly to Parliament on the conclusions and actions taken within the Digital Transport and Logistics Forum in order to further promote the digitization of freight transport and logistics. It emphasizes that it is necessary to guarantee that the planned infrastructure corresponds to the real needs of sustainable logistics and does not unsustainably burden the environment. (European Parliament, 2018).

In view of the above-mentioned critical situation, the aim of the author of the conducted investigation is to find out how the logistics performance of the countries of the European Union changed in 2023 compared to 2018, i.e. before the pandemic. Whether and which countries have used this difficult situation to improve their logistics performance and which have not. At the same time, it is important to pay attention to the factors that had the greatest effect on changes in the logistics performance of successful countries and which, on the contrary, were critical for unsuccessful countries.

2 Methods

In order to fulfil the above objective, secondary research was conducted. At the beginning of 2023, LPIs for the period 2007 to 2018 were publicly available (The World Bank, 2018). From 2010 to 2018, the LPI was published every two years. In 2018, indexes of 160 countries were published (Lukoszová, 2020). Based on the communication of the author of the article with representatives of the World Bank, it was found in the first quarter of 2023 that the publication of new LPIs for 2023 is being prepared, which actually happened not long ago.

In order to calculate changes in logistics performance, the logistics performance indexes of 2018 and 2023 were selected for all 27-member states of the European Union. As mentioned earlier, a total of 139 countries were included in the logistics performance index in 2023 (The World Bank, 2023).

The LPI is calculated on the basis of a global survey of global freight forwarding companies and logistics carriers. It is an online benchmarking tool developed by the World Bank that measures productivity across the entire supply chain of logistics within a country. (Arvis, Ojala, Wiederer, Shepherd, Raj, Dairabayeva, & Kiski, 2018)

“The Logistics Performance Index (LPI), created by the World Bank, is a benchmark tool used to determine the threats and opportunities faced by countries in their logistics performances and to improve their performance. Countries aim to increase their LPI scores and rank higher on the LPI list while developing their strategies.” (Senir, 2021, p. 193).

“The empirical model is based on the theory of gravity model extended to include the six subcomponents of the Logistics Performance Index (LPI).” (Górecka, Skender & Zaninović, 2022, p. 1)

The international LPI is an overall measure of the efficiency of the logistics sector, combining data on six key performance indicators into a single aggregated measure (Lukoszová, 2021). Some respondents do not or cannot provide information on all six indicators, so statistical interpolation is used to determine missing values. Missing values are replaced by the country's average answer for each question, adjusted by the average deviation of the respondent from the average level of the country in the answers to the questions. The six key indicators are: the efficiency of customs and border management clearance (“Customs”), the quality of trade and transport infrastructure (“Infrastructure”), the ease of

arranging competitively priced shipments (“Ease of arranging shipments”), the competence and quality of logistics services—trucking, forwarding, and customs brokerage (“Quality of logistics services”), the ability to track and trace consignments (“Tracking and tracing”), and the frequency with which shipments reach consignees within scheduled or expected delivery times (“Timeliness”). (Beseybaev & Dus, 2020) „The LPI is based on these six indicators and calculated using Principal Component Analysis (PCA), a standard statistical method used to reduce the dimension of a data set. In the LPI, the input data for the PCA are the scores for countries averaged over all respondents providing data on a foreign market. Estimates are normalized by subtracting the mean of the sample and dividing by the standard deviation before performing the PCA. The output from PCA is the LPI, which is the weighted average of these indicators. To then build the international LPI, the normalized scores for each of the six original indicators are multiplied by their component weights and then summarized. Since the weights are the same for all six components, the international LPI is close to the arithmetic mean of the indicators. “(Beseybaev & Dus, 2020, p. 36)

In the future, further objectification of the LPI determination is expected. „In the future, the World Bank and logistics experts expect further objectification of the LPI calculation. “As one of the solutions, it is proposed to calculate LPI of an individual monitored country on a semi-annual basis with a variable set of respondents. Further, the methodology for calculating the index should meet the requirements of completeness, reliability, relevance, and sufficiency of information on the development of digital technologies individual monitored countries. This will allow in the form of a generalized indicator to compare the logistics indicators occurring in each study region.” (Janno, Mochalina, Ivankova, Labanova, Lationina, Safulina & Uukkivi, 2021, p. 153)

The individual values of the LPI indexes always range from 0 to 5, with a value of 5 indicating the maximum assessment of logistics performance.

Base indexes were used to calculate changes in partial (criterion) LPI

$$I_i = (\text{LPI } 2023_i / \text{LPI } 2018_i) 100 (\%) \quad (1)$$

where:

- I_i the base index of the sub-LPI of the i-th country in percent
- $\text{LPI } 2023_i$ partial logistics performance index of the i-th country in 2023
- $\text{LPI } 2018_i$ partial logistics performance index of the i-th country in 2018

An improvement is represented by an I_i value greater than 100 %, a steady state is expressed by a value equal to 100 %, and a deterioration is signalled by a value less than 100 %.

The calculation of the change in the total LPI for individual countries was carried out according to the formula

$$Z_i = [(\text{LPI } 2023_i / \text{LPI } 2018_i) 100] - 100 (\%) \quad (2)$$

where:

- Z_i change in the total LPI index of the i-th country in percent
- $\text{LPI } 2023_i$ the overall logistics performance index of the i-th country in 2023
- $\text{LPI } 2018_i$ the overall logistics performance index of the i-th country in 2018

A positive Z_i index value indicates an improvement in the country's aggregate LPI, a negative value a deterioration, and a value (close to or) equal to 0 indicates no change in the aggregate LPI index.

3 Research results

The result of the investigation, analysis and processing of information using the mentioned methods is, first of all, the determination of the partial indexes of logistics performance of the countries of the European Union in 2018 and 2023, which can be considered the years representing the period before and after the Covid-19 pandemic. Based on these sub-indexes, their percentage changes are then calculated.

3.1 Sub-indexes of logistic performance of European Union countries before and after the Covid-19 pandemic

Table 1 shows the values of partial indexes of logistics performance of European Union countries according to individual criteria for 2018 and 2023. The monitored criteria are: C1 – Customs, C2 – Infrastructure, C3 – International Shipments, C4 – Logistics Competence and Equality, C5 - Timeliness, C6 – Tracking and Tracing.

Table 1 LPI sub-criteria values

EU country \ Criterion	C1		C2		C3		C4		C5		C6	
	2018	2023	2018	2023	2018	2023	2018	2023	2018	2023	2018	2023
Austria	3.71	3.7	4.18	3.9	3.88	3.8	4.08	4.0	4.25	4.3	4.09	4.2
Belgium	3.66	3.9	3.98	4.1	3.99	3.8	4.13	4.2	4.41	4.2	4.05	4.0
Bulgaria	2.94	3.1	2.76	3.1	3.23	3.0	2.88	3.3	3.31	3.5	3.02	3.3
Croatia	2.98	3.0	3.01	3.0	2.93	3.6	3.10	3.4	3.59	3.2	3.01	3.4
Cyprus	3.05	2.9	2.89	2.8	3.15	3.1	3.00	3.2	3.62	3.5	3.15	3.4
Czechia	3.29	3.0	3.46	3.0	3.75	3.4	3.72	3.6	4.13	3.7	3.70	3.2
Denmark	3.92	4.1	3.96	4.1	3.53	3.6	4.01	4.1	4.41	4.1	4.18	4.3
Estonia	3.32	3.2	3.10	3.5	3.26	3.4	3.15	3.7	3.80	4.1	3.21	3.8
Finland	3.82	4.0	4.00	4.2	3.56	4.1	3.89	4.2	4.28	4.3	4.32	4.2
France	3.59	3.7	4.00	3.8	3.55	3.7	3.84	3.8	4.15	4.1	4.00	4.0
Germany	4.09	3.9	4.37	4.3	3.86	3.7	4.31	4.2	4.39	4.1	4.24	4.2
Greece	2.84	3.2	3.17	3.7	3.30	3.8	3.06	3.8	3.66	3.9	3.18	3.9
Hungary	3.35	2.7	3.27	3.1	3.22	3.4	3.21	3.1	3.79	3.6	3.67	3.4
Ireland	3.36	3.4	3.29	3.5	3.42	3.6	3.60	3.6	3.76	3.7	3.62	3.7
Italy	3.47	3.4	3.85	3.8	3.51	3.4	3.66	3.8	4.13	3.9	3.85	3.9
Latvia	2.80	3.3	2.98	3.3	2.74	3.2	2.69	3.7	2.88	4.0	2.79	3.6
Lithuania	2.85	3.2	2.73	3.5	2.79	3.4	2.96	3.6	3.65	3.6	3.12	3.1
Luxembourg	3.53	3.6	3.63	3.6	3.37	3.6	3.76	3.9	3.90	3.5	3.61	3.5
Malta	2.70	3.4	2.90	3.7	2.70	3.0	2.80	3.4	3.01	3.2	2.80	3.4
Netherlands	3.92	3.9	4.21	4.2	3.68	3.7	4.09	4.2	4.25	4.0	4.02	4.2
Poland	3.25	3.4	3.21	3.5	3.68	3.3	3.58	3.6	3.95	3.9	3.51	3.8
Portugal	3.17	3.2	3.25	3.6	3.83	3.1	3.71	3.6	4.13	3.6	3.72	3.2
Romania	2.58	2.7	2.91	2.9	3.18	3.4	3.07	3.3	3.68	3.6	3.26	3.5
Slovak Republic	2.79	3.2	3.00	3.3	3.10	3.0	3.14	3.4	3.14	3.5	2.99	3.3
Slovenia	3.42	3.4	3.26	3.6	3.19	3.4	3.05	3.3	3.70	3.3	3.27	3.0
Spain	3.62	3.6	3.84	3.8	3.83	3.7	3.80	3.9	4.06	4.2	3.83	4.1
Sweden	4.05	4.0	4.24	4.2	3.92	3.4	3.98	4.2	4.28	4.2	3.98	4.1

Source: Own processing

The countries of the European Union are listed here in alphabetical order, so their logistic performance is not considered.

3.2 Changes in values of sub-indexes of logistic performance of European Union countries before and after the Covid-19 pandemic

Table 2 shows the changes in the individual logistics performance criteria, i.e. their growth or decline. The calculation is made as a share of the value of the index for the year 2023 to the value of 2018.

Table 2 Changes in sub-criteria of the logistics performance index expressed using base indexes in %

EU country (alphabetically)	C1 2023/2018	C2 2023/2018	C3 2023/2018	C4 2023/2018	C5 2023/2018	C6 2023/2018
Austria	99.73	93.30	97.94	98.04	101.18	102.69
Belgium	106.56	103.02	95.24	101.69	95.24	98.77
Bulgaria	105.44	112.32	92.88	114.58	105.74	109.27
Croatia	100.67	99.67	122.87	109.68	89.14	112.96
Cyprus	95.08	96.89	98.41	106.67	96.69	107.94
Czechia	91.19	86.71	90.67	96.77	89.59	86.49
Denmark	104.59	103.54	101.98	102.24	92.97	102.87
Estonia	96.39	112.90	104.29	117.46	107.89	118.38
Finland	104.71	105.00	115.17	107.97	100.47	97.22
France	103.06	95.00	104.23	98.96	98.80	100.00
Germany	95.35	98.40	95.85	97.45	93.39	99.06
Greece	112.68	116,72	115.15	124.18	106.56	122.64
Hungary	80.60	94.80	105.59	96.57	94.99	92.64
Ireland	101.19	106.38	105.26	100.00	98.40	102.21
Italy	97.98	98.70	96.87	103.83	94.43	101.30
Latvia	117.86	110.74	116.79	137.55	138.89	129.03
Lithuania	112.28	128.20	121.86	121.62	98.63	99.36
Luxembourg	101.98	99.17	106.82	103.73	89.74	96.95
Malta	125.93	127.59	111.11	121.43	106.31	121.43
Netherlands	99.49	99.76	100.54	102.69	94.12	104.48
Poland	104.62	109.03	89.67	100.56	98.73	108.26
Portugal	100.95	110.77	80.94	97.04	87.17	86.02
Romania	104.65	99.66	106.92	107.49	97.83	107.36
Slovak Republic	114.70	110.00	96.77	108.28	111.46	110.37
Slovenia	99.42	110.43	106.58	108.20	89.20	91.74
Spain	99.45	98.96	96.61	102.63	103.45	107.05
Sweden	98.77	99.06	86.73	105.53	98.13	103.02

Source: Own processing

Values lower than 90 percent are considered critical from the point of view of assessing changes, while values higher than 120 percent are, on the contrary, perceived as significant improvements.

It can be seen from Table 2 that the Czech Republic and Portugal experienced clearly the most significant deterioration in sub-criteria, in three criteria. The Czech Republic in the evaluation of Infrastructure, Timeliness and Tracking and Tracing. Similarly, Portugal also deteriorated in International Shipments, Timeliness and Tracking and Tracing. Croatia (Logistics Competence and Equality), Hungary (Customs), Luxembourg (Timeliness), Poland (International Shipments), Slovenia (Timeliness) and Sweden (International Shipments) experienced a more noticeable partial deterioration. On the contrary, Latvia recorded the most significant improvement: in the criteria Logistics Competence and Equality, Timeliness, Tracking and Tracing. Furthermore, Malta in the criteria Customs, Infrastructure, Logistics Competence and Equality and Tracking and Tracing and Lithuania in the criteria Infrastructure, Logistics Competence and Equality and Timeliness. Furthermore, Greece improved more significantly (Logistics Competence and Equality and Tracking and Tracing) and in the International Shipment criterion Croatia also improved.

3.3 Values of the overall logistics performance index of European Union countries and their changes

The last Table 3 shows the ranking of the individual countries of the European Union based on the absolute value of the total LPI index in 2023. For these countries, among other things, the value of the base index is also monitored and finally the change in the LPI index in 2023 compared to 2018 is expressed in percentage (The World Bank, 2023) (The World Bank Group, 2018).

Table 3 Total LPI values and their changes

Ranking	EU country	LPI 2023	LPI 2018	LPI2023/LPI2018 (%)	Change (%)
1.	Finland	4.2	3.97	105.79	+5.79
2.-4.	Denmark	4.1	3.99	102.76	+2.76
2.-4.	Germany	4.1	4.20	97.62	-2.38
2.-4.	Holland	4.1	4.02	101.99	+1.99
5.-7.	Austria	4.0	4.03	99.26	0.00
5.-7.	Belgium	4.0	4.04	99.01	0.00
5.-7.	Sweden	4.0	4.05	98.77	-1.23
8.-9.	France	3.9	3.84	101.56	+1.56
8.-9.	Spain	3.9	3.83	101.83	+1.83
10.-11.	Greece	3.7	3.20	115.63	+15.63
10.-11.	Italy	3.7	3.74	98.93	0
12.-15.	Estonia	3.6	3.31	108.76	+8.76
12.-15.	Ireland	3.6	3.51	102.56	+2.56
12.-15.	Luxembourg	3.6	3.63	99.17	0
12.-15.	Poland	3.6	3.54	101.69	+1.69
16.	Latvia	3.5	2.81	124.56	+24.56
17.-18.	Lithuania	3.4	3.02	112.58	+12.58
17.-18.	Portugal	3.4	3.64	93.41	-6.59
19.-23.	Croatia	3.3	3.10	106.45	+6.45
19.-23.	Czechia	3.3	3.68	89.67	-10.33
19.-23.	Malta	3.3	2.81	117.44	+17.44
19.-23.	Slovakia	3.3	3.03	108.91	+8.91
19.-23.	Slovenia	3.3	3.31	99.7	0
24.-27.	Bulgaria	3.2	3.03	105.61	+5.61
24.-27.	Cyprus	3.2	3.15	101.59	0
24.-27.	Hungary	3.2	3.42	93.57	-6.43
24.-27.	Romania	3.2	3.12	102.56	+2.56

Source: Own processing

When calculating the percentage change (see the last column of Table 3), it is considered that the 2023 values are published rounded to one decimal place, while the 2018 values were rounded to two decimal places. Calculation of index change, i.e. of its growth or decline in percentages (in the last column of Table 3), is therefore adjusted for this fact.

In the latest survey, Finland's position overtook the best Germany for a long time, as well as Denmark and the Netherlands, which equally occupied the 2nd to 4th place. Changes in order also occurred within the Visegrad Four, which was led by the Czech Republic in 2018. However, after the pandemic, Poland was the best ranked among the "four", followed by the Czech Republic and the same ranking (19th-23rd) is also occupied by Slovakia. The last of the mentioned group was placed by Hungary, which at the same time completes the entire "twenty-seven" together with Bulgaria, Cyprus and Romania.

Table 3 further shows that the greatest improvement during the Covid-19 pandemic was relatively surprisingly recorded by Latvia, followed by Malta and Greece. The alarming fact is that the Czech Republic shows the most significant deterioration in logistics performance of all the countries of the European Union. It follows from the partial indexes of logistic performance that this unfavourable situation was caused by the evaluation of up to three criteria: Infrastructure, Timeliness and Tracking and Tracing (see Table 2). Other countries showing significant deterioration are Portugal and Hungary.

4 Conclusions

A country's logistics performance is a significant factor in a country's competitiveness on a global scale. The logistics performance of the European Union as a whole is dealt with by the Parliament of the European Union and its relevant committees. Each of the member countries bears its share in the success of the European Union and in the fulfilment of the obligations that it has set out in accordance with the provisions of the Parliament.

How and to what extent the individual countries of the European Union contribute to the logistics performance of the whole can be seen from the results of the presented survey. Advanced countries such as Finland, Denmark, Germany and the Netherlands lead the ranking of the absolute ranking of logistics performance for 2023. Among the countries that saw a significant improvement in the post-pandemic period, Latvia is the first, followed by Malta and Greece. The country that recorded the most significant deterioration of all member states of the Union is the Czech Republic, which nevertheless ranks 19th to 23rd in the absolute ranking of logistics performance, together with Croatia, Malta, Slovakia and Slovenia. A significant deterioration was also recorded in Portugal, followed by Hungary.

From the point of view of the sub-criteria, the time parameter appears to be particularly critical, for which a significant deterioration was recorded in the largest number of countries in the observed period from 2018 to 2023. This criterion should therefore be given the greatest attention by the member countries. Paradoxically, this criterion was also the most significant improvement in the case of Latvia. Countries that have experienced a significant deterioration can be recommended to strictly comply with the requirements of the European Parliament (listed in Chapter 1 of this article). The government of the Czech Republic should consider reassessing its priorities towards the reconstruction, modernization and maintenance of the transport infrastructure, the condition of which has a direct impact on the time parameters of deliveries and therefore also on other evaluated criteria.

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A systematic literature review of tourism demand and future research agenda

Anhelina Menchenko¹, Mohsin Javed²

Abstract: The aim of this research is to provide a comprehensive understanding of tourism demand, its various trends, factors, and highlight future research directions. The research method used is the systematic literature review (SLR), involves analyzing existing studies to identify patterns and gaps in understanding tourism demand. The study also highlights the growing trends of experiential and immersive travel, and the emergence of smart tourism. Various economic indicators, such as income levels, exchange rates, and overall economic stability, significantly influence tourism demand. The demographic characteristics, social trends, cultural values, and the influence of social media as well play a role in shaping tourism demand. Factors related to the environment, including climate change, sustainability concerns, and the promotion of ecotourism, have an impact on tourism choices. Noticeably, the use of technology, such as online platforms and emerging technologies, affects tourism demand and shapes the overall tourist experience. The research identifies several research gaps and proposes future directions, including the study of sustainable tourism practices, community-centered tourism, and the interplay between tourism demand and sustainable development. Overall, this research provides valuable insights for practitioners and academics in the tourism industry.

Keywords: tourism demand, tourism demand factors, tourism industry, tourism demand forecasting

JEL Classification: Q01; Q53; Q57

1 Introduction

Tourism is a dynamic and continuously evolving industry that has influenced global economies in a significant way due to widespread traveling by millions and billions of people every year. In modern days, the ease of traveling associated with better facilities related to infrastructural and technological advancements, and changing consumer preferences - the concept of tourism demand has become pivotal for various entities including destinations themselves and policymakers and businesses involved with it. The dynamics of tourism demand are complex, influenced by a wide range of factors spanning from economic, socio-cultural, technological, environmental, and political aspects. These factors interact and shape the behaviors and motivations of travelers, determining their preferences, destination choices, and travel patterns.

Moreover, tourism demand makes enormous impacts across all stakeholders within the travel sector. Economic growth stimulation, creation of job opportunities and infrastructural development all depend massively upon steady influxes of tourist visits. Different businesses in the hospitality industry, such as hotels, tour operators, and restaurants, rely strongly on encouraging and catering to the demands related to their respective services. Therefore, a comprehensive understanding of the complexities and interdependencies that shape tourism demand is essential for industry professionals, policymakers, and academics.

To provide a comprehensive understanding of the dynamics of tourism demand, the systematic literature review (SLR) will provide insight on the complexities and interdependencies that shape the demand for travel and tourism experiences by looking at a wide variety of elements affecting tourism demand, including economic, socio-cultural, technological, environmental, and political concerns. The increasing interest and research focused on tourism and hotel demand modelling and forecasting indicate the significance of understanding tourism demand. Moreover, the adoption of technology, including online platforms and mobile applications, have had a substantial impact on shaping tourism demand. These trends and factors provide valuable insights into the ever-evolving field of understanding tourism demand and can guide future research and decision-making in the tourism industry.

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The results of this SLR will have an impact on policymakers, practitioners in the sector, and academics. Academically, it will solidify the current understanding of tourism demand and point out areas that require more study. The review will provide insightful information to industry professionals on the variables affecting visitor behaviour, allowing them to create efficient marketing plans, initiatives for destination branding, and infrastructure planning. A deeper comprehension of the socioeconomic and environmental effects of tourism demand will help policymakers make wise decisions for the development of a sustainable tourism industry.

There is a noticeable increase in interest and research focused on tourism and hotel demand modeling and forecasting, evident from the rising number of published studies in this field. The adoption of technology, including online platforms and mobile applications, has had a significant impact on shaping tourism demand. These trends and factors provide valuable insights into the ever-evolving field of understanding tourism demand and can guide future research and decision-making in the tourism industry.

In this paper, we begin by introducing the concept of tourism demand, research questions and objectives for this systematic literature review, aiming to uncover trends, factors, and future directions in tourism demand. To ensure a rigorous approach, we provide insights into our methodology, including search techniques and the selection process, while also utilizing the PRISMA framework for a comprehensive review. In section three we analyze trends in tourism demand, highlighting global and regional patterns, factors that shape demand, the impact of technology on travel preferences, and the allure of different destinations. Section four discusses the impact of tourism. Finally, we conclude by summarizing our key findings and their implications for academia, industry, and policy-making. We also identify research gaps and propose future directions to advance our understanding of tourism demand in a rapidly evolving landscape.

1.2 Tourism Demand: Concepts and Measurements

Understanding tourism demand is crucial for the travel and tourism industry. Tourism demand can be seen as the collective interest of individuals or groups to engage in travel activities and explore various destinations. It encompasses the overall demand for travel experiences and the motivation to visit different places. When we talk about tourism demand, we consider factors such as the number of visitors, their characteristics, motivations, and behaviors.

Tourism demand can take on different forms based on the purpose, duration, and frequency of travel. For example, leisure tourism demand focuses on individuals seeking recreational experiences, while business tourism demand is driven by work-related travel. There are also other types of tourism demand, including cultural tourism, adventure tourism, and medical tourism. Internet big data has revolutionized tourism demand forecasting, and now the real-time and high-frequency forecasting allows adjustments in pricing and staff scheduling. (Li et al., 2020)

1.3 Research Question and Objectives

The primary research question that guided this systematic literature review on tourism demand is: "What are the trends, factors, and future directions in understanding tourism demand?"

The specific objectives of this review are as follows:

1. Identify the trends in tourism demand over time, including global and regional patterns.
2. Explore the various factors that influence tourism demand, encompassing economic, socio-cultural, technological, environmental, and political aspects.
3. Identify research gaps and suggest potential avenues for future research in the field of tourism demand.

2 Methods

To ensure a systematic and comprehensive approach, a rigorous methodology was employed. This section outlines the research question and objectives, inclusion and exclusion criteria, search strategy and selection process, as well as the data extraction and analysis approach.

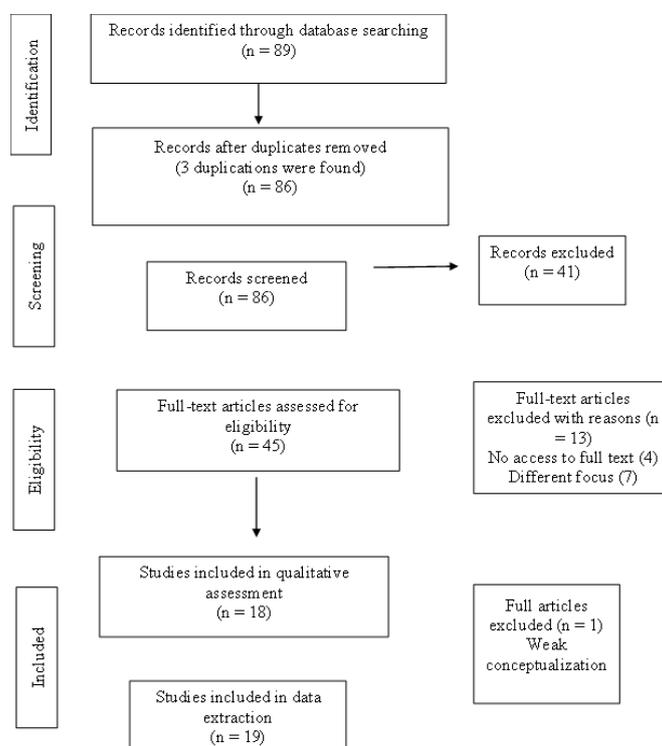
2.1 Search Techniques and the Selection Procedure

For this systematic review, relevant material was found using a thorough search technique. Keywords and controlled vocabulary words associated with "tourism demand" were combined. To find pertinent studies, searches were made in databases like Google Scholar, Scopus, Web of Science, and PubMed. Numerous potential publications were found during the initial search; these were then filtered based on their titles and abstracts. The chosen studies were then subjected to a full-text evaluation to determine their appropriateness for inclusion. Two reviewers separately conducted the selection process, and any disagreements were settled through discussion and consensus.

In this study, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework was used. The PRISMA framework provides a graphical representation that visually presents the entire process, including the

total number of articles initially identified in relation to the topic, the rigorous screening process, and the final number of articles deemed eligible for data extraction. For a detailed visual representation of the PRISMA framework, please refer to Figure 1.

Figure 1 Systematic Literature Review by PRISMA Framework



3 Research results

3.1 Trends in Tourism Demand

Tourism demand is constantly evolving, shaped by various factors such as global dynamics, economic conditions, technology, and changing travel preferences. Understanding tourist arrivals and expenditures provides valuable insights into the overall trends and economic impact of tourism. In recent years, the global tourism industry has experienced steady growth in both international and domestic tourist arrivals. According to the World Tourism Organization (UNWTO), international tourist arrivals reached 1.5 billion in 2019, marking a significant increase compared to previous decades. In 2019, international tourist arrivals reached 1.46 billion, representing a 4% increase compared to the previous year (UNWTO World Tourism Barometer, 2020). Countries in regions such as Southeast Asia, Latin America, and the Middle East have witnessed rapid growth in tourism demand. Rising incomes, expanding middle-class populations, and improved connectivity have fuelled this growth. Europe continues to be a popular destination, attracting a large number of international tourists, particularly from neighbouring countries. The top international tourist destinations in terms of arrivals included France, Spain, the United States, China, and Italy (UNWTO World Tourism Barometer, 2020). Asia-Pacific has emerged as a key contributor to global tourism demand. Countries like China, India, and Southeast Asian nations have experienced remarkable growth in outbound tourism.

When it comes to tourist expenditures, China has become one of the top spenders worldwide. Chinese tourists, with their increasing disposable incomes and evolving travel preferences, have made a significant impact on tourism industries globally. Additionally, high-income countries like the United States and Germany continue to contribute significantly to global tourism expenditures.

Travel preferences have also undergone notable changes. There is a growing emphasis on experiential and immersive travel, where tourists seek authentic cultural experiences, engage in adventure activities, and seek personal growth through their journeys. Sustainable tourism practices and eco-friendly destinations have gained traction as travellers become more conscious of their environmental impact and seek to support responsible tourism. Furthermore, advancements in technology and the sharing economy have given rise to alternative accommodation options such as vacation rentals and homestays. These cater to the preferences of travellers who desire unique and localized experiences during their trips (Hall & Page, 2014).

With the technological progress new ways of tourism and approach to tourism emerge, for example the trend of gamification of tourism and smart tourism. The gamification of tourism involves incorporating game elements and mechanics into the travel experience to enhance engagement, enjoyment, and participation. It utilizes elements like challenges, rewards, leaderboards, and interactive storytelling to make tourism more interactive and immersive. Gamification can be applied in various aspects of tourism, such as city tours, museum visits, and cultural experiences, to create memorable and engaging experiences for tourists. The use of gamification in tourism, particularly with augmented reality (AR) and virtual reality (VR), is still in its early stages and mostly focused on urban destinations. (Skinner et al., 2018). But the needs of Millennials and Generation Z, who are immersed in Web 2.0 technologies, should be addressed in the progressive development of tourism destinations. The example of gamification is also a geocaching is a location-based leisure sport where participants hide and search for hidden treasures using GPS technology. Smart tourism involves the use of mobile applications, wearable devices, location-based services, and Internet of Things (IoT) technologies to provide personalized and context-aware information and services to tourists. Smart tourism aims to improve efficiency, convenience, and sustainability in areas such as transportation, accommodation, attractions, and visitor management, ultimately enhancing the overall tourist experience.

3.2 Factors Influencing Tourism Demand

Tourism demand is influenced by a variety of factors that shape people's decisions to travel and explore different destinations. This section examines the key factors that have an impact on tourism demand, including economic, socio-cultural, technological, environmental, and political factors.

As an economic factor, people's disposable income levels directly affect their ability to engage in tourism activities. When income levels rise, individuals tend to spend more on travel and are more likely to embark on trips. Exchange rates have an impact on the affordability of travel for international tourists. Favourable exchange rates can make a destination more attractive and affordable, thus increasing tourism demand. Conversely, unfavourable exchange rates may discourage travel to certain destinations (Song & Li, 2008).

Socio-cultural factors, and demographic characteristics in particular, such as age, gender, and family composition, can influence travel patterns and preferences. For instance, millennials may be more inclined towards adventure and experiential travel, while families with children may prioritize family-friendly destinations and activities.

In addition, the rise of social media platforms has had a profound impact on tourism demand. User-generated content, recommendations from influencers, and online reviews heavily influence travellers' destination choices and shape their travel experiences (Buhalis & Law, 2008).

The widespread availability of online booking platforms has made the process of researching, planning, and booking trips much more convenient for travellers. This convenience has contributed to the growth in tourism demand.

The perception of safety and security in a destination plays a crucial role in tourists' decisions to visit. Political stability, crime rates, and the presence of conflicts or civil unrest greatly influence tourism demand. Also, the visa requirements and restrictions imposed by governments can impact international tourism demand. Simplified visa processes and visa-free policies can make travel more accessible, attracting more tourists (Hall & Lew, 2009).

COVID-19 created a major disruption to tourists around the world. As an example, we can take a look on Iceland. Iceland's tourism industry experienced «miracle» growth following the 2008 Global Financial Crisis when the government decided to diversify the economy away from fishing and banking. They actively promoted tourism as a new economic driver, resulting in the outstanding increase in international visitors from 500,000 in 2010 to 2.3 million in 2018. Successful marketing campaigns and the use of social media further fueled Iceland's popularity. Nature was the primary draw for tourists visiting Iceland, with 92% citing the country's 'unspoiled' natural beauty as a driving factor (Sæþórsdóttir, Hall, & Wendt, 2020). At the same time, adventure tourism, including activities like hiking and glacier tours, also played a significant role in drawing adventure enthusiasts. Improved international flight routes and the emergence of budget airlines made Iceland easily accessible from Europe and North America. However, challenges emerged as tourism boomed. Appeared concerns about overtourism, especially in the capital and around popular natural attractions. The abrupt closure of one of Iceland's major budget airlines disrupted travel plans, leading to a reduction in incoming tourists. Then, in 2020, the global COVID-19 pandemic forced Iceland, like many other nations, to close its borders to tourists, causing a significant drop in international travel to almost 500,000 tourists again.

In summary, Iceland's tourism success story was the result of strategic economic decisions and its unique natural attractions. While COVID-19 caused a sharp decline in tourism in 2020, the gradual easing of travel restrictions and the availability of vaccines led to a rebound in tourist arrivals in 2021. Iceland actively marketed itself as a safe and appealing destination for post-pandemic travel, still focusing on its natural beauty and outdoor activities. With the resumption of

international flights Iceland saw a resurgence in international arrivals with 1.7 million tourists in 2022 (OECD Tourism Trends and Policies).

Tourism demand is interconnected with other factors that mutually impact each other. The table below shows the examples of some of those relationships. The column of Aspect of Demand describes different elements or components related to tourism that are of interest or importance. Relationships highlights the connection or correlation between each aspect of demand and other factors. Influencing Factors identifies the key factors that impact or shape each aspect of demand.

For example, Cultural Events is linked to local traditions, and its success is influenced by government support; Heritage Sites is connected to cultural events, and the preservation efforts significantly impact them; Utilization of Big Data and EPU in Forecasting enhances decision-making with a focus on data accuracy and technological infrastructure.

Table 1 The aspects of tourism demand and influencing factors

Aspect of Demand	Relationships	Influencing Factors
Cultural Events	Linked to Local Traditions	Government Support
Heritage Sites	Connected to Cultural Events	Preservation Efforts
Local Traditions	Enrich Cultural Events	Community Engagement
Digital Platforms	Amplifies Promotion	Online Presence
Data Analytics	Informs Decision-Making	Visitor Behavior Analysis
Government Policies	Shapes Cultural Framework	Funding Allocation
Community Involvement	Supports Local Events	Volunteerism
Environmental Sustainability	Affects Cultural Preservation	Eco-friendly Practices
Economic Conditions	Influences Visitor Spending	Income Levels
Experiential and Immersive Travel	Enhances Visitor Engagement	Unique Experiences
Smart Tourism	Integrates Technology	Connectivity, Innovation
Economic Stability	Influences Tourism Spending	Exchange Rates, Stability
Social Media Influence	Shapes Visitor Perception	User Engagement, Trends
Climate Change Impact	Alters Tourism Patterns	Sustainability Efforts
Sustainable Tourism Practices	Guides Responsible Tourism	Conservation, Community Support
Tourism Demand and Sustainable Development	Supports Local Economy	Sustainable Practices, Community Involvement
Utilization of Big Data and EPU in Forecasting	Enhances Decision-Making	Data Accuracy, Technological Infrastructure

Source: Own processing

3.3 Destination Attributes and Tourism Demand

The way a destination is perceived and its branding significantly influence tourism demand. These factors shape the expectations and impressions of potential tourists. Unique and captivating attractions, such as natural wonders, historical sites, cultural heritage, and entertainment venues, contribute to the allure of a destination and attract visitors. The availability and quality of accommodations, restaurants, shopping facilities, and recreational activities play a significant role in the overall experience of tourists. A well-connected and reliable transportation network, encompassing air, road, rail, and sea options, makes a destination more accessible to tourists, as well as facilitates their movement within the destination (Mill & Morrison, 2002).

The use of digital marketing platforms and social media channels has become indispensable in reaching and engaging with potential tourists. These platforms allow destinations to showcase their offerings and target specific market segments. Well-established and appealing destination brands have the potential to draw more tourists. Effective marketing and

promotion strategies play a pivotal role in stimulating tourism demand. Strategic marketing initiatives that highlight the unique selling points and experiences of a destination can shape tourists' perceptions and generate interest.

The research by Binrong Wu, Lin Wang and Yu-Rong Zeng shows that multi-source data and big data indices can help in accurately predicting tourism demand (Wu et al., 2022). The study involves collecting information on international arrivals in major European cities for 2020, tracking new COVID-19 cases and extracting data from travel forums like TripAdvisor, and analyzing search trends using Google Trends. The study explains its use of text analysis techniques like Latent Dirichlet Allocation (LDA) and Convolutional Neural Networks (CNN) to extract valuable insights from travel forum posts. The study discusses how the number of topics and their distribution are determined using the LDA model and the CNN classification to extract text features from travel forum posts. It follows that tourism practitioners and authorities can use these forecasts for crowd management and revenue management.

Also, it is important to consider economic policy uncertainty. The topic of EPU is discussed more broadly in the Journal of Travel Research (Kuok et al., 2022). The authors focus on understanding how EPU in China affects tourism in various markets around the world. While previous studies have looked at how EPU affects tourism, this research is unique because it uses a method called Global Vector Autoregression (GVAR) to analyse interdependence between multiple countries. China's economic policy uncertainty has negative effects on both inbound and outbound tourism. Moreover, EPU shocks have a more significant influence on tourism demand than shocks to GDP. Also, the study provides insights into how long the impact of an EPU shock can last, with some effects persisting for more than five years.

3.4 Analysis of Seasonal Fluctuations in Tourist Arrivals and Expenditures

Different seasons experience varying levels of tourism demand, with peak seasons attracting higher numbers of visitors. Factors such as weather conditions, school holidays, and cultural events influence seasonality. Destination management organizations may implement strategies to reduce the effects of seasonality. These strategies can include promoting off-peak travel, developing events and attractions during low seasons, or targeting niche markets.

Seasonality holds significant implications for the tourism industry. Several factors contribute to seasonality, resulting in both positive and negative outcomes. Among the natural factors, weather conditions play a role in shaping travel preferences, with pleasant climates attracting tourists during specific seasons. The timing of school breaks and holidays heavily influences tourism demand, leading to peak seasons when families can plan vacations. Special events, festivals, and cultural celebrations can draw significant crowds, creating seasonal peaks. The Tourism Climate Index (TCI) is often used to gauge tourists' perception of climate comfort and its influence on demand.

As a positive consequence, peak seasons generate substantial revenue, employment opportunities, and business activity within the tourism sector. As a negative, overcrowding, strain on infrastructure and resources, and reduced business during low seasons can adversely impact destinations and local communities.

4 Discussion

The impacts of tourism demand extend to various aspects of destinations, including their economy, socio-cultural fabric, environment, and political landscape. Tourism plays a pivotal role in driving economic growth and development in destinations. It has significant implications for employment and revenue generation. The tourism industry creates numerous job opportunities across sectors such as accommodations, food services, transportation, and entertainment. This leads to a reduction in unemployment rates and improved livelihoods for local communities (Crouch & Ritchie, 1999).

As well, the influx of tourists and their expenditures contribute to the growth of local businesses, infrastructure development, and tax revenues. The travel and tourism sector contributed 10.4% of global GDP and supported 334 million jobs, or 1 in 10 jobs worldwide, in 2019 (World Travel & Tourism Council, 2020). Tourism expenditure accounted for 8.9% of global exports and generated USD 1.5 trillion in international tourism receipts in 2019 (UNWTO World Tourism Barometer, 2020).

According to the article by Doris Chenguang Wu, Haiyan Song, Shujie Shen, New Developments in Tourism and Hotel Demand Modelling and Forecasting despite facing challenges like wars, epidemics, and financial crises, the tourism industry has consistently grown and diversified over the past sixty years. Moreover, there is a noticeable shift in consumer preferences towards experiential travel, sustainable tourism practices, and personalized travel experiences.

Tourism can have profound socio-cultural effects on destinations, shaping their identity, heritage, and community dynamics. By attracting visitors and creating awareness and appreciation for local traditions, customs, and heritage, tourism can play a role in the preservation and promotion of cultural assets. It helps in safeguarding intangible cultural heritage and reviving traditional practices (Timothy & Boyd, 2006).

The environmental impacts of tourism demand are a subject of increasing concern and require careful management. High levels of tourism demand can strain local resources such as water, energy, and land. It is crucial to monitor and

manage resource consumption to ensure the sustainability of destinations and mitigate negative environmental impacts. Transportation, accommodation, and recreational facilities, can contribute to pollution through waste generation, carbon emissions, and habitat degradation. Sustainable practices and responsible tourism management are essential to minimize these environmental footprints.

5 Conclusion

Throughout the review, we have identified several key findings. We have observed that tourism demand is influenced by a complex interplay of economic, socio-cultural, technological, environmental, and political factors. Additionally, seasonality emerges as a significant phenomenon affecting tourist arrivals and expenditures, with various causes and consequences. The role of destination attributes, such as image, branding, attractions, amenities, infrastructure, accessibility, transportation, marketing, and seasonality, has been highlighted as crucial in shaping tourism demand.

The implications of our findings extend to academia, industry, and policy-making. Academically, our review provides a comprehensive understanding of the factors influencing tourism demand, emphasizing the need for further methodological advancements and research in emerging areas. Industry practitioners can leverage the insights gained from this review to better understand and respond to changing tourism demand patterns. In the realm of policy-making, policymakers can utilize the findings to inform evidence-based policies and regulations that promote sustainable tourism development, address economic inequalities, enhance safety and security, and mitigate the impacts of seasonality. Furthermore, the implications of the COVID-19 pandemic and war highlight the necessity for robust crisis management and recovery plans, as well as the importance of utilizing big data and EPU during tourism demand forecasting.

5.1 Research Gaps and Future Research Directions

While significant research exists on the impacts of tourism demand, there are several areas that require further investigation. Future studies should focus on understanding and promoting sustainable tourism practices that minimize the negative impacts on the environment and maximize socio-economic benefits. The community-centred tourism is also worth the exploring the socio-cultural impacts on local communities and their attitudes, perceptions, and experiences. Also, investigating the impacts of tourism demand on emerging destinations and their unique socio-economic and environmental contexts can enrich our understanding of the dynamics between tourism and development.

Examining the interplay between tourism demand and sustainable development is critical. This includes investigating the measurement of sustainable tourism indicators, assessing the effectiveness of sustainable tourism policies and practices, and understanding the roles and responsibilities of various stakeholders in promoting responsible tourism.

Undoubtedly, understanding the implications of technological advancements, such as artificial intelligence, augmented reality, and blockchain, on tourism demand and the overall tourist experience is an important research area. Exploring how technology shapes traveler behavior, destination choices, and industry practices can provide valuable insights.

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The evaluation of expected impact of modern technologies: Consumer attitudes

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Abstract: The aim of the paper is to identify consumer expectations in terms of positive and negative impact of using modern technologies. Within the specified focus group, both benefits and risks of specific and general types and forms of digitization of this consumer segment are identified.

Keywords: consumer, digitalization, focus groups, marketing, modern technologies

JEL Classification: G32, G33, C35

1 Introduction

At the beginning of the digitization era, information and its use were defined (only) in the direction of the positive development of society and the organization. This fact stems from the fact that digital technologies have expanded over time to in many areas and in organizations as well as in the personal lives of individuals in society, which has created many new phenomena in the field of digitization.

During the decade, however, there was a great technological revolution, globalization, interconnection, overcoming the time-space discrepancy, and, above all, the speed of the spread of information. However, the development of innovation in this direction has caused the appearance of the opposite - i.e. the negative side of digitization.

Under the term digitization, we can imagine a summary of activities such as the mass deployment of technical means, new networks, software, robotization, and automation. There are many definitions, some are no longer valid, and others have been modified or modernized for the needs of modern times, but for example, the formulation by Psohlavec (1999) remains a still applicable definition.

„Digitalization is the conversion of selected measurable physical quantities of a digitized object into numerical values, their coding and storage to later generate other physical quantities to enable the later user to have physiological sensations replacing the direct perception of the original. (Psohlavec, 1999). Digitization is a process that converts and changes the recorded data into a digital (i.e. computer-readable) format. This results in preserving and securing the data and information which can be a document or a sound, image, or an object maybe forever as digitized information which can be stored safely and securely indefinitely. It is usually done by converting an analog signal into digital signals which records the information in binary coding or binary numbers in one zeroes.

This process of converting analog signals to numerical values or numbers is known as “digital convergence” or digitization. This process helps to keep the information intact and there is no loss or degradation of data which preserves the information.

In the 21st century, digitization has an immense influence on the functioning of the economy and society. A so-called digital transformation is taking place. Digitization has a major impact on our education, employment, health and leisure time. In most cases, digitization is received positively, but we often encounter negative opinions as well.

According to Colvin (2015), we need to understand a fundamental fact that is more serious than perhaps we realize, it is the fact that the very nature of work is changing, and the skills that the economy values are changing. Humanity has already experienced similar historical shifts a few times, the most famous being the Industrial Revolution. Those who did not want to accept this shift fell away. Those who accepted it as their own at least got a chance for a much better life. The same is happening this time. Today, everyone owns a computer, mobile phone or other digital device.

Veber (2018) talks about the so-called information society, where „information and its use has a positive effect the development of both organizations that focus on their collection, preservation, processing and use, as well as whole ones companies that consider information a valuable asset for their development.“

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According to Csiernik et.al (2006) Technology is not only transforming how people collect and share information but also altering how people interact with one another. The speed of technology has created the lure of immediate gratification and the pressure to communicate more quickly and often with larger numbers of individuals. The fact is that digitization affects not only consumers but also industry. Companies must then respond quickly and flexibly to customer requirements, which are increasingly demanding thanks to competition and the Internet. Therefore, investment in digitization is crucial for every business, regardless of its size. In short, today's times demand digital transformation.

Louis Rossetto (PEW RESEARCH CENTER JULY 3, 2018), self-proclaimed “troublemaker” and founder and former editor-in-chief of Wired magazine, summed it all up this way: “Digital technology is so broad today as to encompass almost everything. No product is made today, no person moves today, nothing is collected, analyzed or communicated without some ‘digital technology’ being an integral part of it. That, in itself, speaks to the overwhelming ‘value’ of digital technology. It is so useful that in short order it has become an integral part of all of our lives. That doesn’t happen because it makes our lives miserable.”

According to Lindsay Herbert (2017), digital transformation is all about understanding that the rules of the game have fundamentally changed. Westerman et al. (2014) add in their study that with digital transformation, communication with customers itself is also changing (and thus the customer experience is also changing).

The benefits of digitization on the one hand, but also its harm on the other, has its effects on the macroeconomic, corporate and consumer levels. The rise of the digital economy is in any case an advantage for consumers. The digital single market in the EU brings consumers a wider range of goods and services than ever before. At the same time, consumers are better informed about products and their availability. Thanks to the advancement of mobile phones, it is now not the slightest problem to make a quick purchase of anything over the Internet.

The rapid convergence and impact of social media, visual advertisements and e-commerce are creating this chain reaction of this shift in consumer shopping experience (consumer buying behavior), presenting the opportunities that were thought to be impossible before. The key to finding success and an achievement is finding a way to have an effect on these choices via such marketing appraisals that are visually attractive and developing cohesive experiences that combine social media, television and other digital platforms such as e-commerce, e-marketing, kiosks, digitized mode of payments (online transactions) (Heini Lipiäinen (2014).

According to Salomon et.al., (2013) under consumer behavior, we should not only imagine the purchase itself, but also the entire process that preceded the purchase. Where the customer searched, how he made his decision, and above all why he decided to buy the given product. It is important for a company to know how the customer behaves in order to adapt its marketing mix accordingly. However, with the advent of digitization, the behavior of consumers is also changing, and they are now influenced by various reviews, price comparisons and advertisements on social networks. Cheap Chinese e-shops are also entering the market, which import their goods to the Czech Republic mostly for free and sell cheap imitations of various products, thus posing a threat to local companies. "The rapid transmission of information affects the speed and direction of developing trends. And that's because the virtual world lets consumers participate in the creation and dissemination of new products." Like it or not, businesses must listen to consumers now more than ever if they want to succeed.

Digitization makes the process of finding the right product relatively easy for consumers thanks to various websites where they can compare prices with competitors, get recommendations or find a business with better service. Furthermore, they are most influenced by personalized advertising that is very well targeted thanks to the collection of user information data.

Agency SmarterHQ (2019) reports that 79% of consumers think businesses know too much about their purchasing activities and preferences, yet 90% of consumers are willing to provide this information for a more convenient purchase or a more favorable offer. Furthermore, 86% of consumers are in this things concerned about the misuse of their personal data. Consumers in the digital age are increasingly spoiled by personalized advertising, great customer service and the ability to make your purchase from almost any device. All this thanks to companies that literally have to compete to see who can offer a better price combination, quality and customer service. This has made consumers relatively comfortable customers, which is much easier to keep than to acquire.

According to Kumar, Rakesh et.al. (2019) several factors affect consumer behavior. It differs from person to person based on his age, income, sex, education and marital status. Age is an important demographic factor that affects consumer behavior. As people grow, their needs change. Similar changes appear in their buying decision making patterns. With age, our health related needs change and so do our other needs. Age brings changes to people's lifestyle and affects their needs and personal values. When people are young, they spend more on their lifestyle needs like fun, movies and fashion. As they grow older, their expenses on these things grow lower.

Abhijeet Pratap (2017) describes it exactly in his study describes generational differences in consumer behavior. Elderly people mostly remain indoors, however, their health related expenses can grow since an aging body is more prone to diseases. In this way, age becomes one of the fundamental demographic factors that affect consumer behavior and buying decisions. Age does not just affect buying behavior, it is also an important factor in terms of market segmentation and marketing strategy. Marketers segment their target market on the basis of age. Age determines several things and when we retire, our consumption patterns change according to the changing income level. Elderly people are less digitally inclined and therefore their consumption of digital services is lower.

2 Methods

From the literature review above, it is clear that the question of digitization and its influence on modern consumers is not a simple area. Therefore, for the purposes of our pilot research, we first conducted qualitative data collection using the FOCUS GROUP technique with semi-structured sets of questions. The goal was not to reach a consensus or find a single solution, the goal was to get the participants' opinion on the topic of discussion. The individual information was then collected into a final document using the transcription from the recorded recordings. The focus groups method was chosen as the main method intended for qualitative research of a structured discussion on the topic - finding out the effects of digitization on groups of students of the Faculty of Economics of the University of South Bohemia.

The aim of the implementation of the focus group on 4-5.10-2022 in four groups of students of the field of marketing research was to find out the opinions and attitudes of students of different age groups on the subject of DIGITALIZATION. School classrooms were chosen as a suitable pleasant and familiar environment. The moderator/educator introduced the focus group participants to its course, rules and emphasized the anonymity of answers or discussion contributions. Each question area was timed for 10-15 minutes of structured discussion. The entire course of the focus group was recorded. On the basis of the previous discussion, the moderators processed 5 areas of questions below on the subject of digitization:

Thematic areas of semi-structured questions:

1. How many times do you come across an element or a tool of digitization in your normal day?
2. How much does it affect you personally? How to perceive it? Is it beneficial? What exactly? Is there a limit somewhere when it bothers you? What specifically bothers you?
3. Do you perceive any personalization in the communication with you, do you perceive the communication of content that is adapted directly to you? What content, when, and where do you get it in your normal day?
4. When was the last time a communication influenced your decision-making about something? Was it a rational decision or an emotional one?
5. Digitization represents a natural development, it is supposed to benefit people - do you see it as useful for humanity, now and in the future? What does it bring to the future?

3 Research results

The question of the first thematic area: How many times a day do you encounter some element or a tool of digitization in your everyday life? The moderator added in the discussion: Imagine the imaginary axis of your day and describe each one for yourself, how many times do you encounter something like this, where, and with what?

In the answers to this question, the most frequent answers were several times a day, many times, all the time, all the time, or countless times. Some even stated that the questions should be: when will I not encounter this?

Students then began to mention specific types of digital tools, in addition to mobile phones, for example, applications, videos, online games, e-recipes, electronic systems in education, transport, etc. In this context, they further commented on what daily activities they use the tools, so in addition to studying, they noted: travel, rest, or shopping.

The key question of the second discussion circle: How much does it affect you personally? How do you perceive it? Is it beneficial? What exactly? Is there a limit somewhere when it bothers you? What specifically bothers you?

The moderator added: If you imagine that imaginary axis - when specifically will it help you? When do you care? When does it annoy you? (where is the focus on negative and positive?)

Regarding the question of the benefit of digitization or the influence and effect on everyone in the group, the answers related to awareness or attitude coincided with the majority of those interviewed. The positive benefits prevailed, simpler, immediate, and faster access to information, but also the opportunity to educate and be inspired. They perceived very

strongly targeted and personalized advertisements, censorship on social networks, monitoring of user intentions or misuse of personal data for marketing purposes as negative.

The third question was aimed at personalization: Do you perceive any personalization in communication with you, do you perceive the communication of content that is tailored directly to you? What content, when, and where do you receive it in your typical day?

In the answers to this question, concepts such as advertising appearing purposefully in various marketing formats were repeated, both with a positive and negative impact, sometimes bordering on harassment and ubiquity. Censorship on social networks, monitoring or misuse of personal data for marketing purposes, the untrustworthiness of sources and unverified information resonated strongly in the discussion, and the aforementioned concerns about loss of attention and worsening concentration, especially due to the so-called scolding of dopamine reels of several seconds, were also interesting.

The fourth circle was related to the influence and influencing of decision-making: When was the last time some communication influenced your decision-making about something? Was it a rational decision or an emotional one? The moderator added: When was the last time something made you go shopping, enter a store, open an e-shop on a computer or mobile phone, make a purchase decision, or change your original decision? What specifically influenced you?

On the question of being influenced by advertising, most of the participants in the discussion agreed that they are influenced by advertising when shopping online, in such a way that they mostly act emotionally, sometimes even impulsively. They are influenced more by the persona of the influencer than by written or photographic advertising. In addition, some mentioned the recent stage of the and the related influence of information from the media. They usually choose to visit a physical store to get advice on choosing or choosing the right product. In addition, some mentioned the recent stage of the market and the related influence of media information. They typically prefer visiting physical stores to receive advice on selecting the right product.

The fifth circle pandemic situation (COVID-19) is related to the opinion on the benefits of digitization in general: digitization represents a natural development, and it is supposed to benefit people - do you see it as useful for humanity, now and in the future? What will it bring to the future? The moderator added: where do you encounter digitization? What does it bring you? What does it bring to humanity?

Most of the students agreed that digitization in the future will be beneficial, it will bring about the acceleration of production or the simplification of technological processes, for example, but there will be a need for greater human awareness of how to deal with it.

The results of this focus group became the impetus for the preparation of a proposal for a quantitative questionnaire survey with the following proposed questions:

Rate individual tools or elements of digitization according to importance: Smart technologies (e.g. mobile phone, smartwatch, tablet, computer, laptop, camera, camcorder); Applications for everyday life (eg calendar, notes, reminders, alarm clock, weather); Communication and sharing, social networks (e.g. Skype, Microsoft Teams, Google Meet, Facebook, Instagram, Tik Tok, Youtube); Photos, video, and audio recordings, Internet search engines; online games; digital platforms

On what occasion do you encounter digitalization elements or tools?

What do you see as a positive benefit of digitization?

What phenomena within digital tools bother you?

Rate the consequences of digital media based on their harmfulness.

What do you see as the usefulness of shopping online?

What factors are the strongest motivation for you to make either an online or a physical purchase?

In what areas do you think the development of digitization tools would have the greatest benefit in the future?

4 Conclusions

This contribution was devoted to finding out the impact of digitization on students of the Faculty of Economics in the field of marketing research, taking into account the specifics of the consumption behavior of this generation. This paper aimed to bring a deeper understanding of the group in students' opinions and attitudes toward digitization. Firstly, the theoretical part of the paper focused on the area of digitization and concepts in general, and the greatest attention was focused on the factors of positive or negative effects of digitization. On the one hand, there are benefits of digitization, however, on the other hand, its harmfulness has an impact on the macroeconomic, corporate, and consumer levels.

Using the qualitative focus group method, it was found that almost all participants in the discussion identified with the topics of the structured discussion. It turned out that while for some of the participants, it was important to be aware of the handling of the elements of digitization, for others it was more important to be aware of the influence of digitization. On the other hand, none of the discussed topics was evaluated by any of the participants as absolutely inappropriate, which means that to a certain extent, they have encountered or are encountering the individual factors and influences of digitization at least in a certain way and have formed a personal opinion or attitude towards it.

As the reflection found, a certain narrowing of the elements of digitization to mobile phones, applications, and social networks was the alpha and omega of the interview participants, to which they returned several times in other circles as well. An important insight is that, although some of the statements proved to be strongly resonant, they were very often preceded by other factors that influenced the participants' opinions with priority: disruption of attention, lack of concentration, and personalization. However, it was less about positive personalization in the sense of the authenticity of digitalization elements, but rather the negative benefit of personalized marketing from the perspective of the participant/consumer and the feared invasion of privacy from the perspective of the user of social networks.

From the point of view of the purchase decision-making process, the participants perceive the advantages of online purchases as speed, and availability of products and services, yet they broaden their view to include a certain risk of online purchases in terms of product quality and features. At the same time, the discussion also pointed out that all recommendations did not have the same weight, and in addition to the price, the credibility of recommendations from friends, families, influencers, or reviews, which were rather a secondary source, played an even greater role, while a very critical distance was often kept from them. This was mainly caused by the participants' skepticism regarding the possible manipulation of such sources. Even choosing the wrong influencer to spread the review can damage trust to a critical extent. On the other hand, trust was strengthened especially in brick-and-mortar stores, mainly in connection with the strengthening of trust in the purchase process and advice.

The aforementioned doubts regarding online reviews and recommendations create a question for further research, namely how generationally hidden advertising in online reviews and recommendations is recognized, or to what extent it is allowed to be influenced when shopping. For an even deeper insight into consumer behavior, it would be advisable to carry out research focused on behavior in already specific areas. At the same time, quantitative research is also offered, which will determine when the price becomes so high for consumers from Generation Z that they start to pay much more attention to, for example, reviews and recommendations, for which the price has proven to be a significant determinant. However, such research should again take place with a separate focus on individual categories.

The resulting findings of the qualitative structured discussion will be used in the future as a basis for processing a quantitative investigation of this issue.

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German labor unions: Shaping occupational trends and earnings across routine jobs

Tomáš Oleš¹

Abstract: This paper uses individual data from the German Socio-Economic Panel (SOEP) to examine occupational trends and earnings returns to routine jobs over the period 1985-2019. Initially, we observe a significant decline in the returns to routine task intensity (RTI), suggesting a reduced demand for routine jobs. However, once unionized workers are taken into account, this decline is reversed and becomes positive and highly significant. This highlights the role of unions in mitigating wage declines in routine occupations, consistent with results of Parolin (2021) for the U.S. labor market. Interestingly, controlling for unionization eliminates the statistical significance of the linear time trend, suggesting that unionized workers are increasingly specializing in non-routine occupations. Moreover, we find that demand for unionized workers does not decline significantly, as in the case of non-unionized workers.

Keywords: labor unions, routine occupation, automation

JEL Classification: J23, J31, J51

1 Introduction

In the last four decades, wage polarization has been significantly increasing in all developed countries (Autor, Katz, and Kearney 2008; Goldin and Katz 2009; Acemoglu and Restrepo 2019; Dustmann, Ludsteck, and Schönberg 2009). Labor market scholars suspect that new technologies could be one of the major driving factors behind unfavorable changes in earning distribution. A very influential argument was made that technologies have a skills-biased effect on labor demand (Tinbergen 1974). Katz and Murphy (1992) observed that despite the increase in the supply of more educated workers the education (wage) premium increased. This well-documented fact was caused by steadily rising labor demand that is biased toward highly educated labor. However, this framework could not explain why low and high-paid service occupations experienced large employment and earning growth at the expense of middle-pay occupations (Goos and Manning 2007). The second flaw of this model lies in the fact that it is not able to explain why wages of low-educated workers fall (not stagnate) substantially (Autor 2022). Later, scholars introduced a concept of task-routines (Autor, Levy, and Murnane 2003; Acemoglu and Autor 2011; Acemoglu and Restrepo 2018) that could account for wage polarization better. Based on the conceptualization of the production process to a set of tasks, that could be either performed by the technology (machines, robots, or AI) - routine tasks, and those that require a higher level of creativity or are performed in a non-controlled environment - non-routine technology could directly complement those, that are non-routine and directly replace those that are routine. Since the most routine occupations are in the middle of the income distribution, these occupations are directly replaced by machines, causing a decline in employment shares. Workers from these high routine-task intensive occupations from the middle of the income distribution tend to move to the lower-paid occupations, where they exert downward pressure on wages (Acemoglu and Autor 2011). In Germany, Dustmann, Ludsteck, and Schönberg (2009) documented that since 1980 wage growth at the top of the wage distribution experienced the largest growth and the middle-tier group of workers experienced slower growth than the bottom of the wage distribution. A similar but more pronounced trend was documented for the U.S. (Autor and Dorn 2013).

In addition to the technology-based explanation, another strand of the literature sees institutional changes as a key driver of wage polarization, such as a secular decline in union density and the minimum wage (Fortin and Lemieux 1997), or changes in the composition of the labor force (Lemieux 2006), or an increase in foreign competition (Feenstra and Hanson 1999; Autor, Dorn, and Hanson 2013). Empirical studies documenting that the impact of technology on wages and employment depends on these institutional changes are numerous. In Germany, Fitzenberger, Kohn, and Wang (2006) documented that the strong deunionization that began in the 1990s contributed significantly to the increase in wage inequality at the bottom of the income distribution. Fitzenberger, Kohn, and Lembecke (2013) further add evidence that

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higher union coverage reduces wage dispersion by increasing wages at the bottom of the income distribution and reducing wages of those at the top of the income distribution. In the U.S. labor market, Parolin (2021) examined the relationship between trends in the earnings returns to occupational routine task intensities, given changes in union densities. He found that if union coverage had remained stable, the polarization of earnings driven by highly routine occupations would not have occurred. Despite of moderating effect of labor market institutions, Kostøl and Svarstad (2023) showed that the moderating effect of trade unions has bi-directional causation. On the one hand, workers who specialize in more routine occupations enjoy higher union premiums compared to non-routine workers, which consequently positively contribute to technological change.

To investigate how earning and employment trends differ across unionized workers who are employed across different routine task intensities occupations (RTI), I will make use of the German Socio-Economic Panel (SOEP) from 1985-1993 (West Germany) and 1993-2019 (East and West Germany) to study the wage premium (1990-2019) and employment trends (1985- 2019) across routine and non-routine occupation. I borrowed the proposed hypothesis from Parolin (2021) and investigated whether trade union membership inhibits declining earning returns to an occupation's RTI, and whether this higher earning potentially has a declining effect on the employment of higher RTI occupations. The main findings of the paper can be summarized as follows. I found a declining trend in the return to routine jobs, and unions appear to mitigate this decline, although their impact is not economically significant. I also document a declining trend in the employment of routine jobs, and it appears that unions play a moderating role in slowing this decline.

After I decompose the employment trends into manufacturing, mining, and all other non-manufacturing sectors, I document a rising number of routine occupations in manufacturing and a declining number of routine occupations in manufacturing. On the one hand, I observe a significant moderating effect of organized workers in the non-manufacturing sector, but surprisingly, the same effect is absent in the manufacturing sectors.

The rest of the paper is structured as follows. Section 2 describes the methods and data used in the paper. Section 3 discusses the main results, and section 4 concludes.

2 Empirical specification and data

The German Socio-Economic Panel (SOEP) created by Goebel et al. (2019) is a longitudinal survey of approximately 15,000 private households in West Germany from 1984 to 2021 and East Germany from 1990 to 2021 (release 2023). Since the union membership was asked for the first time in 1985 and 2019. I restrict my analysis to this period. To estimate the earning returns across different routine task intensities, I follow the specification from Goos, Manning, and Salomons (2014) and Parolin (2021) by estimating the trend in the returns to an occupation's RTI:

$$\log(\text{real wage}_{j,i,s,t}) = \beta_1 RTI_j + \beta_2 (RTI_j \cdot Year_t) + \beta_3 X_j + \gamma_i + \gamma_s + \gamma_t + \varepsilon_{j,i,s,t} \quad (1)$$

The $\log(\text{real wage}_{j,i,s,t})$ of occupation j , in industry i , federal state s , and time t start to be recorded in 1990. I deflated them to the year 2015 by making use of the Consumer Price Index (CPI) obtained from the Federal Statistical Office of Germany (2023). To complement data on Routine Task Intensities (RTI) of occupations later rescaled from 0 (non-routine) to 1 (routine) computed by Tjildens (2023) for ISCO-08, I created consistent occupational groups that were translated from ISCO-88 COM to ISCO-08 by using correspondence tables provided by the International Labor Organization (ILO) by keeping only unique matches across both classifications. The main variable of interest is the β_2 coefficient, which accounts for interacted $Year_t$ and RTI_j . If the estimate of β_2 is positive and significant, this must imply that the earnings returns to higher RTI are increasing over time, independent of composition effects (Parolin 2021). To account for the composition effect, I add the variables that could influence the labor supply, namely the education, age, age squared, sex, and migration background of an individual all composed to vector X_j . Moreover, the model takes into account unobservable fixed effects: γ_i , γ_s , γ_t on the level of industry, federal state, and year respectively, that are correlated with our dependent variables and should eliminate different institutions, or sectoral specific shocks. Subsequently, I extend the model (1) by adding trend of earning return to unionized workers:

$$\log(\text{real wage}_{j,i,s,t}) = \beta_1 RTI_j + \beta_2 (RTI_j \cdot Year_t) + \beta_3 X_j + \beta_4 (RTI_j \cdot Year_t \cdot Union_j) + \gamma_i + \gamma_s + \gamma_t + \varepsilon_{j,i,s,t} \quad (2)$$

A positive and significant slope, β_4 , would suggest that union coverage is associated with more favorable earnings returns to an occupation's RTI over time. To test whether higher union coverage leads to accelerated declines in occupations at greater risk of automation, I estimate the same specification as Parolin (2021):

$$\log(RTI_j) = \beta_1 Year_t + \beta_2 Union_j + \beta_3 (RTI_j \cdot Year_t \cdot Union_j) + \gamma_i + \gamma_s + \varepsilon_{j,i,s,t} \quad (3)$$

All composition controls and fixed effects are the same as in the previous models. I exclude the year fixed effect γ_t because I include a time trend estimate, β_1 , in the main specification. A negative and significant estimate of the time trend would imply that high RTI occupations are declining over time, presumably because negative labor demand is shifting to routine occupations. Since I am most interested in the moderating effect of unions, the significant and positive estimate will suggest that unionized workers tend to be less exposed to negative labor demand shifts over time.

3 Results

Table 1 shows the results of the (1) and (2) models. The interaction term of RTI and the linear time trend is negative and statistically significant in the first and second columns, indicating that returns to RTI have declined on average. Interestingly, after I include the interaction with unionized workers, the estimate is positive and highly significant, suggesting that unions do indeed play a moderating role in the downward pressure on wages in more routine occupations. Similar results were obtained for the US labor market in Parolin (2021). Notably, the introduction of controls for unionized workers in column (2) eliminates the statistical significance of the linear time trend. The estimate for the union parameter (- 0.99 (0.56)) suggests that unionized workers, on average, tend to specialize in more non-routine occupations. Strikingly, the demand for unionized workers tends to increase over time, captured by a positive estimate for different time trends for unionized workers in table 1. These results contrast with those of Parolin (2021), who found a modest negative impact of unions on wages in the U.S labor market.

Finally, I estimate the model (3) within the subset of manufacturing, mining, and transportation (hereafter manufacturing) and all other agricultural and service industries (hereafter non-manufacturing) in order to clarify whether specific subsets of industries are driving the overarching trend of declining demand for routine occupations attributed to unions. The results of this exercise are presented in table 3. On the one hand, the linear trend estimates consistently show a decline in the prevalence of routine occupations over time in non-manufacturing industries. On the other hand, an increasing demand for more routine occupations is observed in the subset of manufacturing industries. While unions exert a more pronounced restraining influence in non-manufacturing, their statistical significance diminishes in manufacturing, possibly due to greater heterogeneity among manufacturing firms.

4 Conclusions

This paper examined occupational trends and the earning returns to routine occupations in the German labor market between 1985 and 2019, and the role of unionized workers. First, we observed a significant decline in the returns to RTI over time, suggesting a declining demand for routine occupations.

However, an important finding emerged when we introduced unionized workers into the equation. The decline in returns to RTI was not only reversed but turned positive and highly significant. This result underscores the moderating role that unions play in mitigating downward pressure on wages in routine occupations. This finding is consistent with the research of Parolin (2021), who found similar trends in the U.S. labor market.

In addition, this paper revealed that the statistical significance of the linear time trend disappeared when controlling for unionized workers. The results suggest that unionized workers tended to specialize in non-routine occupations and, remarkably, the demand for unionized workers appeared to increase over time.

These results diverge from the previous results of Parolin (2021), who found that unions had a modest positive impact on wages but noted that this effect was offset by a reduction in the employment share of routine occupations.

After splitting our analysis into manufacturing and non-manufacturing industries. We found different trends. Routine occupations showed a steady decline over time in non-manufacturing industries, while the opposite trend was observed in manufacturing. Unions exerted a stronger restraining influence in non-manufacturing, but their statistical significance diminished in manufacturing, possibly due to the greater heterogeneity among firms in this sector.

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5 Appendix

Table 1 Trends of real wages and routine occupations interacted with trade union membership in Germany, 1990-2019.

	$\Delta \log(\text{Real Wages}_{jst})$	
	(1)	(2)
RTI _j	11.474*** (0.781)	11.474*** (2.501)
RTI _j × Year	-0.005*** (0.001)	-0.005*** (0.001)
RTI _j × Union × Year		0.000*** (0.000)
Adj. R ²	0.41	0.41
Observations	114,263	36,649

Note: Real wages, trade union membership, and all demographic variables come from SOEP database created by Goebel et al. (2019). The Routine Task Intensity (RTI) scores are from Mihaylov and Tjidsens (2019) estimate for ISCO-08 occupation and are rescaled between 0 (non-routine occupation) and 100 (routine occupation). Wages are winsorized at 1 and 99 percentile. Estimates control for age, age squared, education, gender. Fixed effects are defined at the level of 2-digit NACE industries and 16 federal states. Standard errors are clustered at the federal state level, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 2 Trends of routine task intensity score and trade union membership in Germany, 1985-2019.

	ΔRTI_j	
	(1)	(2)
Year(linear)	-0.0001*** (0.0000)	0.0002 (.0001)
Union		-0.9928* (0.5641)
Union × Year (linear)		0.0005* (0.0002)
Adj. R ²	0.22	0.22
Observations	190,049	61,299

Note: Trade union membership and all demographic variables come from SOEP database created by Goebel et al. (2019). The Routine Task Intensity (RTI) scores are from Mihaylov and Tjidsens (2019) estimate for ISCO-08 occupation and are rescaled between 0 (non-routine occupation) and 100 (routine occupation). Wages are winsorized at 1 and 99 percentile. Estimates control for age, age squared, education, gender. Fixed effects are defined at the level of 2-digit NACE industries and 16 federal states. Standard errors are clustered at the federal state level, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3 Non-manufacturing and manufacturing trends of routine task intensity score and trade union membership in Germany, 1985-2019.

	Δ RTI _{ij}			
	Non-manufacturing		Manufacturing, mining	
	(1)	(2)	(3)	(4)
Year(linear)	-.0004*** (0.0001)	-.0003*** (0.0001)	0.0007*** (0.0001)	0.0016*** (0.0002)
Union		-1.5060*** (0.6656)		-0.3025 (1.0100)
Union × Year (linear)		0.0007*** (0.0003)		0.0001 (0.0005)
Adj. R ²	0.27	0.27	0.13	0.13
Observations	137,842	43,991	52,207	17,308

Note: Trade union membership and all demographic variables come from SOEP database created by Goebel et al. (2019). The Routine Task Intensity (RTI) scores are from Mihaylov and Tijdens (2019) estimate for ISCO-08 occupation and are rescaled between 0 (non-routine occupation) and 100 (routine occupation). Wages are winsorized at 1 and 99 percentile. Estimates control for age, age squared, education, gender. Fixed effects are defined at the level of 2-digit NACE industries and 16 federal states. Standard errors are robust to HAC, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

A systematic literature review of tourism dynamics in the post-covid era

Solomon Owusu Yeboah¹, Mohsin Javed², Adwoa Yeboaa Owusu Yeboah³

Abstract: The COVID-19 pandemic has significantly influenced the worldwide tourism sector, causing unprecedented disruptions and changes in visitor behavior. Due to the massive spread of the virus at the global level, the World Health Organization (WHO) labeled the epidemic a pandemic in March 2020, resulting in extensive travel restrictions, border closures, and dramatic changes in consumer behavior. These precautions were designed to slow the spread of the virus, but they had severe consequences for the tourism sector. This systematic literature review (SLR) aims to offer an overview of new research on tourist dynamics in the post-COVID period. The study summarizes the findings of necessary research published between 2021 and 2023, concentrating on significant issues such as tourism sector change, shifting travel patterns, destination management strategies, and the role of technology in influencing tourism's future. The SLR identifies research gaps and provides insights to policymakers, destination managers, and academics to help them navigate the changing world of post-pandemic tourism.

Keywords: Tourism Dynamics, Post-COVID era, Systematic Literature Review

JEL Classification: Q5, Q54, Q56, Q58

1 Introduction

Overview of The Tourism Industry

The tourism industry plays a crucial role in the global economy, generating substantial revenue, creating jobs, and contributing to nations' development. It encompasses a wide range of activities related to travel, accommodation, transportation, entertainment, and hospitality, catering to the needs and desires of travelers. From domestic tourism to international travel, this industry has become a primary economic sector with significant impacts on various aspects of society (Canh & Thanh 2020).

Impact of the COVID-19 Pandemic on the Tourism Sector

In the wake of the COVID-19 pandemic, the global tourism landscape has undergone profound transformations, necessitating a reevaluation of traditional paradigms and the emergence of new perspectives on tourism dynamics. The pandemic disrupted international travel, leading to unprecedented challenges for the tourism industry worldwide (Sigala, 2020). As nations gradually recover from the acute phase of the crisis, attention turns to understanding the nuanced and complex dynamics that shape post-COVID tourism.

The recovery and prospects of the tourism industry heavily depend on the virus's effective containment and global immunization efforts. While certain places have begun to reopen and gradually recover, there are still concerns about the appearance of new variants and changes in travel restrictions. To travel in the post-pandemic era, travelers' trust and confidence must be reestablished, and novel techniques and stakeholder cooperation are necessary (UNWTO, 2021). The far-reaching impacts of the COVID-19 pandemic on the performance and development of the tourism industry can be seen in the discussion below:

Travel limitation and border closures: To prevent the virus from spreading across international borders, governments worldwide instituted travel restrictions and border closures. These restrictions drastically hampered international and local travel, resulting in a significant drop in tourist arrivals. According to the United Nations World Tourism Organization

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(UNWTO), international visitor arrivals would be 74% lower in 2020 than the previous year, resulting in a \$1.3 trillion loss in global tourism earnings (UNWTO,2021).

Economic impact: Tourism contributes significantly to global GDP and jobs. Travel limitations caused by the epidemic and a drop-in tourist arrival resulted in a substantial economic downturn in the industry. Many firms, particularly small and medium-sized enterprises (SMEs) reliant on tourism, were forced to close due to financial difficulties. According to the International Labour Organization (ILO), the pandemic would cost the equivalent of 255 million full-time jobs in 2020, with the tourist and hospitality industries among the most impacted (ILO, 2020).

Challenges for the airline and cruise industries: The pandemic significantly impacted the airline and cruise industries. Many airlines had financial difficulties due to decreasing travel demand and numerous cancellations, resulting in layoffs, furloughs, and even bankruptcy. According to the International Air Transport Association (IATA), worldwide airline passenger revenues will fall by \$371 billion in 2020 (IATA, 2021). Similarly, the cruise sector suffered considerable interruptions due to port closures and a drop in reservations, resulting in substantial financial losses (Cruise Lines International Association, 2020).

Consumer attitudes and behavior have shifted significantly as a result of the epidemic. For passengers, health and safety concerns have taken precedence; The fear of contagion and a heightened awareness of health and safety have significantly influenced travel decisions (Robina-Ramírez et al., 2023). People, therefore have grown more careful in their travel choices, preferring sites and services that adhere to strict health and cleanliness standards. As tourists seek outdoor and less congested experiences, there has also been an upsurge in interest in sustainable and nature-based tourism (Deloitte, 2021). This, has necessitated the need for collaboration between governments, public health agencies, and the tourism sector (Yan et al., 2023).

The rise of remote work during the pandemic has also blurred the lines between leisure and business travel, giving rise to the concept of "bleisure" travel (Pavia et al., 2023). Tourists increasingly seek destinations that offer a balance between work and leisure, reflecting a fundamental transformation in the nature and purpose of travel experiences.

Advancement of technological change: The epidemic has expedited the tourist industry's digital transformation- with technology playing a pivotal role in shaping post-COVID tourism dynamics (Trunfio & Pasquinelli, 2021). Consequently, physical travel limits, virtual experiences, contactless technology and digital platforms for booking and information dissemination have become integral components of the tourism ecosystem. This digital change will have long-term consequences for the industry (McKinsey & Company, 2023).

Navigating these dynamics presents both challenges and opportunities for stakeholders in the tourism industry as they seek to rebuild and reshape a more resilient and sustainable future.

Theoretical Background

Tourism Dynamics

The COVID-19 pandemic has left an indelible mark on the global tourism industry, prompting a paradigm shift in its dynamics. As destinations emerge from the crisis, a range of transformative trends is reshaping the way tourism is perceived and experienced.

Tourism dynamics relate to the ever-changing patterns, trends, and factors that affect the tourism sector; it is shaped by a complex interplay of economic, environmental, social, and technological influences. Understanding these dynamics is critical for decision-makers, entrepreneurs, and researchers looking to maximize the advantages while minimizing the negative consequences of tourism. Tourism dynamics begin with the interaction between supply and demand. Individual travel decisions are influenced by factors such as income, demography, and consumer preferences on the one hand and the availability and quality of tourism infrastructure, services, and attractions on the other hand. Additionally, various crises, natural disasters, health emergencies (e.g., the COVID-19 pandemic), political instability, and economic downturns can hugely affect tourism dynamics. How destinations and businesses respond to and recover from these crises is a critical aspect of tourism dynamics.

Post-COVID Era

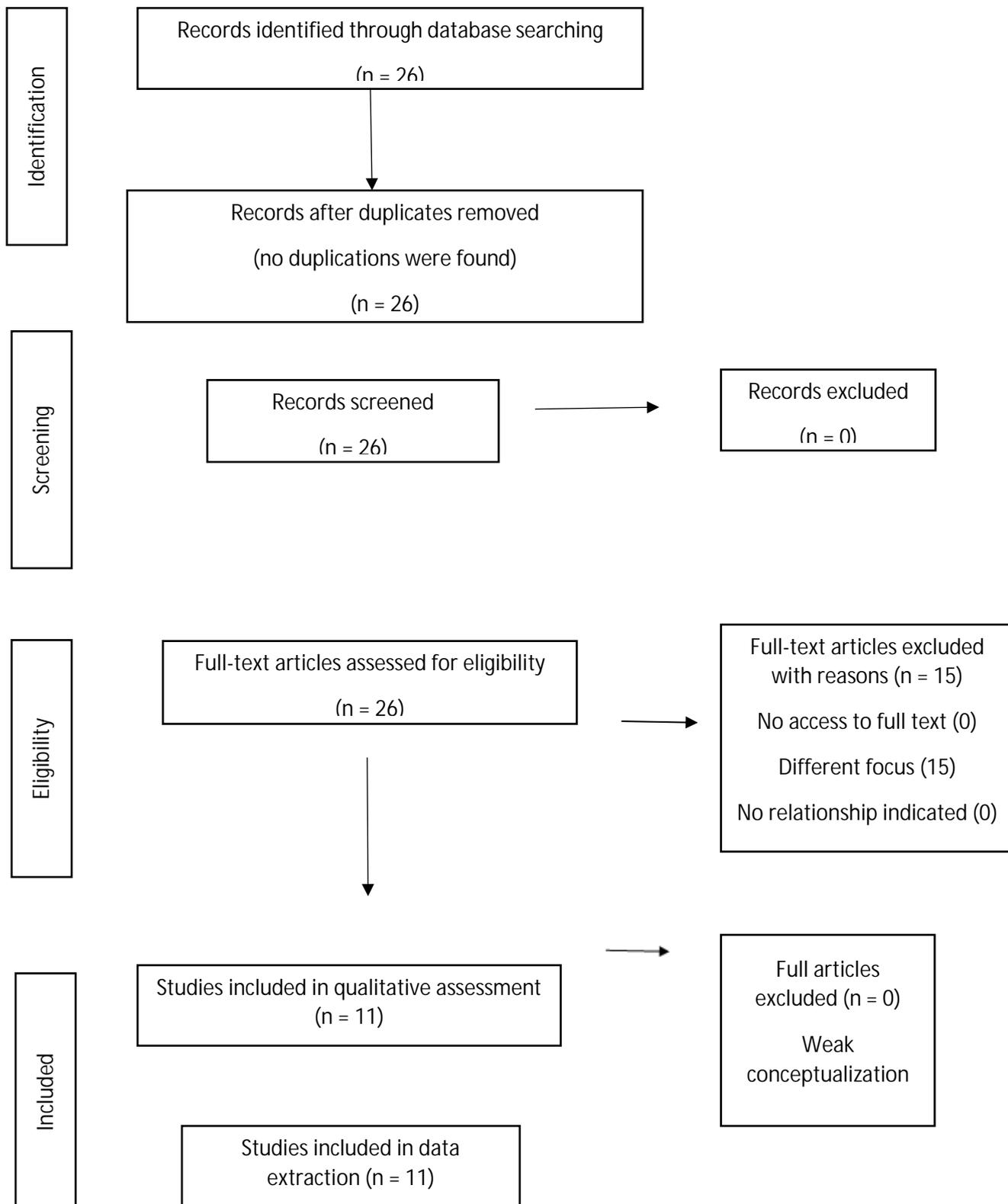
The post-COVID era represents a unique and transformative period in human history, marked by the aftermath of the COVID-19 pandemic. Significant societal shifts characterize this era, including healthcare, economics, technology, governance, and social behavior. Understanding the theoretical underpinnings of the post-COVID era requires interdisciplinary research, including tourism, economics, public health, sociology, and technology studies. It also involves adapting to the evolving challenges and opportunities this transformative period in human history presents.

2 Methodology

The purpose of this systematic literature review (SLR) is to look into the dynamics of tourism after COVID-19. This technique describes the SLR process, including the search strategy, study selection criteria, data extraction, and data synthesis. The SLR will be carried out to collect appropriate and up-to-date information on the effects, trends, and changes in the tourist industry due to the COVID-19 pandemic.

The SCOPUS database was heavily relied on to collect the relevant scientific articles. The graphical demonstration of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) framework was employed. The outcome of the search is represented in the figure 1 below:

Figure 1 Systematic Literature Review by PRISMA Framework



Research Questions

The following research questions will guide the SLR:

- a. What are the primary consequences of the COVID-19 epidemic for the tourism industry?
- b. What impact has the post-COVID period had on tourism demand and behavior?
- c. What are the new trends and developments in the tourist industry following the pandemic?
- d. What initiatives and measures have been implemented to revitalize tourism in the post-COVID era?

Search Strategy

To locate relevant papers and material, a detailed search strategy was established. The search took place in the SCOPUS electronic database. The keywords and keyword combinations were used in the "Title-Abs-Key" bar as the search criteria. The keywords were tourism "dynamics" and "Post-COVID," consequently, 26 scientific records were retrieved.

Data Synthesis

The data retrieved from chosen articles will be thematically examined. Common themes and patterns in tourist dynamics will be recognized in the post-COVID period. The findings will be summarized, and the links between the various topics will be investigated.

Quality Assessment

The quality and rigor of chosen publications were evaluated to verify the findings' reliability and validity. This was accomplished by scrutinizing the scope of the subject area in light of the topic under consideration. Due to those mentioned above, all nonconforming papers were removed. As a result, of the 26 articles examined for eligibility, 15 were removed for having a different focus.

Data Extraction

As the last step, the data were extracted using a predetermined form: the PRISMA framework. The data were extracted for a thorough analysis. As a result, 11 articles were considered fit to be included in the qualitative assessment, and all 11 passed for the data extraction. The papers that passed through the PRISMA framework are crucial to achieving the aim of the SLR.

Reporting

The SLR findings will be organized and comprehensively reported. The report will include sections on the introduction, methods, results, discussion, and conclusion. The findings will be presented descriptively, with tables, graphs, and citations from the articles selected to back them up.

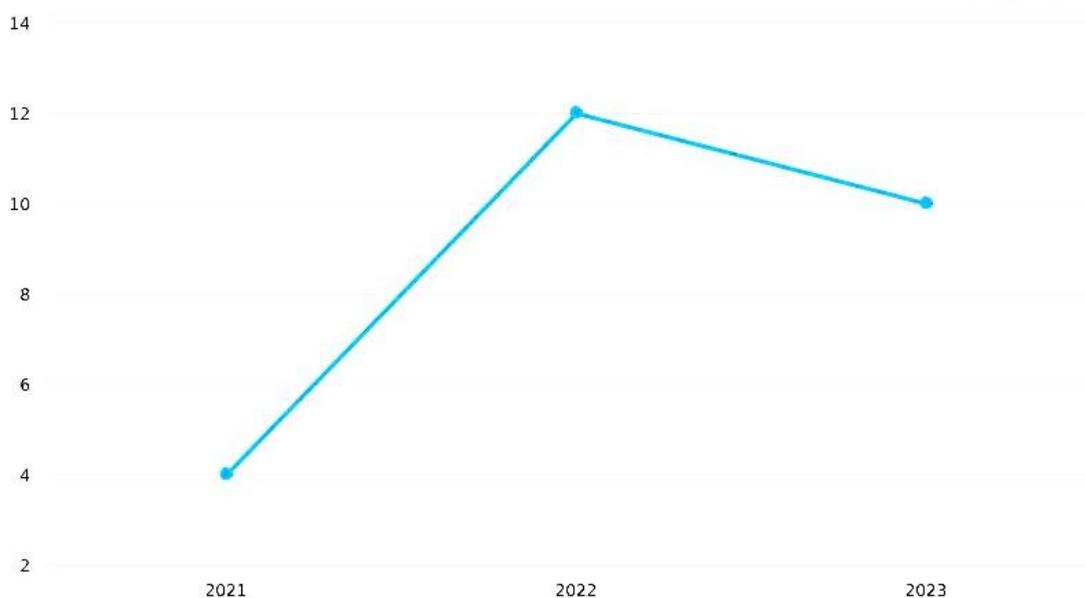
Limitations

The SLR may have limitations, including insufficient relevant literature, potential publication bias, and the exclusion of non-English articles. However, attempts have been made to reduce these constraints by a thorough search and a rigorous selection process.

3 Results and Interpretations

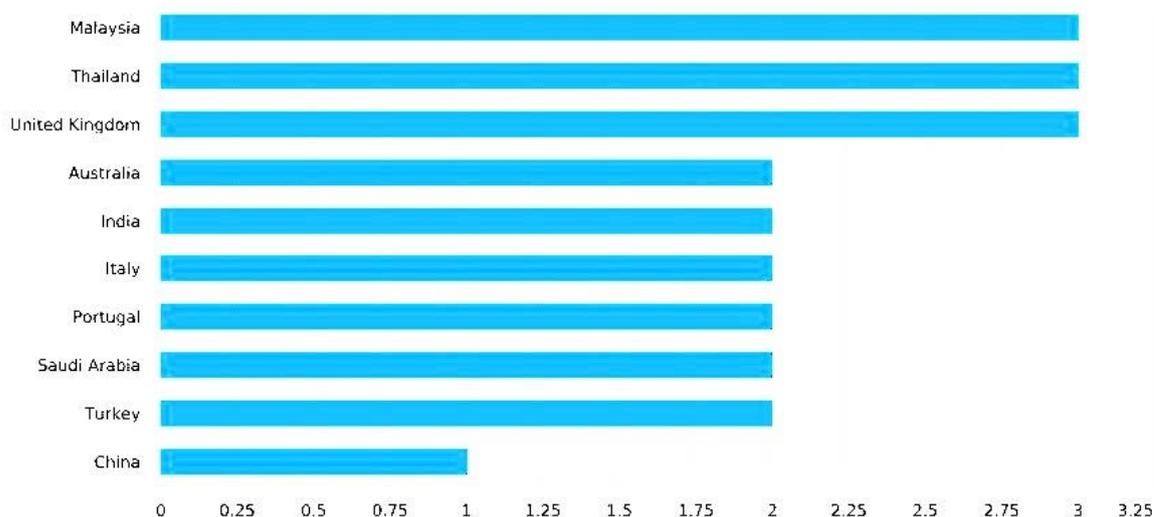
The analyses of the selected records from the SCOPUS database showed fascinating findings. It became evident that the subject under study has received considerable attention in the number of publications since 2021. As can be seen in Figure 2, the year 2021 saw only 4 Papers published; the number in 2023 skyrocketed to 12 in 2022, and as of the time of preparation of this document, 10 publications have been recorded this year (2023). This upward trend underscores the growing significance of the issues concerning tourism dynamics in the post-COVID era.

Figure 2 Distribution of publications by year



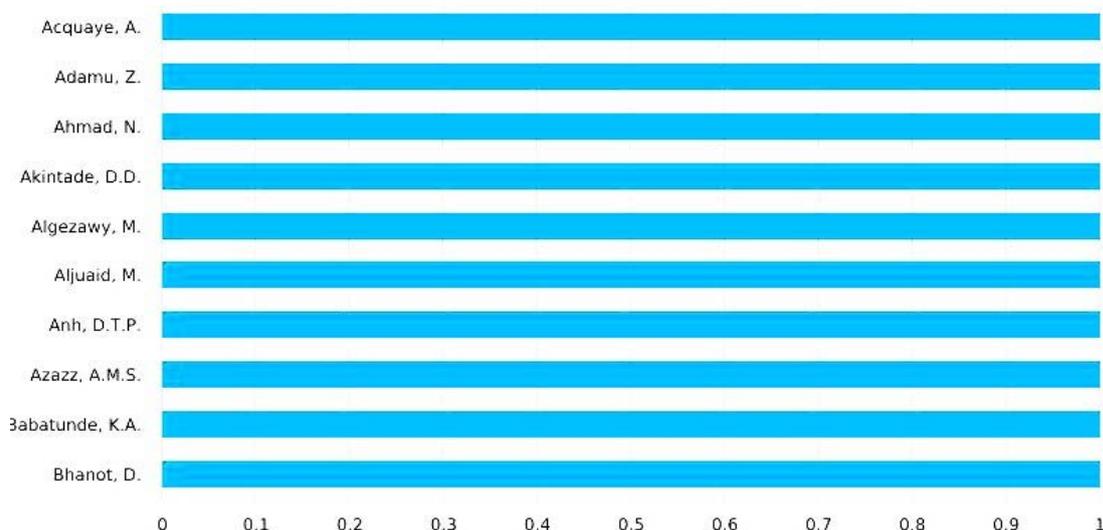
Furthermore, Figure 3 illustrates the distribution of scientific publications across various countries. Regarding tourism dynamics post-COVID era, these papers have primarily emerged from many developed nations across the globe. Malaysia, Thailand, and the United Kingdom lead in scientific publications with 3 articles each followed by Australia, India, Italy, Portugal, Saudi Arabia, and Turkey with 2 publications each, and China with the least 1 publication in the body of research in this area.

Figure 3 Distribution of publications by Countries



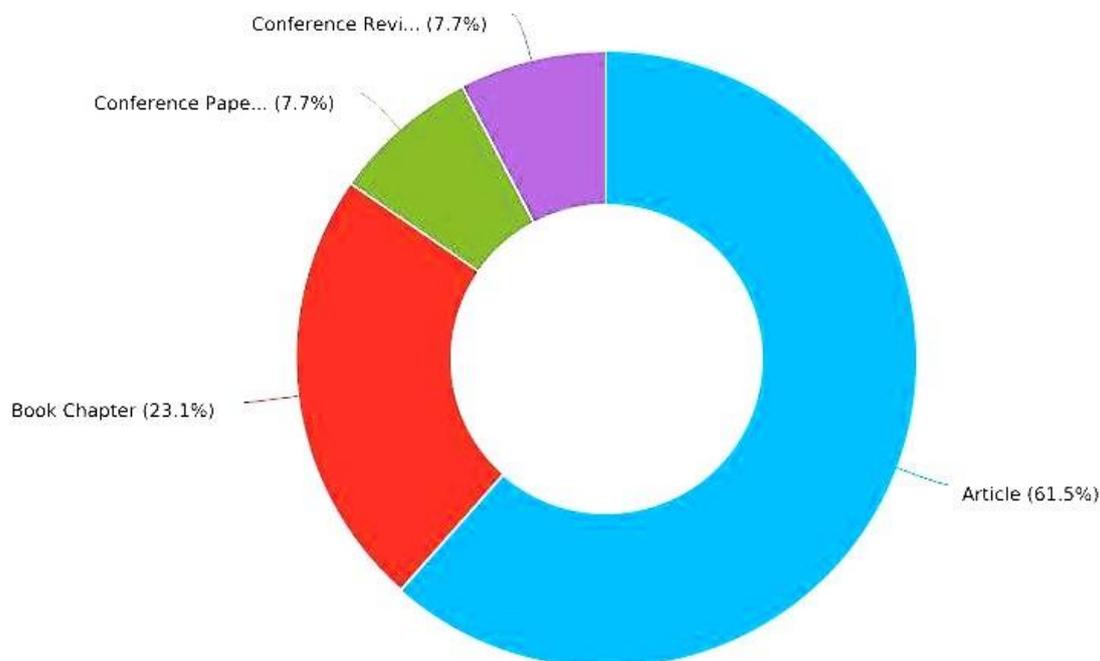
In the realm of the researched theme, scientific publications have been contributed by authors hailing from various parts of the globe. Figure 4 provides an overview of the publication frequency among different authors. Interestingly, all the listed authors have a publication each. All these contributions are published in SCOPUS-indexed journals, as depicted in Figure 4. Distribution of publications by Authors.

Figure 4 Distribution of publications by Authors



Moving forward, it's worth noting that the majority of content found in SCOPUS-indexed journals consists of articles. Among the journals listed in SCOPUS, 61.5 percent are articles, while conference papers make up 7.7 percent, conference reviews and regular reviews account for 7.7 percent, and book chapters 23.1 percent. This is illustrated in Figure 5 below.

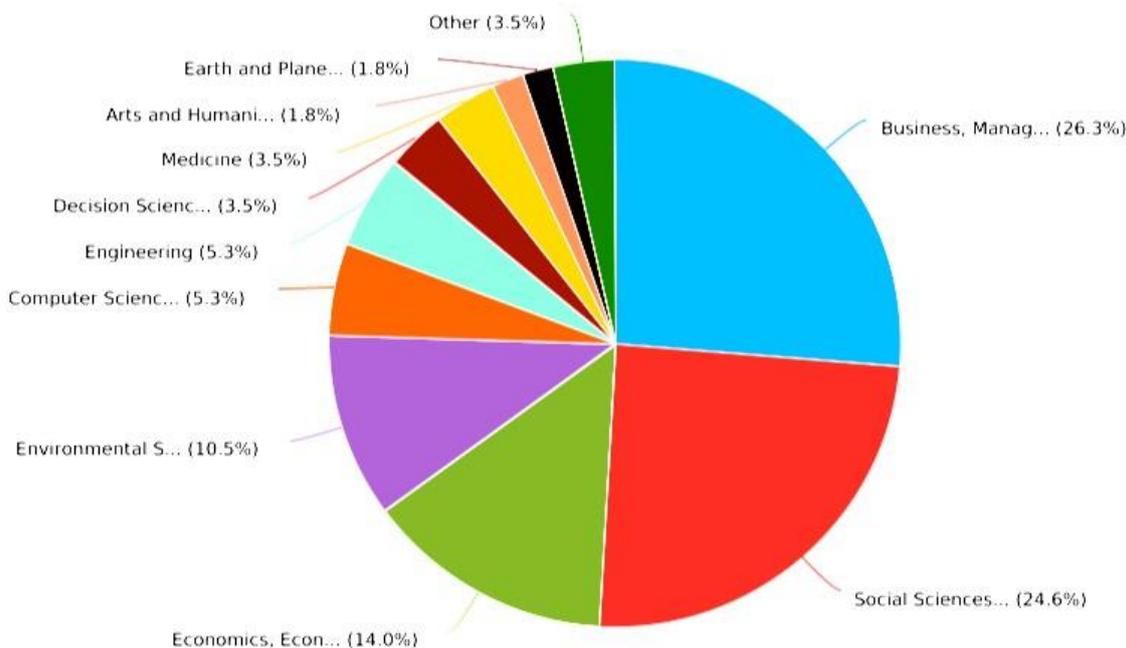
Figure 5 Distribution of publications by Type



Analyzing the distribution of scientific publications across various subject areas is necessary. Figure 6 provides a breakdown of these percentages for each subject area. As anticipated, the data reveals that 26.3 percent of scientific documents are concentrated in Business, Management, and Accounting. The Social Sciences follows, with approximately

24.6 percent, and Environmental Science accounts for about 10.5 percent. Computer science and engineering had 5.3 percent each, and all other subject categories had below 4 percent.

Figure 6 Distribution of publications by Subject Area



4 Discussion and Conclusion

The necessity for resilience and adaptability in the tourism sector is a frequent issue in the literature. Travel limitations, health concerns, and economic downturns were all exacerbated by the COVID-19 pandemic. Researchers and practitioners have stressed the necessity of preparing for external shocks like pandemics and natural disasters. Diversifying tourist offerings, improving health and safety standards, and increasing domestic tourism have all been mentioned as ways to adjust to the new normal.

Therefore, this research's primary objective was to conduct a comprehensive systematic literature review of scientific studies cataloged in the SCOPUS database. In pursuit of this goal, the study employed the systematic literature review (SLR) methodology, a rigorous scientific approach. The study aimed to investigate the wide-ranging implications of uncertain circumstances, particularly within the recent COVID-19 pandemic, which has profoundly impacted various facets of life. Some of the critical importance of uncertainty has changed the tourism phase, introducing new dynamics. Specific industries like travel and tourism are especially susceptible to such crises (Hall et al. 2020). Consequently, this study delved deeply into this issue, specifically within the context of the travel and tourism industry, to ascertain the current state of knowledge and lay the foundation for future research endeavors.

The literature highlights that uncertainty can have multifaceted impacts on various aspects of an economy, with a notable effect on the tourism industry, particularly on entities like hotels during periods of crisis and uncertainty. In response to tourism dynamics in the post-COVID-19 era, tourism operators employ various strategies to instill confidence in tourists. Additionally, research has indicated that during pandemics like COVID-19, individuals' perceptions of health and safety change significantly. Consequently, tourism operators become more preoccupied with compliance with the enhanced health and safety protocols, exploring different forms of tourism (Xiong & Tang 2023), putting untold financial stress on the sector, leading to the neglect of employees' welfare and continuous development.

Additionally, the digital revolution has accelerated in the post-COVID age. Contactless check-ins, online booking systems, and virtual tourism experiences have all become vital components of the traveler's journey. Many studies emphasize the importance of technology in creating a smooth and safe travel experience. Furthermore, digital marketing and social media have been critical in destination promotion and connection with travelers.

On the issue of sustainability, the pandemic has highlighted the significance of sustainable and responsible tourist practices. The lockdowns resulted in short-term improvements in environmental conditions, sparking debate about prioritizing sustainability in tourist recovery efforts. Researchers have investigated regenerative tourism, which aims to benefit both the environment and communities. In the post-COVID age, sustainable tourism strategies such as lowering carbon footprints and supporting local economies are gaining traction.

In conclusion, the systematic literature review on tourism dynamics in the post-COVID era emphasizes the industry's resilience and adaptation in the face of unprecedented obstacles. The pandemic has hastened digital transition, reaffirmed sustainability goals, and shifted travelers' preferences. Health and safety precautions are critical to restoring tourists' trust. As the tourism industry navigates the challenges of the post-COVID age, the examined literature emphasizes the importance of continued research, creative methods, and stakeholder collaboration. The tourism environment has changed, and the industry's future success depends on its capacity to accept change, promote sustainability, and fulfill the changing expectations of travelers.

5 Future Research Agenda

This systematic literature review sought to open up existing knowledge. Due to this discussion, the following ideas have been identified for future research:

First, Examine the long-term consequences of the COVID-19 pandemic on tourist behavior. Investigate how changes in travel preferences, safety concerns, and adopting technology-driven experiences affect destination selections and tourism trends. Second, Delve deeper into regenerative tourism and its implementation in the post-COVID era. Explore how destinations can go beyond sustainability to positively impact the environment, culture, and communities, and assess the economic feasibility of regenerative tourism practices. Third, research the unique issues that small and medium-sized companies (SMEs) encountered in the post-COVID era tourism sector. Investigate methods that allow SMEs to adapt, recover, and grow, such as digitization, access to financial support, and collaboration within local ecosystems. Fourth, investigate new ways to destination branding and marketing in the post-COVID era. Analyze the efficacy of digital marketing techniques, storytelling, and destination resilience in attracting tourists and fostering destination loyalty. Fifth, examine how well destinations and the tourism sector are prepared for disasters in the future. Examine the creation of crisis management strategies, the use of technology in crisis communication, and international collaboration in dealing with global crises that affect tourism.

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Consumers' perception of environmental claims in purchasing

Kamil Pícha¹, Renata Klufová²

Abstract: Many producers keep to showcase their commitment to sustainability and environmental responsibility. One of the ways is to place environmental claims or labels on product packaging. Based on a pilot survey, the article presents some findings about consumers' perceptions and attitudes concerning those claims or labellings, especially their care of environmental claims and labellings and their willingness to pay a premium price for environmentally friendly products.

Keywords: consumer behaviour, purchasing behaviour, perception, environmental claims

JEL Classification: M31, D12, F18

1 Introduction

In an era of increased environmental consciousness, many businesses want to demonstrate their commitment to sustainability and environmental responsibility. One common strategy is to include environmental claims on product packaging. These claims can range from "biodegradable" to "carbon-neutral". However, like with any marketing claim, understanding the theoretical underpinnings, benefits, potential hazards, and broader ramifications is critical. Consumers, especially in developed countries, more and more seek information to make purchase decisions that align with their values. Environmental claims provide cues that can influence these decisions. At the same time, in a period of higher price growth and uncertainty about future price developments, the tendency of consumers to save money and to weigh the price and quantity of goods purchased more heavily is growing. Examining current attitudes and their evolution is therefore increasingly important.

2 Literature Review

There is always a certain group of consumers that are environmentally aware (Pícha and Navrátil, 2019) and environmentally conscious (Dembkowski, & Hanmer-Lloyd, 1994; Mina Okada & Mais, 2010; Zhang, Zhao, Zhao, & Tang, L. (2020). However the environmental consciousness does not automatically implicate purchasing environment-friendly products (Johnstone, & Tan, 2015).

Green marketing is considered to be an essential tool for sustainable business strategy (Papadas, Avlonitis, & Carrigan, 2017; Dangelico, & Vocalelli, 2017). It involves promoting products based on their environmental benefits. It hinges on the idea that environmentally conscious consumers are willing to pay a premium for green products, giving companies a competitive advantage. The green marketing is also partially based on the assumption of the signaling theory. Even if the signaling theory by Michal Spence (Spence, 1973; Spence, 1978) can seem quite old and not very pertinent, it has been widely applied to organizational concerns, in last decades (Connelly et al., 2011). Companies signals, environmental claims as signals to convey information about their products to consumers. In markets where product quality is hard to ascertain before purchase, signals become essential. Environmental claims act as a quality signal, indicating the company's commitment to sustainability. Signaling theory offers an explanatory mechanism for the way in which certification seals or eco-labels can work to affirm the credibility of an advertiser's environmental claims (Atkinson, & Rosenthal, 2014).

An important attention is paid by many countries and institutions to the labelling of the environmentally friendly products. They created or supported and promoted many ecolabel programmes (Bratt et al, 2011). There are still doubts as to whether ecolabelling is contributing to changes in the production and consumption patterns and the products themselves (Iraldo, Griesshammer, & Kahlenborn, 2020).

Many consumers keep considering prices of environmentally friendly products to be expensive (Bhate & Lawler, 1997; Thøgersen, & Ölander, 2006; Kianpour & Asghari, 2012; Syarifuddin & Alamsyah, 2017; Kreczmańska-Gigol & Gigol, 2022).

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3 Research Methodology

The paper presents some results of a pilot survey among 250 respondents. We used convenience sampling with a quota requirement for equal representation of men and women. That quota has been fulfilled (51,2% of women and 48,8 % of men). The age structure of the sample was mainly influenced by the electronic form of data collection (see table 1). Only simple sorting (frequency tables) was used to analyse the results and the aim was to verify the wording of the questions and also to find some suggestions for more detailed research on the perception of environmental claims.

Table 1 Age structure of the research sample

Age	%
18-25	39,6%
26-35	16,8%
36-45	16,8%
46-60	18,4%
61 +	8,4%

4 Results

There is only a small group of consumers who regularly look out for any environmental claims or labels on the product packaging. However, almost one third of respondents declare frequent consideration of information on the environmental impact of the product.

Table 2 Noticing and monitoring of environmental labels on product packaging (n=250)

Frequency	%
always	6,0%
quite often	32,4%
less often	48,4%
never	13,2%

We intended to find out differences in consumer behaviour concerning their environmental sensitivity when purchasing in different store formats. Respondents had a possibility to select more than one store format. An interesting finding is the difference between food stores and non-food stores – only one tenth of respondents look for environmental claims or label in the non-food stores. Very interesting is also the very small percentage of consumers in case of the small food stores or convenience stores.

Table 3 Search for environmental claims and labels in stores (n=250)

Store type	%
Small food stores (convenience stores)	3,2%
Supermarkets and hypermarkets	47,2%
Discount stores (Lidl, Penny, Norma)	38,8%
Specialized food stores	56,8%
Non-food stores (eg. clothes and fashion)	9,6%

In the time the consumers have lived a considerable increase of prices and quite a high inflation compared to the previous period, we were worried about their willingness to accept a higher price for environmentally friendly products. Only a few of them are one hundred percent ready to pay a certain price premium. 37.6% of the surveyed consumers admit a high probability of accepting a higher price for such products.

Table 4 Willingness to pay a premium price for environmentally friendly products (n=250)

Extent of the willingness	%
Definitely yes	5,6%
Rather yes	37,6%
Absolutely not sure	29,2%
Rather no	20,8%
Absolutely no	6,8%

We have excluded those who definitely refused their readiness to pay a higher price. Two thirds of the respondents who were invited to answer this question are willing to pay a small price premium. For 37% of them the acceptable increase of the price is lower than 5%.

Table 5 Acceptable premium for environmentally friendly products (n=233)

Premium	%
< 5%	37,3%
5-10%	29,6%
10-20%	24,0%
20-40%	8,2%
>40%	0,9%

5 Discussion and conclusions

Of course, individual findings need to be verified on a larger and more representative sample of respondents. The little attention paid to the environmental aspect of the products purchased in small grocery stores can most likely be explained by the generally complementary nature of the shopping experience, in which consumers prefer speed of purchase and shop on the way home or close to home as those shops are mostly located in the city centres or neighbourhoods (Nilsson et al., 2015). In some cases, consumers are significantly more likely to buy less healthy food in small stores (Ruff, Akhund, & Adjoian, 2016).

The price can be a limiting factor for purchasing environmentally friendly products. For instance, the price of food is important for most (even 90%) of Czech consumers and a higher price is a negative determinant for buying environmentally friendly food products, including the higher income households (Rojík et al, 2021). Our pilote survey revealed that two third of consumers considering pro-environmental claims or labels are ready to pay only a low price premium for such products. Sun and Yoon (2022) concluded that the perceived quality of the ecofriendly products is an important factor in a consumer's decision to pay premium prices, which was not considered in this survey.

Implications

Very few people look for environmental claims or labelling in non-food outlets. Further research should focus not only on verifying this finding, but also on the situation for different types/groups of non-food goods. This finding can be put in context with the level of use of environmental claims and environmental labelling on non-food products. However, it would also be useful to focus on the marketing communication of retailers or manufacturers and to determine the intensity of communication of environmental aspects of the goods sold in the case of food and non-food products. The price-sensitivity of consumers is still very high, it should be reinforced by the general increase of prices during last two years which is followed by an increased price-sensitivity, especially in the countries with a considerable inflation rate. Both researchers and suppliers of environmentally friendly products should focus the impact of the perceived quality on the consumers' willingness to pay a price premium of green products.

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Digital communication of companies during the selection process

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Abstract: Digitization affects various areas and finds practical application all over the world. Companies are not idle and use digitization just like individuals. Those individuals who are looking for employment in the labour market. Companies have assimilated and use digitization when looking for new employees. This scientific article describes what forms of digital means they use.

Keywords: human resource marketing, personnel management, human resources, digital marketing

JEL Classification: M12, M31, M51

1 Introduction

The process of selecting an employee is increasingly complex and competitive in the current era of digitization. Therefore, it is necessary for companies to assimilate and use digitization also during selection process. Companies can use a wide variety of social networks and other online channels, and recently also publicly accessible artificial intelligence. Bejtkovský (2020) focused on the use of social networks in relation to the size of the company. Surprisingly, his conclusions did not find a statistically significant connection between the size of companies and the amount of use of social networks in the selection of employees. But he also came to the idea that the company with more employees, the more it uses video recordings to share information about a potential employer.

Businesses use digital channels in the short and long term. In the short term, to spread information about a specific filled position and in the long term, to share and promote your company culture, love brand, for which job seekers will be motivated to work. Viot & Benraiss-Noailles (2019) conclude that the ideal combination of brand influence on potential employees is the benevolence of the employer and well-being at work. Pulyaeva & et al. (2018) summarizes the practical use of digital communication channels in practice. They mention accounting, records of working hours, analyzes optimizing managerial decisions. It defines the software used in companies and the benefits of using them. Floricic (2018) is focused on using digital communication channels in tourism and personalised email marketing. The use of digital communication channels increases the effectiveness of the recruitment process. This claim has already been confirmed by Bondarenko, Voronov & et al. (2020), who surveyed employees (managers or recruiters) of 250 companies, and where 67 % evaluated "result of HR marketing function is positive dynamics". The theme of HR (human resources) marketing has long been of interest to many authors (e.g. Wimmers, 2009; Collins, & Payne, 1991; Glassman, & McAfee, 1992; Peterson, 1993; Ambler, h & Barrow, 1996; Žarnik-Žuławaska, 2012; Gladka, & Fedorova, 2019). They define HR marketing as the application of marketing principles in the field of HR management. Ambler and Barrow (1996) confirm the applicability of the marketing concept to the employment situation in their article. Martin (2006, 2009) points out: while the issue of brand and reputation of companies has long been intensively addressed in marketing activities in target markets, in the field of HR marketing, the companies has not received significant attention of those information and their HR managers or academic authors of scientific articles. When creating the brand of the employer and try to attract quality candidates, companies must carefully consider the communication channels used and increasingly consider the importance of digital communication channels (Kaiser, 2012). Digitization or Industry 4.0 bring new challenges across the entire system of corporate governance and in the field of HR management and marketing (Karas & Novotná Březnovská, 2020). The main goal of this article is to determine the relationship between the size of the company and the use of digital communication tools in the process of selecting a new employee.

2 Methods

There were 30 companies selected for the research. For comparability, all companies are based and operate in the Czech Republic (CR). The companies were divided by size into 10 small companies with up to 50 employees, 10 medium-sized companies with 50-499 employees and 10 large companies with over 500 employees. For these companies, the area in which they do business was monitored. The categorization according to the size and subject of business of the companies was based on the publicly available database of the Administrative Register of Economic Entities (ARES) according to the current authorities of the Ministry of Finance of the CR (2023). The parameter determining the group of

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the subject of business will be based on the Classification of Economic Activities CZ-NACE (2018), or from data on the subject of business listed in the Commercial Register (Justice.cz, 2023).

Activity on selected digital channels was monitored for individual companies. Social networks were selected: LinkedIn, Facebook and Instagram. Websites with a career section and job portals were also examined. On the LinkedIn social network, it was monitored whether the company even had a profile; how many followers the company's profile has; activity was measured by the number of posts for the previous year and the number of active job advertisements. On Facebook, the existence of the profile, the number of followers and whether the company uses its profile to recruit new employees were investigated. On the social network Instagram, the same parameters were examined, and in addition, data on the number of posts was collected. The actual number of shared advertisements with a job offer was determined on the career pages on the company's website. The two largest job portals were selected - Jobs.cz and Prace.cz. The number of advertisements with job offers was monitored here. Furthermore, it was investigated whether companies use at least one other job portal.

All the data used for the research was therefore freely available on the Internet. Research questions were established prior to data processing:

RQ₁ – Do companies with more employees look for more new employees than small companies?

If the answer to the question is yes, it is necessary to create a comparable parameter that takes into account the size of the company. This indicator will be the ratio between the number of employees and the number of advertisements of individual companies. The indicator was named *RQI index*.

RQ₂ – Do companies looking for a higher percentage of employees (with a higher *RQI index*) used social networks, career sites and job portals more intensively on a comparable scale?

The activity intensity indicator on digital channels will be represented by the number of followers and posts on social networks and the number of job advertisements on other digital channels. It can be assumed that the higher the *RQI index*, the higher the activity on digital communication channels should be.

RQ₃ – Is there any connection between the subject of business and the choice of digital channel?

The indicator is created by dividing companies according to the subject of business and the existence of individual social networks.

RQ₄ – Is there any connection between the location of the company headquarters and the intensity of the use of social networks in HR marketing?

The indicator will be created by dividing companies by location and comparing the number of followers and posts.

RQ₅ – Is LinkedIn social network the most common digital communication channel for companies?

This parameter will present the number of followers of the company profile on individual social networks.

RQ₆ – Are career sites used only by large companies?

This parameter will compare the number of employees of individual companies and the existence of career pages.

RQ₇ – Are paid job portals used less often than career sites?

This parameter will be represented by comparing the number of advertisements on career sites and job portals.

RQ₈ – Is the largest job portal Jobs.cz used more than the job portal prace.cz?

This parameter will be represented by comparing the number of company advertisements from Jobs.cz and Prace.cz.

3 Research results

In general, it can be declared that 100 % of the selected companies own websites. Apart from one, they also have a Facebook profile, but only a third of them use it for HR marketing purposes. Facebook is the most used social network. Overall, 70% of the selected companies use Facebook the most. It is especially popular with large companies, where it ranked first in 90% of cases. In medium and small companies, it is used the most at 60%. In second place is Instagram. Most small businesses do not have a LinkedIn profile. For only one large company, LinkedIn is the main digital

communication channel. Medium-sized companies usually use LinkedIn, but it is the least followed social network. The results are clearly presented in Table 1.

Table 1 – Use of digital communication channels

Digital communication channel	% existence	% usage for HR marketing	The most used social network
LinkedIn	67 %	100 %	3 %
Facebook	97 %	33 %	70 %
Instagram	90 %	23 %	27 %
Website	100 %	70 %	
Carries page	70 %	100 %	
Jobs.cz	50 %	100 %	
Práce.cz	53 %	100 %	
Other job portal	93 %	100 %	

Source: Own processing

3.1 RQ₁ – Do companies with more employees look for more new employees than small companies?

The answer is yes in 100 % cases. That is why the *RQI index* was created, which is the ratio of the number of positions currently being recruited to the number of company employees. This indicator will further be used for the comparability of individual companies when calculating RQ₂.

The indicator also has a telling value about the company. Higher numbers can infer higher turnover of employees or economic growth of the company. As a result, small companies are looking for a significantly higher percentage of new employees than large companies. It can also be stated that 3 out of 4 companies with the worst results are from the field of gastronomy.

3.2 RQ₂ – Do companies looking for a higher percentage of employees (with a higher *RQI index*) used social networks, career sites and job portals more intensively on a comparable scale?

By a simple ratio of the *RQI index* to the number of followers, posts or job advertisements, indices indicating the intensity of use of digital channels of the selected companies were created. All these indices show the disadvantages of small companies. In general, it can be summarized that small companies do not use digital communication channels compared to what the absence of a missing employee is a thorn in their side.

To get an idea of this, the average of the individual indicators also speaks for itself. In Table No. 2, for clarity, the average of individual indicators of companies is divided by size.

Table 2 - Average activity on digital communication channels in different size of companies

	Types of digital communication channels							
	NFLI	NPLI	NALI	NFFB	NFIG	NPIG	NAJ	NAP
Large enterprise	32904	122	18	823790	59505	1240	46	35
Mid-market enterprise	3629	12	0	95998	3338	4011	2	2
Small businesses	228	0	0	1596	428	90	0	1

Source: Own processing

NFLI = number of followers on LinkedIn

NPLI = number of posts in previous year on LinkedIn

NALI = number of job offer advertisements on LinkedIn

NFFB = number of followers on Facebook

NFIG = number of followers on Instagram

NPIG = number of posts on Instagram

3.3 RQ₃ – Is there any connection between the subject of business and the choice of digital channel?

A relationship can be observed between the number of social networks used and the subject of business. All online stores and portals have established and actively use all selected social networks. However, the data may be correlated with the location, all of these companies are from Prague. The opposite trend can be observed in the construction industry. All 3 construction companies from the selection show a lower use of social networks. Not one of the hospitality companies has established LinkedIn and they are all active on Facebook and Instagram in HR marketing.

The interpretation of the results may indicate that small companies use more offline channels, possible ignorance or mistrust in the online environment. In the short term, they may not even need digital communication channels because they can recruit from their personal networking network until it is exhausted.

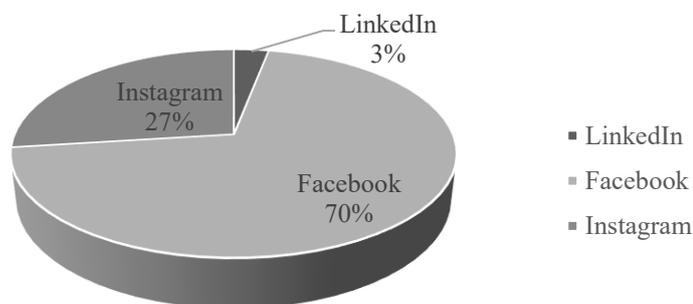
3.4 RQ₄ – Is there any connection between the location of the company headquarters and the intensity of the use of social networks in HR marketing?

The answer on RQ₄ is yes. All Prague companies have established profiles on all selected social networks and, apart from 2 exceptions on LinkedIn, they are significantly more active in adding posts to social networks.

3.6 RQ₅ – Is LinkedIn social network the most common digital communication channel for companies?

The answer on RQ₅ is no. Despite the fact that LinkedIn is a work social network specialized in meeting employees with employers, the most used social network is Facebook.

Figure 1 – The most used social media in HR marketing



Source: Own processing

3.7 RQ₆ – Are career sites used only by large companies?

The answer on RQ₆ is no. A rather surprising 70 % of companies have career pages on their website that they use for recruitment. These are not only large companies, but practically all medium-sized companies as well.

3.8 RQ₇ – Are paid job portals used less often than career sites?

This statement is not entirely confirmed. Companies use the job portal prace.cz 13 % more than their career pages, and the job portal jobs.cz is used more often by 7 % of companies.

3.9 RQ₈ – Is the largest job portal Jobs.cz used more than the job portal prace.cz?

The answer on RQ₈ is no. This statement applies to only 23 % of companies. The rest of the companies use the job portal prace.cz more than the job portal jobs.cz.

4 Conclusions

In conclusion, it can be stated that the size of the company plays a significant role in the intensity of use of digital communication tools. Large companies use digital online channels more intensively. And this despite the fact that for small companies, the absence of one person in the company can be a ruinous circumstance.

It can be assumed that it is easier for smaller companies to use offline channels. In the case of small companies, it will probably be friends of friends. This personal network of friends is quite narrow. In the digital world, the job market can be much broader than networking. Therefore, small companies should not underestimate online communication channels and should not forget to build their digital world not only to expand their own products, but also when looking for potential employees.

The prices for sharing on selected job portals are high, increasing the total cost of recruiting a new employee. In general, it is recommended not to use the services of job portals unless it is necessary. That is why the intensity of use of job portals is quite surprising. The good news, however, is the high proportion of the existence of career pages of companies whose management is de facto free of charge.

Acknowledgement

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Consumer e-commerce acceptance: A replication study

Sarath Thulaseedharan Mallika¹

Abstract: The E-commerce business is continuously growing and attracts the attention of practitioners as well as researchers. Its acceptance among consumers has been the subject of academic research for more than a decade now. In particular, the Technology Acceptance Model and latent factor analysis originally used for information system adoption show signs of high popularity in the e-commerce domain. Replication studies, on the other hand, have not received much attention. Despite the fact that replication guarantees progress in every scientific discipline, customer behaviour is no exception. In order to alleviate this undesirable condition and verify previous research in the field, we have selected a popular journal article from Ha and Stoel (2009) and re-researched their main model. To do that, an internet survey was conducted among 125 online consumers. Website design, customer service, privacy/security, and shopping atmosphere/ shopping experience were the factors evaluated in this study with e-shopping quality as a second-order factor. Exploratory factor analysis revealed that latent factors do not load as previous research suggests thus we failed to replicate the model. Further, confirmatory factor analysis showed better results with decent reliability of the model. However, validity measures showed troubling values. Based on the findings, implications for future research are proposed in the conclusion.

Keywords: E-commerce acceptance, Technology Acceptance Model, Trust, Privacy, Replication, Shopping quality, Website

JEL Classification: M21

1 Introduction

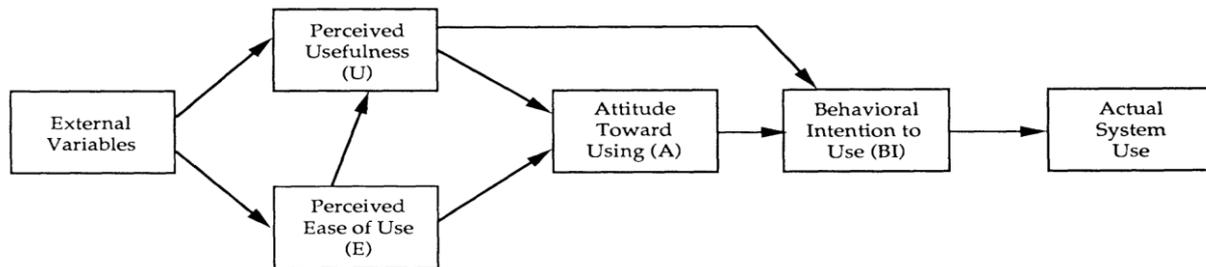
Electronic commerce or e-commerce has continuously grown for decades. Due to the accessibility of internet connection, safer payments and more businesses going online, more and more customers are doing their shopping in this virtual environment. This is followed by the growth in sales of online vendors. Yet, the pace of online shopping acceptance is somehow uneven. To explore the reasons behind these differences, researchers are trying to describe factors influencing online shopping adoption in many countries and markets. A handful of studies attempt to explain consumer acceptance of e-commerce from the perspective of the technology acceptance model (TAM). It explains the ease of use and usefulness of technology influencing consumers' attitudes towards acceptance of technology and hence the use of it.

The TAM model originally used to explain and increase user acceptance of consumer systems has gotten considerable attention from academics. It is probably the most influential model on acceptance. It proposes a belief-attitude-intention-behavior causal relationship for explaining and predicting users' system acceptance. According to TAM, perceived usefulness and perceived ease of use determine a person's attitude toward using technology and the attitude then forms an intention to use and final behaviour. It has been widely used to explain e-commerce or online shopping adoption (Gefen et.al.2003; Pavlou 2003)

TAM represents the behaviour as the outcome predicted by perceived ease of use, perceived usefulness, and behaviour intention. Davis (1989, 1993) describes technology acceptance based on TAM as a three-stage process, whereby external factors like system design trigger cognitive responses such as perceived ease of use or perceived usefulness, which, in turn, form an affective response like attitude towards using technology, influencing user behaviour. The higher the affective response, the higher the likelihood that the behaviour will occur. The effect of perceived usefulness can have a direct impact on the actual use of the technology, but, perceived ease of use does not affect user behaviour directly. The model thus suggests that, if technology is expected to be easy to use, it is more likely to be considered beneficial and it will stimulate acceptance of that technology (Davis et al. 1989; Davis 1993).

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Figure 1 Technology Acceptance Model



Source: Davis et al. (1989)

Individuals' decision to perform behaviour is the result of the analysis of the benefit that they expect to receive from the behaviour compared to the effort or costs they put in to perform the behaviour (payne & Payne 1985; Payne 1982).

Perceived usefulness is defined as an individual's perception of the extent to which the use of a particular technology improves performance. Perceived ease of use is the extent to which a person believes that a particular technology is easy to use (Davis 1989). Perceived ease of use also resembles the complexity factor, which is theorized as a barrier to innovation adoption in the innovation diffusion literature. It has been defined as the extent to which individuals find innovations difficult to understand and apply.

Previous studies have confirmed TAM as a robust framework for understanding user adoption of technology in various contexts, including banking technology (Adamson & Shine, 2003), m-commerce (Bruner & Kumar, 2005), telemedicine technology (Chau & Hu, 2001), etc. Despite the robustness of the TAM, some research has shown conflicting results regarding the impact of usability on attitudes. Researchers have suggested that persuasive factors such as usefulness, enjoyment, self-confidence, and achievement may influence a person's attitude toward using technology more than ease of use (Van der Heijden & Verhagen, 2004).

Although the widespread application of TAM confirmed the robustness of the theory, the authors of the model focused on increasing its predictive power. The rationale for extending the model is that there is a limited understanding of the conditions underlying user perceptions of technology use. Vijayasarathy (2004) argues that the variables in TAM are more suitable for decisions involving the selection of a few technology choices than for situations where users make voluntary decisions such as online shopping. Therefore, the original TAM variable may not sufficiently capture the key factors influencing consumers' attitudes toward the e-shop.

Since replication is a vital element of research (Graham et al. 2017), there were attempts to conduct such studies including the TAM model. Some of them have been successful (Melas et al. 2011) but some failed (Adams et al. 1992; Chau & Hu 2001; Barnett et al. 2006; Subramanian 1994). This means that for generalization we have to repeat the research again to confirm that the model is valid. Independent research teams should undertake subsequent verification and assess the interpretations and biases of the original researchers (Uncles & Kwok 2013). Moreover, to the best of our knowledge, there are no replications of the TAM model in e-commerce. Therefore, the objective of this paper is to verify the extended TAM model in the e-commerce context. We do it by replicating the final model of Ha & Stoel (2009) study which has attracted the attention of many scholars. It has been cited 621 times in Web of Science database as of 08 October 2023.

2 Methods

The general approach of this paper is replication research. Replications can be categorized based on the level of similarity with the original study. Uncles & Kwok (2013) describe differentiated close and exact replications. In exact replication, the study is done again within the same context of time, space and phenomena. Close replications allow alteration of one of these to some extent. For instance, collecting data in the same space on the same phenomena but in the first and later in the second quarter of the year. Lastly, differentiated replication allows for major changes in time, space and phenomena or combination. We have conducted the replication in different time and space (India 2022) compared to the original study (USA 2009). Therefore we can categorize our research as a type of differentiated replication.

Data were collected from people of all ages, gender, employment type, and level of education. The questionnaire consisted of 17 variables corresponding to factors of web design (WD), customer service (CS), privacy/security (PS), and atmospheric/experiential (AE). All variables except for demographic information were assessed using a 7-point Likert scale (1= strongly disagree, 7= strongly agree). Respondents were initially asked to name the e-commerce site they use quite often and asked to keep that retailer's name in mind while filling out the questionnaire. All the variables used in this

study were adopted from previous research (Ha & Stoel, 2009). On average, respondents spend about 7 minutes completing the survey.

A total of 125 responses were collected. The sample size is similar to some previous studies on TAM (Adams et al. 1992). 63 respondents were females which makes it 50.4% of the total respondents. 45.6% of the respondents fell under the age group of 26 to 30 years and 27.2% fell under the group of 20 to 25 years. Out of the 125 respondents, only 2 were over the age of 50. 92.8 % of the respondents were graduates and 65 respondents had a master's degree and above qualifications. Students accounted for only 10.4% of this survey and 10.4% of respondents were unemployed. 80 respondents were employed full time and 12 were self-employed.

Exploratory and Confirmatory factor analysis are used to examine the underlying factor structure of the data. But it plays quite different roles in terms of the purpose of given research: One is used for theory building and the other is used mainly for theory testing.

Exploratory factor analysis (EFA) is used to identify a set of latent or unobserved factors that reconstruct the complexity of the observed data in an essential form. By "essential form", it means that the factor solution extracted from EFA should retain all important information available from the original data. However, unnecessary and/ or redundant information and noises induced by sampling and measurement errors are removed (Henson & Roberts, 2006)

Confirmatory factor analysis (CFA) on the other hand is employed to test an existing theory. It is used when there is a strong model assumption and the relationships between the items are tested and the factors and related items are known (Bandalos & Finney, 2010).

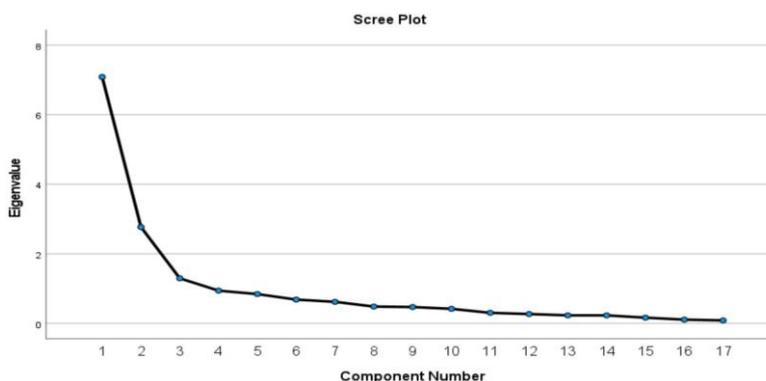
EFA was performed using principal component analysis and the oblique rotation method (oblimin) was utilized as the presence of correlations across underlying e-commerce factors was presumed (Matsunaga, 2010). The minimum factor loading (factor-variable correlation) criteria were set to 0.50. The communality of the scale, which indicates the amount of variance in each dimension, was also assessed to ensure acceptable levels of explanation. A minimum eigenvalue of 1.0 was used as the criterion for the factor number decision. Later, CFA was performed using a free version of Smart PLS software.

3 Research results

Lets begin with the results of EFA. The overall significance of the correlation matrix was assessed using Bartlett's Test of Sphericity, which provides a measure of the statistical probability that the correlation matrix has a significant correlation among some of its components. The result was significant, $P < 0.001$, which indicated its suitability for factor analysis. The Kaiser-Meyer-Olkin measure of sampling adequacy (MSA), which indicates the appropriateness of the data for factor analysis, was 0.855. Data with MSA above 0.8 are considered appropriate for factor analysis (Kaiser & Rice, 1974)

The factor solution derived from this analysis yielded three factors for the scale, which accounted for 65.58% of the variation in the data. Scree plot, another technique to determine the number of underlying factors also shows a similar result (Fig.2)

Figure.2 Scree Plot



Source: own research

Exploratory factor analysis revealed that three factors can be used for measuring consumer acceptance of e-commerce. It is one less than expected when compared to the original study.

Table 1. Pattern Matrix

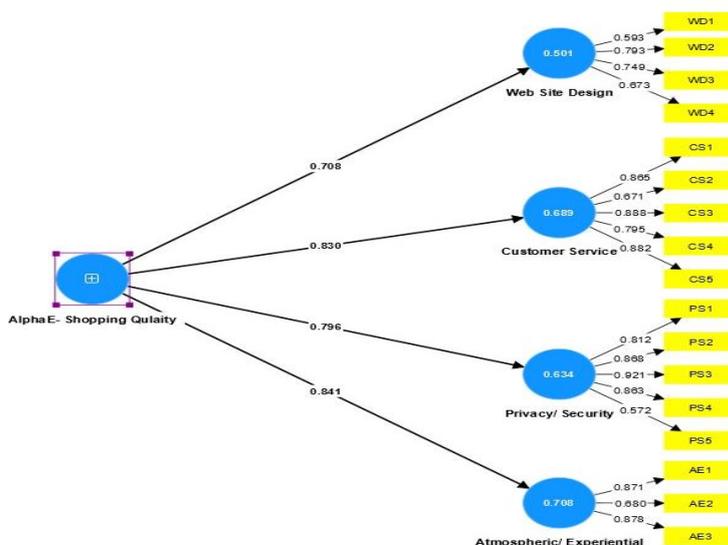
		Pattern Matrix		
	Variable	Factor 1	Factor 2	Factor 3
1	The site doesn't waste my time			0.735
2	I can go exactly what I want quickly			0.685
3	The organisation and layout facilitates searching for products			0.659
4	The site gives me enough information so that I can identify the item to the same degree as if I am in the store			0.588
5	The company is ready and willing to respond to customer needs	0.796		
6	The website has reasonable shipping and handling costs	0.516		
7	Customer service personnel are always willing to help you	0.847		
8	Inquiries are answered promptly	0.821		
9	When you have a proble, the website shows a sincere interest in solving it	0.849		
10	I feel like my privacy is protected at this site		0.882	
11	I feel safe in my transactions with this website		0.89	
12	I feel I can trust this website		0.867	
13	The website has adequate security features		0.934	
14	The company behind the site is reputable	0.711		
15	It is really fun to shop at this website			
16	The site almost says "come in and shop"	0.715		
17	Buying at this website is exciting for me		0.575	

Source: Own research

The above table shows us whether our items for a particular construct load well together or not. The first four items representing Web design load well together and variables 5 to 9 representing customer service also load together. Variables 10 to 13 load well together to their parent construct which is privacy/ security. However, we can see that variables 14 and 16 load to construct customer service and variable 17 loads to factor Privacy/ Security. Variable 15 doesn't show any loading at all. We expect those three variables to represent their own construct, experiential/atmospheric.

Further, the CFA has been calculated via Smart PLS software. Similarly to the original study (Ha & Stoel, 2009), there was a second-order construct used to convey a hypothesis that the first-order constructs are seemingly distinct but ultimately related by one common underlying higher-order construct. Figure 3 shows the final causal model with second-order construct alpha, the E-shopping quality. The model shows solid path coefficients between the first-order constructs and the alpha. Factor loadings are also significantly better compared to what we previously saw in exploratory factor analysis. However, Hair et al. (2019) recommend values higher than 0.708 for acceptable item reliability. Only two of the four items meet this criterion in the Website design construct (WD2 and WD3). In Customer service, Privacy/Security and Atmospheric/Experiential constructs at least one item does not meet the criteria (CS2, PS5 and AE2).

Fig.3 Causal model



Source: Own research

Additionally, when the overall model reliability and validity was inspected, we can see several threshold violations as well (table 2). First, Cronbach's alpha score for website design shows a lower-than-acceptable result. Cronbach's alpha

should be at least 0.7 (Nunnally & Bernstein, 1994). Second, based on Jöreskog (1971), the composite reliability score for confirmatory research is 0.7 thus the parameter in website design does not meet these criteria as well. In the original study, Cronbach's alpha and AVE for Web Design were 0.89 and 0.73 respectively, for Customer service 0.89 and 0.70, for Privacy/Security 0.95 and 0.78, and last but not least for Atmospheric/Experiential 0.75 and 0.60.

Table 2 Construct reliability and validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
AlphaE- Shopping Quality	0.902	0.910	0.917	0.399
Atmospheric/ Experiential	0.742	0.768	0.854	0.665
Customer Service	0.879	0.888	0.913	0.680
Privacy/ Security	0.867	0.868	0.907	0.667
Web Site Design	0.659	0.676	0.797	0.498

Source: Own research

Further, the reliability and convergent validity of the model have been measured by Average variance extracted (AVE). As table 2 shows, there are two constructs violating the threshold of AVE being at least 0.5 (Bagozzi & Yi, 1988). It is a Website design and second-order construct E-shopping quality. Common praxis is to run the model again without problematic items, however, this is not the case for a replication study. The purpose here is to verify not modify.

4 Conclusions

Growth in the number of internet users, smartphone and computer owners, online shops, and secure payment providers positively contributed to the growth of e-commerce. Interestingly, some countries as well as industries and product categories experience different e-commerce adoption rates. To explain the factors behind e-commerce adoption in different contexts, the technology acceptance model gained popularity among scholars. However, TAM replication studies showed mixed results, and more research is needed. Therefore this paper replicated the extended TAM version used in the popular study by Ha & Stoel (2009).

Both exploratory and confirmatory factor analyses gives unsatisfactory results. Only three factors were generated by EFA compared to the theoretical four. Moreover, the items expected to represent Experiential/Atmospheric failed to load together. These items loaded onto a factor other than its underlying factor and one item did not load at all. Further, confirmatory factor analysis showed inconsistencies in comparison to the original study. Also, violations of the criteria for item loadings as well as construct validity and reliability were observed.

To conclude, this study failed to provide evidence of the model's reliability outside context other than the initial study. Interestingly, this study is one of the few with the goal of replicating previous research in the TAM literature within the e-commerce adoption topic. Since we have not verified the model, I would like to urge my colleagues to pursue more replications since these and only these can provide solid evidence of consumer behaviour.

This study surveys consumers from India only thus the generalization of findings to consumers outside India is problematic. Another major limitation of this study is the inadequacy of the sample size. Only 125 responses were collected which also impedes the generalization of the results. In the original study, the sample size was 298.

Acknowledgement

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Customer engagement at a business entity in the field of sport

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Abstract: Customer engagement captures interactions among customers and companies (brands). It is one of the hot topics, also thanks to the development of various social networks, enabling an easy and fast realization of customer-brand interactions. This paper is designed as a case study describing the phenomenon of customer engagement at a chosen business entity in the field of sport. A particular hockey club from the Czech Republic was selected as an example. The aim was to identify ways and methods of engaging sports customers at the chosen business entity. A mixed research approach was used to obtain data: it was a mix of an online survey, content analysis of relevant materials, and semi-structured interviews with two managers from the chosen hockey club. Results indicate that there is a range of engaging activities, both online and offline. Overall, respondents think they are sufficiently engaged in the company's activities (92%), in which social networks play an important role in engaging customers at the analyzed company.

Keywords: customer engagement, social networks, hockey club, Czech Republic

JEL Classification: M31, M37

1 Introduction

Customer engagement is a current topic these days. Its topicality is fueled by the development of various social networks, which companies widely use for customer engagement.

1.1 The term 'Customer engagement'

One of the foundational studies on customer engagement is considered a paper by Hollebeek et al. (2014), who describe customer engagement as the cognitive, emotional, and behavioral activity of a customer during his/her interactions with a brand. Different dimensions of the concept of customer engagement are distinguished as follows (Hollebeek et al., 2014):

- Cognitive dimension: it refers to how a customer processes brand-related thoughts in a specific interaction with a brand;
- Emotional dimension: it indicates a positive link between a customer and a brand in a specific interaction;
- Behavioral dimension: it indicates how much energy, effort, and time a customer devotes to the brand in a specific interaction.

In general, companies realize the value of inviting, guiding, and activating (i.e., engaging) customers to participate in marketing activities such as product and brand development. In this context, Kotler et al. (2021) use the term 'customer-engagement marketing', which implies creating opportunities for getting brand experience, building communities, etc.

The goal of customer-engagement marketing is to ensure that a particular brand becomes a significant and meaningful part of customers' lives and their conversations. Thus, it is more than simply selling to a customer. In order to stimulate customer activity and communication, companies are active on social media, manage their blogs, and create mobile apps or microsites. The purpose of doing so is to achieve a higher level of interactivity and a greater emphasis on customer personality. Customer-engagement marketing is based on the characteristics of today's consumers, who are better informed, more connected through social networks, and have much more power than ever before. (Kotler et al., 2021)

Engaged customers are likely to recommend products to others through word of mouth, blogs, social media, and website comments. In many ways, customer engagement extends the traditional role they play because they help companies to understand their real needs, they participate in the product development process, provide feedback on

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strategies and products, and even become product advocates. Interactions among companies and engaged customers enables co-creation of value. (Sashi, 2012)

The emergence of technologies and tools that enable greater interactivity among customers and businesses is essential (Brie et al., 2013) – specifically, social media play a very important role there (see the following section 1.2).

1.2 Customer engagement and social media

Development of the Internet has brought the emergence of blogs or microblogging sites, video platforms such as YouTube, and social networks such as Facebook, Instagram, MySpace, or LinkedIn. Social media has mainly caught the attention of managers who use it to understand their customers better. (Sashi, 2012)

Customers use a range of social media tools to interact with brands. Customer brand-related activities on social media can be divided into three levels, representing certain levels of customer engagement (Schivinski et al., 2016):

- Consuming type (a customer is an observer),
- Contributing type (a customer is a contributor),
- Creating type (a customer is a content creator).

For example, if customers watch a video, movie, trailer or view images, they are observers who consume certain content. They move from the observer to the contributor level if they interact on social media by commenting on a post or tagging "like" on specific content. And lastly, if customers decide to upload their product or share a review/recommendation of a service on social media, they create content. (Schivinski et al., 2016)

The increased use of social media to boost customer engagement is supported by Wang et al. (2023), who claim that social media are able to support customer engagement and also increase the perceived value for customers.

1.3 Customer engagement in the field of hockey sport

Sport has become a fast-growing business in recent years, which is also valid for hockey clubs. Thanks to the possibility of watching hockey both in the stadium and from the comfort of home via the so-called PPV (Pay Per View), sport business entities may be profitable. Many clubs also offer other ice-related services in addition to hockey matches. These include skating lessons, figure skating, public skating, which can also provide significant profits. Most professional clubs also gain profits from running a fan shop where they offer their customers products with the logo of the hockey club – such products are called merch (Ollikainen, 2023).

According to Huettermann et al. (2022), customer engagement in the field of sport is described as a sport consumers' behavior with an extra-role in non-transactional exchanges in favor of their favorite sport business entity. In this context, there are three main dimensions of customer engagement (Huettermann et al., 2022):

- Managerial and marketing cooperation (it helps the management of a sport business entity),
- Social behavior (relationships among customers of a particular sport business entity, helping other customers, opinions...),
- Performance tolerance (supporting the sport business entity regardless of how it performs).

2 Aim and methods

This paper is focused on a selected business entity in the field of sport – specifically, the Hockey club Tábor (= HC Tábor) was chosen. It is a limited liability company (Czech abbreviation: s. r. o.).

The aim is to identify ways and methods of engaging sports customers at the chosen business entity (in the following text, the shorter term 'company' is used). The stated aim is specified through the research questions (RQ) below:

- RQ1: What methods of customer engagement are currently used at the analyzed company?
- RQ2: In the context of customer engagement, what are company's customers (fans) missing and what do they want?
- RQ3: Do social networks have their importance in engaging customers at the analyzed company?

A mixed research approach was used to obtain answers to the research questions. Firstly, quantitative research approach was applied in the form of an online questionnaire survey. The data collection was conducted in May 2023 (n = 214; sample structure: 37% female, 63% male). Secondly, qualitative research approach was based on the content

analysis method of relevant and available online materials (company's websites hctabor.com, n.d., and the Facebook profile HC Tábor, n.d.) in order to find out what customer engagement methods are currently used in the chosen company. Furthermore, semi-structured interviews with two managers were conducted in June 2023 (the marketing department manager and the finance and sports manager).

3 Research results and discussion

Because of the limited range of this paper, only partial research results are presented here. Research questions RQ1-RQ3 are answered on the basis of collected and analyzed data.

RQ1: What methods of customer engagement are currently used at the analyzed company?

The analyzed company (HC Tábor) strives for a connection with its customers, both those who use its services and the fans who support its A-team at hockey matches. The company realizes that long-term customer loyalty can be achieved thanks customer satisfaction, which then enables to achieve the company's goals, such as profit from ticket sales, merchandise sale (e.g., scarves, shirts, souvenirs, hockey accessories, etc.), refreshments at matches, and other services offered by the company, which include figure skating, public skating, skating lessons, and a preschool for kids or beginners. These days, the company uses below described ways to engage its sports customers.

Engagement through social networks – discussions, contests, polls (online)

Interaction with customers (fans) takes place mostly on social networks (Facebook and Instagram). The company's marketing team manages social networks profiles and posts various information and articles.

Customers and fans have the opportunity to express their opinions and feedback and engage in discussions with others on company's social media profiles. The discussions are open to all who wish to express their opinion and contribute to any discussion. When the company publishes a more interesting post that contains an important message (e.g. from behind the scenes of teams, coaches, new information or results from matches), this can spark a lively conversation among users. Specifically, the post that communicates the result from the match reached the highest number of comments (161 comments in the period from March to July 2023), whereas the average number of comments for similar posts is about 40 for a single published post. On the other hand, posts containing more general pieces of information (such as information about when individual matches are played, team line-ups) do not have the same response.

There are also contests there, e.g. a guessing game, where engaged customers guess results of upcoming matches. The contests are designed to motivate customers to participate and make use of a chance to win various prizes (the most frequent prizes are, e.g., free tickets to hockey matches or various vouchers). On average, over 100 people or more participate in these contests. The interest in the actual contests also depends on the prizes.

Charity fundraiser events

Every year the company organizes special hockey matches dedicated to charitable purposes for selected organizations or individuals in need. These charity events are usually held before Christmas. Before each special charity match, the company informs customers on social network profiles or company's website about it. The money is raised partly from profits, ticket sales, financial support from the company, sales from special products from the fan shop and from public collection where anyone can donate. There was also a special auction of A-team jerseys.

The charity fundraiser events organized by the company are very popular and always involve a large number of volunteers. For instance, the company has so far supported children with disabilities, given Christmas presents to children in a local hospital etc.

This kind of activities can be understood as public relations (PR) that the analyzed company uses with the effort to create long-term positive relationships with the public.

Training camps and sports days for children

The company organizes training camps dedicated to children, which are supported by well-known sports personalities. An added value is always the accompanying program, lectures on attractive topics or training lessons with an interesting person from the hockey world. For instance, a well-known personality of Czech hockey took part in a youth training camp where he spent several hours with the children and acted there as a 'temporary coach' for them.

The company also organizes sports days dedicated to children. An interesting day-long program accompanied by various contests is always prepared for them. The aim of these events is to motivate children more towards sports and try to provide them an entertaining program.

Ice arena contests (offline form)

During hockey matches (i.e. during breaks), contests are prepared for visitors. For example, on the ice rink, where customers can shoot on goal and win interesting prizes.

Marketing communications

Besides the above described items, the marketing department manager stated that the company uses marketing communication tools to increase customer engagement. According to this manager, 'classic' marketing tools include especially paid advertisements, helping to get the company more into the awareness and customer minds. Indeed, Kotler et al. (2021) also state that advertising is an excellent tool for brand building because it can create a rational and emotional connection with customers.

Season tickets – definite advantages for their holders and higher attachment to the company

The company offers a yearly season ticket for hockey matches, which has certain advantages for its holder. First of all, it is more advantageous than a single ticket (it is cheaper). In addition to that, the season ticket holder can reserve priority seating.

The hockey club merchandise – offered products

Merchandise (= merch) is a product labelled with a printed logo or specific motive that sports clubs offer to their fans (Ollikainen, 2023).

The questionnaire survey showed that 69% of respondents own club merchandise, typically scarves, jerseys, mugs and stationery. The most club merchandise is used when cheering at hockey matches. Many respondents also use club merch in their everyday life or have it as decoration in their homes.

RQ2: In the context of customer engagement, what are company's customers (fans) missing and what do they want?

Perceived level of engagement

On the whole, respondents think they are sufficiently engaged in the company's activities (92%). On the other hand, there were 8% who do not feel this connection.

These not-engaged respondents were the most likely to say that they missed being informed about what goes on 'behind the scenes' of the A-team, and would also appreciate various videos, event trailers and hockey games. The same issue was found by Konvičný (2015) who stated that customers/fans of the Zlín hockey club from the Czech Republic do not receive enough information about what is going on inside the business.

Better content on YouTube social network profile and company's official website

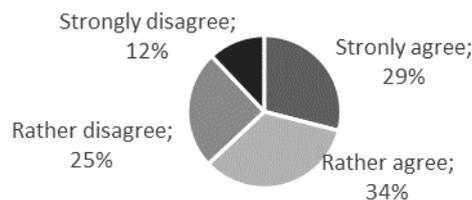
Specifically, respondents would like to watch better content on YouTube social network – they suggest trailers of upcoming events and interviews regarding matches.

Furthermore, respondents recommend modernizing the company's official website and publish more information there – for that matter, Karlicek & Kral (2011) claim that website updating needs to be done on regular basis to be run as efficiently as possible.

Interest in contributing to the final design of the hockey club merchandise

Questionnaire survey contained a question focusing on respondents' interest in contributing to the final design of the club merchandise (= merch). Figure 1 shows that 34% of respondents rather agree and would like to be engaged in the final design of the club merch. Also, a further 29% of respondents would definitely like to be engaged and 25% of respondents are inclined to rather disagree. The remaining 12% of respondents would not like to be part of it.

Figure 1 Level of agreement with possible engagement in the final design of the club merchandise



Source: Own processing

Furthermore, it was statistically tested whether it is indeed the majority of respondents who would like to be engaged in the final design of the club merch. The statistical test confirmed this assumption that there is more than 50% of those (statistical test was performed at the 5% significance level; $\chi^2 = 14.65$; $p\text{-value} < 0.001$).

RQ3: Do social networks have their importance in engaging customers at the analyzed company?

Nowadays, social networks play an important role in customer engagement (e.g., Matosas-Lopez & Romero-Ania, 2021). Based on the conducted questionnaire survey, it was found out that 56.1% of respondents communicate with the analyzed company through company's social network profiles. In general, Simon & Tossan (2018) note that social networks such as Twitter, Facebook, and Instagram offer new opportunities for companies to connect with their customers (especially Facebook or Instagram are considered great for building deeper relationships with them).

The company's social network profiles (Facebook, Instagram, YouTube)

The company uses social networks such as Facebook, Instagram and YouTube to communicate with its customers. Through these networks, it tries to be in closer contact with its sports customers and hockey fans. The company informs them about what is happening in the company, publishes various articles, polls and contests.

The largest following is on Facebook, where the company is followed by around 7,600 people (as of July 3rd, 2023). The company does not have a set frequency of social media posts, but its goal is to run social networks profiles as efficiently as possible, posting interesting and quality content for customers.

Reach of company's social network profiles

The analyzed company tracks the statistics on Facebook and Instagram for the posts published to see how much reach they have. It depends on what is posted. For more interesting posts, such as contests, polls and videos, the posts have a higher number of views (about 3,000 or more); in the case of more general information, the reach is not as great.

Content published on individual social network profiles

Content on network profiles logically varies by social platform. Short videos, trailers and interviews are posted on YouTube. On Facebook and Instagram, there are posts in the form of contests, polls, and others that give customers the opportunity to engage in more intense interaction.

From the new season of 2023, customers can look forward to a new concept that will be more focused on the social network YouTube – more interviews with coaches and players will be posted there.

Communication on social network profiles – getting customer feedback

The conducted interview revealed that the company gets customer feedback mainly through social network profiles – customers/fans have space to express their opinions and reviews there, and they can engage in public discussions with the company and other users. Customer feedback is highly useful – as Plsek (2012) states, it helps to learn about specific customer wants and needs.

The analyzed company have to face negative feedback sometimes – in such cases, it tries to respond to negative comments as quickly as possible and, if necessary, clarify the situation.

Furthermore, it was statistically tested whether respondents' gender influences willingness to participate in communication on social network profiles. Results indicate there is an influence – according to the findings, women are more engaged in social media communication than men ($\chi^2 = 18.248$; $df = 2$; $p\text{-value} < 0.001$). This finding is also supported by Stanek (2014) who found out that social networks are more often used by women.

Company's reaction to social media trends

If social networks have a greater interest from the company's customers, the company would consider setting up profiles on newer social networks, with the effort to engage more its customers. It means that videos and challenges would be created with customer participation.

4 Conclusions

Results indicate that there is a range of engaging activities, both online and offline. Overall, respondents think they are sufficiently engaged in the company's activities (92%), in which social networks play an important role in engaging customers at the analyzed company, focusing on sport customers.

As for future research ideas, future studies may compare domestic and international hockey clubs and their engaging activities, trying to find the best practices.

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Power of aroma marketing in branding: Design of available methodological approaches

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Abstract: Traditional marketing methods are for today's purposes and influence are in short supply on the market. The dynamics of changes in the market and the rapid growth of competition means: that on the one hand, there is big pressure on brand sustainability, on the other hand, this situation brings opportunities for implementing innovative approaches in the marketing strategies of the brand. One of the innovations is aroma marketing, one of the directions of sensory marketing. For the application of fragrance in branding, knowledge from a field called neuromarketing is used, which (using neuroscientific tools) provides results about consumer behavior, decision-making, and emotions. For this purpose, a systematic review of the existing literature was carried out, and then the potential of using aroma marketing in branding was described. The records obtained allowed an in-depth insight into how the application of fragrance can contribute to understanding consumers' emotional and decision-making responses to strengthen the brand's marketing strategy.

Keywords: aroma marketing, branding, consumers, neuromarketing, sensory marketing

JEL Classification: M31, O36, Z31

1 Introduction

Today's competition in the business world is huge (Mohsen & Mostafa, 2020), and company marketers therefore they must employ several strategies to acquire and retain their customers. (Nyoni & Buga, 2017) One such strategy is the use of modern tools that the field of marketing offers. Increasing competitiveness is not the only advantage, the approach can be targeted to support stronger ties between the customer and the brand, which subsequently affects, in a positive direction, the customer's trust and value towards the brand. (Gill & Singh, 2022) Nilashi et al. (2020) indicate another positive aspect of the adoption of new trends in marketing companies' strategies, thereby supporting sustainable business. One such trend emphasizes understanding consumer emotions and their subconscious reactions to analyze consumer choice and decision-making processes on a comprehensive scale. (Fortunato et al., 2014) Answers to the most important marketing question can thus be obtained: "What motivates consumers to put a given brand ahead of others?" (Fisher & Klitzman, 2010) Traditional marketing tools (for example, questionnaire surveys, interviews, surveys, self-reports) it only measures the reactions and behavior of consumers at the level of consciousness, so the subconscious component is in the traditional marketing concept completely overlooked. (Duque-Hurtado et al., 2020) However, the available study states that most purchasing decisions are made by consumers subconsciously. According to his research. (Glova & Mudryk, 2020; Nyoni & Bonga, 2017) indicate that the subconscious mind makes up to 95% of purchasing decisions. From this point of view, they are traditional marketing methods challenged. Based on the need to obtain sufficient and accurate data about consumer behavior, a science called "neuromarketing". (Morisson et al., 2011)

With the first scientific studies, a considerable difference was observed between the expected behavior (observed on a conscious level) and actual consumer behavior (observed on a subconscious level). Putting neuromarketing into practice has (according to existing literature and research) a direct impact on marketing success. (Mileti, Guido & Prete, 2016) Marketing (itself) is very expensive, and due to the inability to express how the consumers feel and think about a given marketing stimulus. Traditional marketing tools are ineffective. Conversely, neuromarketing and neuroscience tools are an advantage in this regard, they can offset costs, add value to marketing plans, and bring about better (more efficient) results. (Jordao et al., 2017) Moreover, it is an innovative way to build awareness of brands using methods that focus on human feelings. Also, the senses are an important part of neuromarketing, it is called "sensory marketing". (Spence, 2020)

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Measured processes and their interpretation emotional tendencies of customers (toward the brand) can ensure the success of the brand in the long term. Marques Martinez (2021) adds that sensory marketing increases the emotional connection, thus increasing consumer trust and value towards the product or brand. As a result, it can be stated that the implementation of neuromarketing or specifically sensory marketing (into company's strategy) can positively change consumer buying habits and preferences. (Rosenlacher & Tichý, 2020)

1.2 Sensory marketing in branding

Every day, the consumer is exposed to various sensory triggers that subconsciously stimulate a influence the buying behavior of consumers. These sensory triggers cause consumers to create (desired) brand attributes, on the contrary, this cannot be provided verbally. Understanding the sensory senses in connection with marketing, to provide specific areas: "aroma marketing", (Berčík et al., 2021) "flavor marketing" (Liang et al., 2016), "audio marketing" (Malenkaya & Andreyeva, 2016), "visual marketing" (Zhang et al., 2020), and "haptic marketing" (Rodriguez et al., 2017). Each of these focuses provides a greater understanding of consumer perception that determines their purchasing behavior. (Jang & Lee, 2019) Besides this, sensory marketing offers other advantages of its application - Kalenskaya (2019) refers to sensory marketing as a low-cost sales promotion tool that is also very effective in increasing profits. Simha (2020) describes sensory marketing as a promising direction for further future research. In general, the most used sense for marketing purposes is sight. However, there is so much visual information that consumers are oversaturated with them. Sample et al. (2020) this fact the formulate, so-called "visual smog", therefore it is advisable to choose a different form of sensory strategy. Berčík et al. (2021) recommend using the sense of smell.

1.3 Aroma marketing in branding

The advantage of smell is that it is the most connected to the emotional reactions of all the senses, so it can quickly captivate and instantly evoke strong memories. The reason is the connection with the limbic system, where emotions and memories (with long-term memory function) are stored. (Berčík et al., 2021) The uniqueness of the sense of smell also lies in the fact that a person can perceive and subsequently identify over 10,000 scents (fragrances) and assign a specific memory or emotion to each of them (including about a brand or product). (Howard Hughes Medical Institute, 2014) In his study, Krishna (2012) proves that it is through the use of scent that one can effectively create a consumer's desire for a brand or product in the mind. The chapter is then about what fragrance should be used for the brand at the point of sale. Erajaa et al (2021) claim that if we want to "fix" the consumer shopping (the positive) experience into (long-term) memory, it is appropriate to use a scent that is identical whit the brand. (De Luca & Botelho, 2021; Rathee & Rajain, 2018) However, some studies reveal specific market sectors that, on the contrary, they ask for incongruity, i.e. incongruity, not concerning the brand, product, or place, but gender.

However, they point out that the use of aroma marketing as a modern marketing strategy and investigating the effect of olfactory stimuli (smell) is not a simple matter. In addition, aroma marketing is based

on technology, which is built on the psychology of scents, of the influence of single-component scents or scent mixtures on human behavior. Therefore, there is a strong relationship between neuromarketing, aroma marketing, and aromachology. (Girona-Ruiz et al., 2021) Following this fact, the emotional states of consumers become an important subject of more detailed investigation. (Guillet et al., 2019)

The design of the resulting fragrance is a (especially time-consuming) process. However, the positive effect is more than enough to start implementing scents into corporate strategies (mainly in the retail sector). (Rathee & Rajain, 2021) Berčík et al. (2021) highlight retail, as an environment where aroma marketing is a very appropriate part of the branding strategy. Roy & Singh (2023) add that the application of a scent that is rated "pleasant" increases retail brand awareness (i.e. brands that are not very well known). Other studies from the retail environment demonstrate the ability of the fragrance to significantly improve consumer perception of product evaluations, (Krishna et al. 2016) to increase consumer returns while acting on increasing the time spent in the sales environment, (Spence, 2015) to increase the brand image perceived by customers, (Krishna et al., 2012) increase consumer satisfaction, (Bui & Nguyen, 2021) increase the number of new customers and strengthen the loyalty of regular customers. (Ruzeviciute et al., 2020). Berčík et al. (2021) and Bočková (2021) mention another added value.

1.4 Neuroscience tools and aroma marketing in branding

On the one hand, aroma marketing is a young field, on the other hand, the technical progress in the form of neuroscientific tools is very advanced. Several tools and techniques are used to study consumer behavior, noteworthy the most commonly used in research: electroencephalography (EEG); functional magnetic resonance imaging (fMRI); electrocardiograph (ECG); Eye Tracking; and FaceReader.

Berčík et al. (2021) investigated the effect of selected fragrances on increasing the sales of a specific product for a brand in the hospitality sector. Innovative approaches used neuroscientific EEG FaceReader tools (in both laboratory and real conditions) for the selection of a suitable aromatic substance. Based on the results, it was found that the scent matching the product increases its sales, which in turn strengthens the brand as such. A similar claim is made by a study by Harwood & Jones (2013), the results of the study show that a scent identical to the brand's product attracts the visual attention of consumers, which leads to an increase in product sales, and again the positive effects on the brand as a complex are confirmed. The use of the neural tool fMRI provides positive effects on a better perception of product quality by consumers. (Mensing, 2023). ECG, it has been shown that using scent results in greater memorability and brand recall (after a longer time interval) of a brand. (Coz et al., 2022)

2 Literature review methods

Based on the above literature review, the use of aroma marketing with the application of neuroscience tools in the field of branding has been extensively researched and there are still research gaps. The following is an overview of several possible methodological approaches to understanding emotional consumer processes - their behavior and decision-making towards the brand using the aroma marketing application using neuro-marketing tools. It is possible to look at the given topic from several points of view:

1. *From a brand point of view – brand image, brand awareness, sales promotion*
2. *From a retail store point of view – quality, and pleasant perception, provide a sensory (unique) experience*
3. *From a consumer point of view – increasing the length of stay in the retail environment, repeat purchase intention, satisfaction, consumer loyalty*
4. *From an employee point of view – satisfaction, motivation, efficiency*

3 Existing research

In 2014, Holtmann & Vollmers examined fragrance incongruence and congruence about the brand on consumer satisfaction. Using a modified S-O-R (Stimuli – Organism – Response) model, they arrived at the result that the match the fragrance with the brand leads to greater consumer satisfaction. At the end of the article, the research team adds that simply connecting the fragrance with the brand is not enough, a very important factor (to increase consumer satisfaction) is the type of fragrance chosen. Erraja et al. (2021) also examined the incongruence (control) and congruence (test) of a scent with a brand image. Using a factorial design, it was again found that the congruence of the fragrance with the brand image has a positive effect on consumer reactions and thus leads to higher consumer satisfaction, higher intention to revisit the point of sale, and higher consumer intention to buy again. As in the previous article, this research also highlights the fact that simply using a pleasant congruent scent (with different brand factors) is not enough, on the contrary – it must be complex and consistent to have a positive effect on the brand image.

Hashim & Jebur (2023) investigated the relationship between aroma marketing and consumer brand awareness. Using a questionnaire survey, the positive impact of the use of fragrance on increased brand awareness, brand recognition among other (competing) brands, and brand recall was determined. As this issue is found both at the level of emotions and at the level of knowledge, other elements supporting this process (awareness - recognition - remembering) - repurchase intention and consumer loyalty to the brand - were revealed.

Rodas-Areiza & Montoya-Restrepo (2018) focused their research on the influence and subsequent discussion of the correct setting to attract consumers and prolong their stay in the retail environment on the one hand, and at the same time to create a pleasant working environment for retail employees. Using FaceReader, the intensity of the scent was investigated, but to attract consumers, a really strong intensity of the scent is needed, for employees, the pleasantness of the intensity is even slightly lower due to a longer working stay in a small amount of shops. Moreover, the paper's conclusions state that the effects of attraction do not directly demonstrate sales promotion, but may be a side effect of creating a pleasant environment that provides exciting sensory experiences. On the contrary, Berčík et. al. (2020) wanted to prove with their research that the application of fragrance can support (increase) sales. They used the neuroscientific tool FaceReader to collect data – the unconscious level, but they also focused on the conscious level, and the collection of this data took place using a questionnaire survey. Concerning previous studies, the research team accepted the importance of choosing a suitable scent for the brand concept (image) and devoted the first part of the experiment to

choosing a suitable scent, the second part of the research focused on the set research objectives. Results demonstrate increased profitability, as well as customer attraction and retention.

4 Conclusions

In this paper, we discussed possible methodological approaches to neuromarketing (aroma marketing) research using appropriate neuroscientific tools. First, we conducted a systematic review of the existing literature focusing on aroma marketing and its influence on the brand and the branding process. Several possible approaches from different areas related to the topic of linking fragrance and brand (branding) and the neuromarketing tool – FaceReader, were proposed, with a subsequent confrontation with the existing scientific literature. The goal of future research will be to try to follow up these proposals of possible methods with empirical research.

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Factors influencing entrepreneurial personality and their share in business success – a literature review

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Abstract: The aim of this paper is to conduct a literature review on determinants of entrepreneurial personality and their implications for business success. Both unchangeable personal factors such as gender, generational affiliation, age, cultural and regional conditions, as well as changeable factors in the form of personality traits (Traits) are examined. The literature review elucidates that both categories of factors significantly shape entrepreneurial personality and consequently influence business success. In conclusion, the relevance of considering personality traits in startup consulting is emphasized to minimize business failure and ensure well-founded advice for founders. The paper recommends the integration of the discussion on personality traits into startup consulting to promote a more comprehensive understanding of entrepreneurial challenges and requirements.

Keywords: Entrepreneur/Unternehmer, Personality/Persönlichkeit, Entrepreneur success factors/Unternehmer Erfolgsfaktoren, Influence factor success/Einflussfaktoren Erfolg, Traits/Persönlichkeitsprofil

JEL Classification: L26, M13, J24, J16, Z13

1 Introduction

This study examines the diverse factors influencing business start-ups that go beyond the business plan, product, and target group. It focuses on the imprints, origins, and life circumstances of the founder, which shape the entrepreneurial personality and thus influence business success. The study distinguishes between personal influencing factors, determined by birth and personal disposition, and those factors influenced by the life circumstances and environment of the entrepreneur. In the subsequent sections, personality traits crucial for business success are discussed, supported by examples from trait research. In conclusion, the significance of the examined influencing factors for business start-ups is emphasized, and the need for an expanded discussion on personality traits in start-up consulting is highlighted to prevent business failures.

2 Methods

The methodology of this study is based on a systematic literature review and analysis. The aim was to identify relevant literature that deals with immutable factors influencing entrepreneurial success. The research was primarily conducted through Google Scholar, supplemented by relevant books and articles from well-known works. Specific keywords targeting various aspects of entrepreneurship were used. For general topics in entrepreneurship, no specific time frame was set, while for other topics, the search focused on the period from 1991 to 2021 to ensure timeliness and relevance.

The selection of literature was guided by criteria such as relevance to the main theme, contribution to understanding the influencing factors on entrepreneurial personality, and the quality of the publication. The identified literature was then systematically analyzed to identify common themes and trends. This allowed for a deeper investigation of the influencing factors and answering the research questions. The results were summarized to develop a comprehensive understanding of the topics studied.

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The following table provides an overview of the keywords used and the selection criteria:

Category	Keywords	Selection Criteria
General Entrepreneurship	"Entrepreneurship", "Founding", "Startup"	Relevance to the topic, currency, quality of publication
Age	"Entrepreneur Age", "Silver Economy", "Age Factor in Entrepreneurship"	Contribution to understanding age as an influencing factor
Gender Differences	"Gender Diversity", "Woman in Entrepreneurship", "Gender Equality"	Studies on gender-specific differences
Health	"Entrepreneur Health", "Work-Life-Balance", "Health Management"	Relevance for the health and well-being of entrepreneurs
Family Influence	"Family Influence in Entrepreneurship", "Social Capital", "Family Business"	Studies on the influence of family on business startups
Regional/Cultural/State Factors	"Regional Influences", "Cultural Influences", "Governmental Frameworks"	Impact of local and cultural conditions
Personality Traits	"Entrepreneurial Traits", "Personality Traits", "Entrepreneurial Spirit"	Studies on characteristic traits of entrepreneurs

In addition to the literature review, my personal experience as an entrepreneur with over 14 years of self-employment and experience in research & development, as well as in senior positions in sales and marketing, was considered. These experiences served as background knowledge but did not influence the objectivity of the research and analysis.

3 Research results

3.1. The Age Factor: Understanding Its Impact on Entrepreneurship

The age of an entrepreneur at the time of founding varies significantly between 22 and 45 years according to studies (Azoulay et al. 2018, S. 2; Jacobsen 2003, S. 48–49; Friedl et al. 2019, S. 8). In Germany, 39.9% of founders belong to the age group of 25 to 34 years and 22.8% to the age group of 35 to 44 years (Statista 2020b), which contradicts the common image of the young entrepreneur. Zhao et al. and Bosma et al. emphasize that, in addition to age, other factors are relevant for entrepreneurial success (2021, S. 16–17; Zhao et al. 2021, S. 4; Bosma et al. 2020). In regions such as the USA, the EU, and Japan, entrepreneurship for older adults is becoming increasingly attractive due to the aging population and the associated alternative professional challenges and opportunities (Zhao et al. 2021, S. 2).

Business success, defined by growth, monetary goals, and survival, correlates with the age of the entrepreneur (Sefiani 2013; Zhao et al. 2021, S. 2). Studies show that the growth rate and success increase with age up to 59 years (Azoulay et al. 2018, S. 3; Crook et al. 2011, S. 451), but decrease thereafter (Azoulay et al. 2018, S. 3; Jacobsen 2003, S. 2–3). Older entrepreneurs tend to have higher business survival rates (Jacobsen 2003, S. 2–3), although some studies find no statistically significant influence of age (Winistörfer 2011, S. 11). The transition from professional predictability to uncertainty poses a greater challenge for young entrepreneurs (Layr und Bäümel 2020, S. 45–46).

Younger entrepreneurs often strive for higher income and status, while older entrepreneurs tend to have higher incomes but are less monetarily oriented (Wach et al. 2016, S. 1107). Life experience and networks facilitate access to resources and risk management (Kiendl et al. 2019; Zhao et al. 2021, S. 4).

3.2. Generational Differences in Entrepreneurship:

Generational affiliation shapes entrepreneurship. While older entrepreneurs tend to be self-employed, the "Generation Y" combines business with social aspects (HSBC Private Bank 2015) and emphasizes teamwork (Layr und Bäümel 2020, S. 7). Differentiating between Generations X, Y, Z, and Alpha² reveals differences in communication, commitment, respect, and ecology that will influence future entrepreneurship (Schnetzer 2020; Layr und Bäümel 2020, S. 3). Despite

² Generational designations and corresponding birth years: Traditionalists (1922-1954), Baby Boomers (1955-1964), Generation X (1965-1979), Generation Y (1980-1994), Generation Z (1995-2009), Generation Alpha (2010-2024), Generation Beta (from 2025) Schnetzer 2020, S. 2–4.

shared values such as health, friendship, and family, the generations vary in other aspects, which will impact both future entrepreneurs and financiers (Layr und Bäumel 2020).

3.3. Entrepreneurship and Gender: Barriers and Motives:

In Germany, in the 2nd quarter of 2020, 80% of startups were initiated by men and 16% by women (see Käufer und Conell 2020; Statista 2020a). These differences are observed internationally (Röhl 2016, S. 14–15), with countries like the USA, Spain, Mexico und Brasil seeing women's entrepreneurial activities closer to those of men (see Bosma et al. 2020, S. 17 und 56). The motives for starting a business are similar for both genders, with women emphasizing the desire for flexibility and the reconciliation of work and family life (Parasuraman et al. 1996, S. 277), whereas men are more financially motivated (Bosma et al. 2020, S. 16). Personality differences between the genders are minimal, although women may lag behind men in risk-taking and assertiveness (Antoncic et al. 2015, S. 823–824 und 830–831; Ames und Flynn 2007, S. 321–322). Financial barriers are greater for women, as they are demanded to provide higher securities (Cooper et al. 1994, S. 389; Röhl 2016, S. 16–17; Matthews und Moser 1996, S. 41; Halabisky und Potter 2017, S. 3). Education, networks, and counseling can support women in both the founding and growth phases (Sobeková Majková und Kijucnikov 2017, S. 58–59; Halabisky und Potter 2017, S. 3).

3.4. Health Management as a Success Factor in Entrepreneurship:

The health of entrepreneurs is crucial for business success, akin to the demands on elite athletes (Rau et al. 2008, S. 122, 2008, S. 115). Due to high workloads, responsibility, limited leisure time, and stress, entrepreneurs are often exposed to health risks such as hypertension, heart attacks, sleep disorders, depression, and anxiety (Alstete 2008, S. 588–590; Rau et al. 2008, S. 116–122). Direct comparisons between employees and entrepreneurs are challenging due to differing responsibilities and working hours (Rau et al. 2008, S. 115–116). Increased systolic blood pressure in entrepreneurs can be influenced by growing competition, while success and vacation have positive effects on health (Rau et al. 2008, S. 122–123). The balance between work and leisure is especially important for small business owners (Wach et al. 2016, S. 1103–1105; Parasuraman et al. 1996, S. 294; Alstete 2008, S. 586) Factors such as the need for control and perfectionism can contribute to additional stress (Alstete 2008, S. 591–592).

3.5. Family-Related Influences on Entrepreneurial Success: Support, Conflicts, and Social Capital::

Family factors are pivotal in the entrepreneurial context. A supportive partnership, where financial and emotional resources are shared, promotes business success (Parasuraman et al. 1996, S. 295; Abraham 2006, S. 96, 2006, S. 18). Family support, especially from partners within the household, allows entrepreneurs to focus more intensively on their businesses (Abraham 2006, S. 259–260). Family background and role models, particularly entrepreneurial parents, shape the entrepreneurial personality and career decisions (Kets de Vries 1977, S. 35–36; Dyer und Handler 1994, S. 72). Family background and role models, especially entrepreneurial parents, influence the entrepreneurial personality and career choices (Dyer und Handler 1994, S. 72; Sefiani 2013, S. 263). While family support and social capital through networks offer advantages, family conflicts and excessive dependence on the family can be detrimental (Dyer und Handler 1994, S. 72–74; Edelman et al. 2016, S. 441, 2016, S. 428, 2016, S. 429–430; Aldrich und Martinez 2001, S. 47–48) Too much financial support can dampen entrepreneurial ambition and slow growth (Edelman et al. 2016, S. 443). Role models, both within the family and externally, significantly influence the decision to start a business (Röhl 2016).

3.6. Regional, Cultural, and Governmental Influences on Entrepreneurship:

Entrepreneurial inclination varies globally, with high entrepreneurial willingness in countries such as Saudi Arabia and Mexico and lower in France and Germany Ipsos 2018, S. 8³ Regional differences within countries influence the propensity to start a business, where a culture favorable to founding has reinforcing effects Röhl 2016, S. 9–10, 2016, S. 5. Cultural norms, traditions, and religion influence entrepreneurial willingness and the definition of success (Röhl 2016; Makhbul und Hasun 2011, 119ff.; HSBC Private Bank 2015, S. 15). Governmental measures and legal frameworks can impact entrepreneurship (Röhl 2016; Aldrich und Martinez 2001, S. 50), with the importance of reliable governmental support being emphasized in times of challenges such as the Covid-19 pandemic and globalization (Schiewerling 2019, S. 18).

3.7. Personality Traits and Their Influence on Entrepreneurship:

Personality traits, often referred to as "Traits," are crucial for entrepreneurial success (Jacobsen 2003, S. 8). These stable characteristics influence behavior and, consequently, the trajectory of a business (Herron 1994; Coglisier und Brigham 2004, S. 781–782). Particularly, traits such as innovativeness, self-confidence, persistence, and openness are

³ A study conducted in 24 countries based on the Ipsos Online Panel System between September 20 and 28, 2018, in anticipation of the Global Entrepreneurship Week (2018, November 12 to 18th, <https://genglobal.org/gew>)

typical for entrepreneurs (Soos 2017, S. 202; Antoncic et al. 2015, S. 831–832). Performance motivation and reliability are also essential (Brandstätter 2011, S. 226; Alstete 2008, S. 586–587; Sefiani 2013), while risk-taking shows mixed results (Sefiani 2013, S. 264; Cogliser und Brigham 2004, S. 786). Negative emotions like nervousness and fear can arise when starting a business (Ipsos 2018). The "possibility thinking" enables entrepreneurs to see ambiguities and changes as opportunities (Begley und Boyd 1987b, S. 80, 1987b, S. 83–84). An Austrian survey emphasizes assertiveness, business acumen, and emotional intelligence as key factors (Statista 2021). However, these traits alone do not guarantee success (Antoncic et al. 2015; Begley und Boyd 1987a, S. 89–91; Rauch und Frese 2007; Jacobsen 2003, S. 26–27).

4 Conclusions

The research findings reflect the dynamic challenges faced by entrepreneurs in Germany. Amplified by global events such as the COVID-19 pandemic and geopolitical conflicts, they have led to high volatility and significant insolvency rates among young companies (Statistisches Bundesamt (Destatis) 2023, S. 5; Verband der Vereine Creditreform e.V. 2019). These developments highlight the need to transform challenges into opportunities, and emphasize the importance of adaptability and resilience. The trend of the 'Silver Economy'⁴ underscores the growing role of experienced entrepreneurs who, with their extensive knowledge and networks, contribute to economic transformation (Azoulay et al. 2018, S. 115–187; Jacobsen 2003, S. 48–49). Generational differences demonstrate that each generation brings unique values and approaches to entrepreneurship, with Millennials and subsequent generations emphasizing teamwork and ecological sustainability (HSBC Private Bank 2015, S. 30; Layr und Bäuml 2020, S. 7). The increasing number of female founders in Germany in 2021 (Metzger 2022, S. 1) reflects the global trend towards greater gender equality in entrepreneurship, highlighting the removal of barriers for female entrepreneurs and equal access to resources and financing (Halabisky und Potter 2017, S. 3). The importance of entrepreneurs' health as a factor for success aligns with the growing awareness of work-life balance and well-being (Rau et al. 2008, S. 115–116), as well as the role of family influences and social capital as support systems (Abraham 2006, S. 259–260). Regional and cultural influences emphasize the importance of local resources and conditions. The Covid pandemic has reinforced the significance of 'Local Sourcing' and sustainability (Röhl 2016, S. 9). In a rapidly changing global economy, entrepreneurial personality traits such as innovativeness, self-confidence, persistence, and openness are critical (Soos 2017, S. 202; Antoncic et al. 2015, S. 831–832). These stable characteristics are essential for entrepreneurial success (Herron 1994; Cogliser und Brigham 2004, S. 781–782). Especially in an environment characterized by rapid changes and uncertainties, 'possibility thinking' enables entrepreneurs to recognize opportunities amidst ambiguities (Begley und Boyd 1987b, S. 80, 1987b, S. 83–84). However, despite the importance of these traits, they alone do not guarantee success, as factors such as performance motivation, reliability, and emotional intelligence are also essential (Brandstätter 2011, S. 226; Alstete 2008, S. 586–587; Sefiani 2013).

A deep understanding of global trends is crucial for developing an adapted and innovative entrepreneurship that provides effective support to entrepreneurs in a rapidly changing economic environment. Coaching and targeted consulting play a key role, particularly in reflecting on personal imprints and business characteristics. These approaches help maximize entrepreneurial potential and are essential in providing entrepreneurs with the necessary tools for success and adaptability in dynamic markets. Lacking business traits can be compensated with targeted support, thereby strengthening entrepreneurs in their decision-making.

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⁴ Author's Note: "Silver Economy" refers to economic activities related to the older population. This encompasses products and services tailored for older adults, as well as their roles as consumers, entrepreneurs, and members of the workforce.

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Industry 4.0 and technologies used in SMEs

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Abstract: Innovation is becoming an increasingly essential part of business. Modern technologies are increasingly penetrating everyday life, not just the business sphere. Without the implementation of new technologies, many companies will cease to exist. At best, they will lag far behind the competition. We can already see different levels of use of new technologies across individual businesses. The question also remains how to finance and subsequently evaluate these significant investments. This contribution aims to determine which technologies are most used in small and medium-sized organizations and how their choice is influenced. Attention is also paid to the reasons behind using technologies related to Industry 4.0. Data for this research were collected using an online questionnaire survey. It has been found that digitalization and cloud storage technologies are the most widely used in absolute terms. On the other hand, technologies such as Machine learning, Big data, or Virtual reality are used to a minimal extent. It has also been observed that the organization's vision is the main reason for implementing these technologies.

Keywords: Industry 4.0, Innovation, Technology, SMEs

JEL Classification: M10, O31, O32

1 Introduction

The world is currently facing many challenges related to the digital transformation called Industry 4.0, and SMEs are a significant area in this respect (Costa Melo et al., 2023; Abdulnour et al., 2022). Industry 4.0, as the fourth industrial revolution, is a big topic of the present time, and this term is associated with many modern technologies such as Robotics, Automation, 3D printing, Cloud, Virtual or Augmented reality, etc. (Wightman et al., 2023). The term comes from Germany, and its first use dates back to 2011 (Olšánová et al., 2021). Today, however, it is spread worldwide and offers many opportunities for developing businesses and the entire state or individual regions (Soukupová et al., 2020).

However, the implementation of modern technologies in enterprises also brings specific barriers. Among the most common, we can rank lack of infrastructure, personnel resistance, high investment requirements, lack of digital strategy, uncertainty, lack of adequate skills (Attiany et al., 2023), doubt about sustainability, lack of alternate solutions (Goel et al., 2022), lack of trust, lack of business model or lack of government support (Kumar et al., 2023).

Small and medium-sized enterprises' performance is influenced by several factors, one of which will undoubtedly be Industry 4.0 and new technologies. Ali Qalati et al. (2021) list three large groups of elements influencing the performance of small and medium-sized enterprises – organizational, environmental, and technological – among which we can include the outputs of the Industry 4.0 concept. Owalla et al. (2022) then propose dividing factors into two large groups, namely external and internal, with innovation and technology included in the group of internal factors. Kádarová et al. (2023) then directly points out the impact of digitalization and modern technologies on the productivity or competitiveness of small and medium-sized enterprises in the countries of the European Union. Therefore, the connection between small and medium-sized enterprises and Industry 4.0 is justified and needs to be studied more deeply.

2 Literature overview

For a better idea of the term Industry 4.0, a demonstrative list of technologies related to this term is offered, respectively, technologies used to characterize the overall level of digitalization.

- Additive manufacturing – **3D printing or scanning** (Bigliardi et al., 2020; Brodny & Tutak, 2022; Galizia et al., 2023; Semeraro et al., 2023); predictive **manufacturing** (Tubis & Grzybowska, 2022);
- Advanced manufacturing solutions – **smart sensors** (Bigliardi et al., 2020; Galizia et al., 2023), **robots, and machine-to-machine communication technologies** (Brodny & Tutak, 2022; Semeraro et al., 2023; Tobon-Valencia et al., 2022), **smart factory** (Karuppiah et al., 2022);
- **Artificial Intelligence** (Brodny & Tutak, 2022; Karuppiah et al., 2022; Tobon-Valencia et al., 2022);

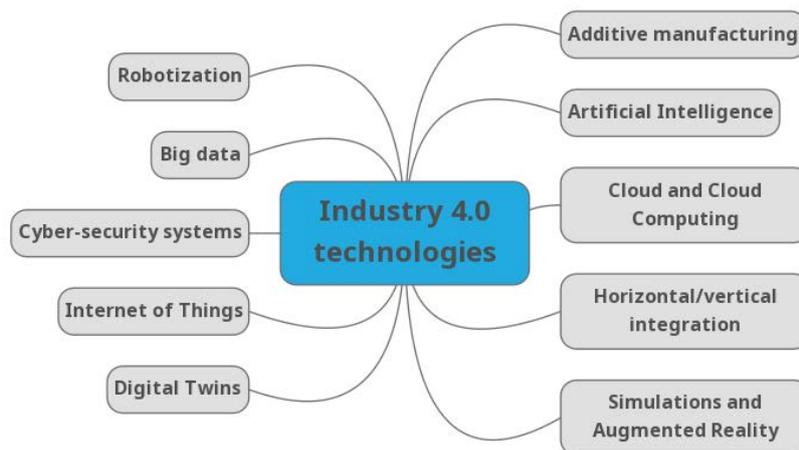
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- **Augmented reality** (Bigliardi et al., 2020; Galizia et al., 2023; Karuppiah et al., 2022; Semeraro et al., 2023; Tubis & Grzybowska, 2022);
- **Big data** – analysis of data (Bigliardi et al., 2020; Brodny & Tutak, 2022; Galizia et al., 2023; Karuppiah et al., 2022; Semeraro et al., 2023; Tobon-Valencia et al., 2022);
- **Blockchain and GPS** (Karuppiah et al., 2022);
- **Cloud** (Bigliardi et al., 2020; Brodny & Tutak, 2022; Galizia et al., 2023; Semeraro et al., 2023; Tobon-Valencia et al., 2022; Tubis & Grzybowska, 2022);
- **Cyber-security and cyber-physical systems** (Bigliardi et al., 2020; Brodny & Tutak, 2022; Galizia et al., 2023; Karuppiah et al., 2022; Semeraro et al., 2023);
- **Digital skills** (Brodny & Tutak, 2022);
- **Horizontal or vertical integration** (Brodny & Tutak, 2022; Galizia et al., 2023; Karuppiah et al., 2022), **RFID** (Karuppiah et al., 2022);
- **Industrial internet** (Galizia et al., 2023);
- **Internet of Services** (Semeraro et al., 2023);
- **Internet of Things** (Bigliardi et al., 2020; Brodny & Tutak, 2022; Karuppiah et al., 2022; Semeraro et al., 2023; Tobon-Valencia et al., 2022; Tubis & Grzybowska, 2022);
- **Machine learning** (Bigliardi et al., 2020);
- **Simulation and digital twin** (Galizia et al., 2023; Semeraro et al., 2023; Tobon-Valencia et al., 2022), **simulated reality** (Tubis & Grzybowska, 2022);
- **Virtual reality** (Semeraro et al., 2023; Tobon-Valencia et al., 2022), **mixed reality** (Tubis & Grzybowska, 2022).

Figure 1 shows a diagram of the most commonly used technologies and terms related to Industry 4.0 developed based on the above list of words.

Figure 1 The most frequently mentioned technologies related to Industry 4.0



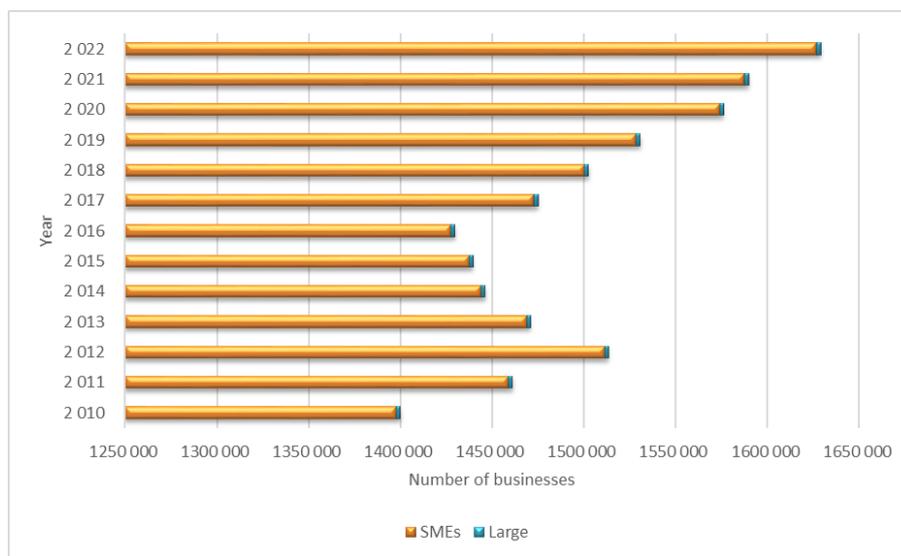
Source: Own processing

Small and medium-sized enterprises represent an integral part of the Czech economy. They also play a significant role in the European Union and worldwide. In the European Union, they represent 99 % of all businesses and provide two-thirds of jobs in the private sector. The same percentage of SMEs in all enterprises is registered in the Czech Republic. Therefore, ensuring their sufficient competitiveness should be one of the main priorities for national/supranational policies (Cordina, 2023). However, financing the implementation of new technologies can be a significant problem for such businesses. As reported by the Ministry of Industry and Trade of the Czech Republic (2021), small and medium-sized organizations are very vulnerable in financing, and finances were perceived as the most significant problem in their operation by 10 % of enterprises in 2022. However, it should be noted that before the arrival of the COVID-19 pandemic, the Czech Republic had a positive trend in this area. As in 2011, finances were a problem for 12 % of businesses, but by 2019, this share had decreased to 8 %.

The awareness of small and medium-sized enterprises about the importance of new technologies is summarized by Krajčík (2021). A general understanding of new technologies is not very high in the group of SMEs. Representatives of these organizations most often seek information themselves, e.g., in the form of conferences. However, it is alarming that most companies do not consider implementing new technologies in their strategy or plans. On the other hand, 14 % of businesses have at least started to take the first steps. However, 40 % of organizations do not see this topic as their main priority shortly. Based on their analysis of small and medium-sized enterprises, Brodny & Tutak (2022) find that the level of digitalization in the Czech Republic varies according to the enterprise size. For small businesses, the above is already true – the status and awareness of digitalization are deficient (at the level of countries such as Romania or Bulgaria). Medium-sized enterprises are already at an average level (such as Croatia or Estonia). In terms of large enterprises, the Czech Republic is among the best countries in the analysis.

To illustrate the situation in the Czech Republic, Figure 2 is offered. The evolution of the number of small and medium-sized organizations against the number of large enterprises is illustrated here. It is evident that small and medium-sized enterprises dominate in the Czech Republic, and in this comparison, we can see how low large enterprises there are. That is why it is essential to be interested in the situation of most companies in the Czech economy.

Figure 2 Comparison of the number of SMEs and the number of large enterprises in the period 2010-2022



Source: Czech Statistical Office (2023), own processing

3 Methodology

The main aim of this paper is to find out what technologies are most used by small and medium-sized enterprises in the Czech Republic and what factors determine the level of their implementation. The results are based on data collection between November 2022 and February 2023. The investigated technologies are selected based on previous research and analysis of the empirical literature.

A questionnaire survey was used for data collection, which took place online. The return rate was approximately 4,8 %, and 1 271 were asked for the study. Companies were approached completely randomly or without focusing on a specific industry. No sample specification criteria were applied. It can be stated that the structure of enterprises is approximately 50:50 in terms of the division between enterprises that offer services and enterprises that manufacture products. Financial and accounting companies have a significant presence in terms of services. From the point of view of companies producing products, companies from the construction and crafts sectors. The questionnaire consisted of open (2) and closed questions (12) and also included semi-open questions (5). Managers, owners, and executives of small and medium-sized organizations were addressed. The sample consisted of microenterprises (36), small enterprises (13) and medium-sized organizations (12). The core of the whole survey was the knowledge of how much organizations use selected technologies – Big Data, Machine Learning, Internet of Things, Artificial Intelligence, Smart Sensors, 3D printing and 3D scan, Cloud Storage, Robotization, Digitalization, Cyber Protection, and Virtual Reality. Usage rates were rated by respondents using a Likert scale on a scale of 0-5, where 0 meant that the company was not using the technology at all and 5 meant maximum use. Subsequently, it was observed whether the size of the enterprise (micro, small, medium) and awareness of Industry 4.0 (none, average, significant) independently affect the degree of use of automation/digitalization of activities in the enterprise, which was divided into two simple intervals (0-50%; 51-100%). The fact that these variables can impact the perception and implementation of new technologies is pointed out by Krajčík (2021) or Brodny & Tutak

(2022). It is reasonable to verify this claim. The interdependence or correlation between the two variables has not been investigated.

Two hypotheses were developed to answer the above questions, designated as "A" and "B."

$H_{0(A)}$: The size of the enterprise does not affect the degree of automation/digitalization of activities in the enterprise.

$H_{1(A)}$: The size of the enterprise affects the degree of automation/digitalization of activities in the enterprise.

$H_{0(B)}$: The level of awareness of Industry 4.0 does not affect the degree of automation/digitalization of activities in the company.

$H_{1(B)}$: The level of awareness of Industry 4.0 influences the degree of automation/digitalization of activities in the company.

The pivot table's independence test was used to evaluate the relationship between these variables. The significance level of the test was set at 5 %. All tested data can be characterized as categorical variables. This test was used because it is necessary to verify whether the first factor (within the contribution is size and awareness of Industry 4.0) affects the second factor (degree of use). Generally, the most used test for such verification is the chi-square test. The same test is used in studies, e.g., by Sujová & Simanová (2022). The general prerequisites for the test have been met, namely that more than 80 % of the elements of the table reached a theoretical frequency higher than 5, and 100 % of the characteristics of the table got a theoretical frequency higher than 2. During the test, the following formula was used to calculate the test characteristic (modified by the author):

$$\chi^2 = \sum_{i=1}^r \sum_{j=1}^c \frac{(n_{ij} - e_{ij})^2}{n_{ij}} \quad (1)$$

Where:

χ^2 Chi-square statistics
 n_{ij} Observed frequencies
 e_{ij} Expected frequencies

The calculated value was then compared with the critical value of the distribution (modified by the author), where:

$$\chi^2 \geq \chi_{(r-1)(c-1)}^2(1 - \alpha) \quad (2)$$

Where:

$\chi_{(r-1)(c-1)}^2(1 - \alpha)$ Critical value of the chi-squared distribution

, then H_0 is rejected (Mrkvička & Petrášková, 2006).

4 Results

Based on the research carried out, the technologies most frequently used by SMEs have been identified. On a scale of 0 to 5, respondents rated the technologies listed in Table 2. As can be seen from the table itself, the most commonly used technologies on a scale of 0-5 are primarily Cloud Storage (3,07), followed by Digitalization (2,85) and Cyber protection (2,33). Surprisingly, the use of the Internet of Things remains relatively in the background (1,59). On the other hand, the least used technologies are Machine learning (0,75) and Virtual reality (0,72).

Table 2 Technologies used

Technology	Statistical indicator				
	N valid	Mean	Median	Modus	Standard deviation
Big data	61	0,93	0	0	1,55
Machine learning	61	0,75	0	0	1,30
Internet of Things	61	1,59	1	0	1,48
Artificial Intelligence	61	1,13	0	0	1,48
Smart sensors	61	1,20	1	0	1,42
3D printing/3D scan	61	1,00	0	0	1,53
Cloud	61	3,07	3	5	1,83
Robotization	61	1,34	0	0	1,67
Digitalization	61	2,85	3	4	1,69
Cyber-security	61	2,33	2	0	1,78
Virtual reality	61	0,72	0	0	1,26

Source: own processing

The question remains, however, how this distribution of technology use will change in the future. Table 3 shows how respondents think about adopting new technologies in their businesses in the near term. The potential of technologies was rated on a scale of 0-5, and in the future, Cloud Storage (3,51), Digitalization (3,34), and Cyber Protection (3,00) were identified as key for enterprise deployment. Big data and Machine learning were identified as the technologies with the lowest importance for future adoption (1,28).

Table 3 Future technologies

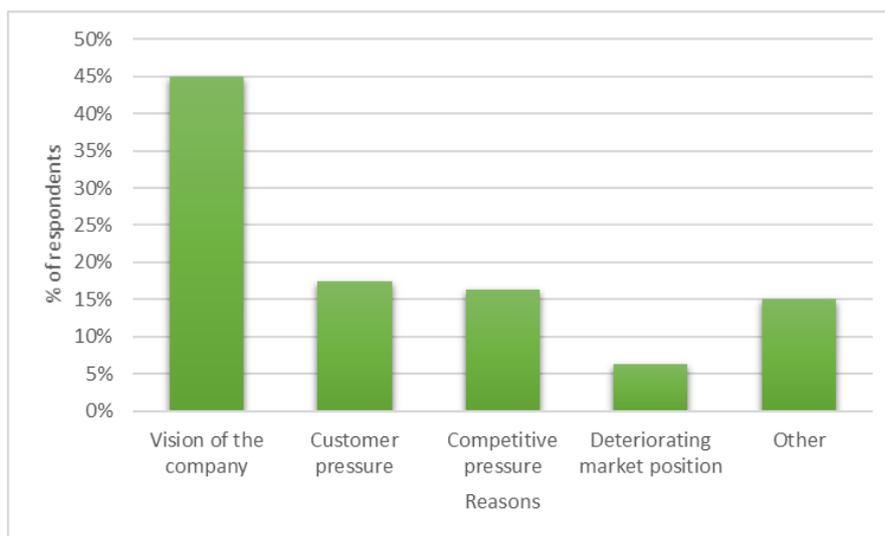
Technology	Statistical indicator				
	N valid	Mean	Median	Modus	Standard deviation
Big data	61	1,28	1	0	1,61
Machine learning	61	1,28	1	0	1,58
Internet of Things	61	2,15	2	0	1,88
Artificial Intelligence	61	1,79	1	0	1,78
Smart sensors	61	1,87	2	0	1,86
3D printing/3D scan	61	1,46	1	0	1,68
Cloud	61	3,51	4	5	1,74
Robotization	61	1,77	1	0	2,04
Digitalization	61	3,34	4	5	1,87
Cyber-security	61	3,00	3	5	1,85
Virtual reality	61	1,54	1	0	1,56

Source: own processing

However, it can be noted as a positive fact that for all the technologies examined, companies expect them to be more useful in the future. The highest difference between the current usage rate and the potential for deployment and use was recorded by Virtual reality (+0,82) and Smart sensors, along with Cyber protection (+0,67). On the other hand, the lowest recorded difference between the current usage rate and the potential for deployment and usage is found in Big data (+0,35).

In general, businesses claim that they support innovation and the introduction of new technologies, which are necessary for their further development. On a scale of -2 (no innovation needed) to 2 (innovation is essential), the average score for all enterprises was 0,72. Based on this knowledge, further development of technologies can be expected in the future. In addition, it is worth mentioning that companies introduce new technologies and implement innovations mainly based on internal pressures. Figure 3 shows the reasons for implementing new technologies in enterprises.

Figure 3 Reasons for implementation of Industry 4.0



Source: Own processing

The next step was to evaluate the working hypotheses. The first hypothesis was formulated as follows:

$H_{0(A)}$: The size of the enterprise does not affect the degree of automation/digitalization of activities in the enterprise.

$H_{1(A)}$: The size of the enterprise affects the degree of automation/digitalization of activities in the enterprise.

To evaluate it, the independence test in the pivot table was used. It was found that the test characteristic χ^2 reaches 4,478. When compared to the critical value of the distribution $\chi^2_{(r-1)(c-1)}(1 - \alpha)$ at significance level $\alpha = 0,05$ and $(r-1)(c-1)$ degrees of freedom, it was found that $\chi^2 < \chi^2_{(r-1)(c-1)}(1 - \alpha)$. In the supplementary calculation, it was observed that the relation $p\text{-value} > \alpha$ holds here. For this reason, the null hypothesis about the independence of the size of the enterprise and the degree of automation/digitalization in the enterprise is not rejected. There is no evidence of a dependence between an organization's size and how strongly it implements new technologies.

The second working hypothesis was constructed as follows:

$H_{0(B)}$: The level of awareness of Industry 4.0 does not affect the degree of automation/digitalization of activities in the company.

$H_{1(B)}$: The level of awareness of Industry 4.0 influences the degree of automation/digitalization of activities in the company.

A test of independence in a pivot table was also used to evaluate it. It was found that the test characteristic χ^2 reaches 5,580. When compared to the critical value of the distribution $\chi^2_{(r-1)(c-1)}(1 - \alpha)$ at significance level $\alpha = 0,05$ and $(r-1)(c-1)$ degrees of freedom, it was found that $\chi^2 < \chi^2_{(r-1)(c-1)}(1 - \alpha)$. In the supplementary calculation, it was observed that the relation $p\text{-value} > \alpha$ also holds here. For this reason, the null hypothesis about the independence of Industry 4.0 awareness and the degree of automation/digitalization in the company is not rejected. There was no evidence of interdependence between the awareness of top managers and responsible persons about new technologies and the degree of their use in the organization.

5 Conclusions

The main aim of this paper was to find out what technologies are most used by small and medium-sized enterprises in the Czech Republic. Secondary attention was then focused on whether the selected variables influence the level of implementation of these new technologies. Based on the evaluation of the questionnaire survey, it was found that three technologies are most often used by small and medium-sized enterprises – Cloud, Cyber protection, and digitalization. Moreover, these technologies are expected to remain the most widely used. In contrast, it was found that the least implemented in enterprises are Machine learning and Virtual reality. In the future, enterprises expect to make the most minor use of Big data and Machine learning. The vision of the enterprise is the main reason for implementing new technologies. Other, less important reasons are the pressure of competition or customers. However, it was found that the size of the enterprise does not affect the degree of automation in SMEs. There was also no dependence between Industry

4.0 knowledge and the adoption rate of new technologies. It is essential to point out that the conclusions drawn from the above can primarily be applied to companies represented in the questionnaire survey. However, according to the low number of respondents, the results of this research can hardly be generalized.

Last but not least, the limitations and barriers of this research must not be forgotten. It is also appropriate to outline possible directions of research in the future. The study was conducted in a defined area, the Czech Republic. Data collection was also limited in time between 2022 and 2023. As a limitation, the entire investigation was carried out online. Several other future research can be carried out, e.g., focused only on a selected sector most strongly affected by this concept. A study with a larger sample of respondents is also appropriate.

The article's authors believe that the selected technologies cannot be directly linked to the field of business in all cases. It is obvious that, for example, digitalization technologies, the cloud, and cyber-protection are suitable and relevant for companies operating in all service and production sectors. At the same time, the authors must point out that the selected technologies, such as big data and machine learning, have a strong connection especially to companies operating in the ICT sector. Robotization and smart sensors then offer a direct relationship with manufacturing companies. It is, therefore, appropriate in the future to observe the development of technologies based on individual sectors.

Acknowledgment

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Limits of home-office in perspective of the amendment to the Czech Labour Code

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Abstract: This paper reacts to the current issue of home-office in the Czech legislation. Currently, an amendment to the Labour Code is to be approved bringing substantial changes to this legal institute. The aim of this paper is to draw attention to those changes because this topic has been legally regulated only marginally. The necessity to adopt legal rules to make home-office function practically was confirmed during the "Covid" era, when this tool started to be used by employers for objective reasons. employers began to massively use this tool for objective reasons. Another significant reason for new regulation is an obligation to harmonize the Czech and EU legal regulation which is based on the Directive 2019/1158/EU on work-life balance for parents and carers and on the Directive 2019/1152/EU on transport and predictable working conditions in the EU. This obligation was already required to be fulfilled up to August 2022. It is necessary to consider whether this regulation would sufficiently respond to the practice needs and whether it makes the usage of this legal tool easier for labour-law relations. Of course, only practice will prove a correctness of such legal changes.

Keywords: home-office, teleworking, agreement on home-office, termination of home-office, entitlement to home-office

JEL Classification: K31, J81

1 Introduction

The aim of the legal regulation of teleworking, for the purposes of this paper as more commonly used term home-office, has to be to eliminate the disadvantage of employees working in such a regime; at the same time, it is necessary to adjust the conditions in order to make the implementation of home-office to the practice easier for both employers and employees. It is general request as it comes to support of all forms of flexible work as the Directive 2019/1158/EU on work-life balance for parents and carers and the Directive 2019/1152/EU on transport and predictable working conditions in the EU do. Those Directives have to be harmonized with national laws thus the Czech Republic reacted by the Labour Code Amendment effective since 1st October 2023.

Home-office is one of the types of flexible working relationships, the application of which should be supported for the full use of the workforce and the flexibility of the labour market. Appropriately set legal conditions will make it easier for both employees and employers (Jouza, 2018). Home-office work performance is closely related to work-life balance. Collins (2019, p. 43) says „... helping people to achieve satisfactory work-life balance becomes even more fraught when work is demarcated by neither time nor place. In future we are likely to see demands from workers, for a legal right to be left alone and a right to turn off email and messaging systems outside working hours.“ Sladká and Kreid (2018) deal more with possible conflict between home-office and work-life balance. Such fact cannot be also overlooked thus the flexible work is more likely assumed to be used by employees-carers. Šimáčková and Havelková and Špondrová (2020, p. 644) stress that: „...making the access to the labour market easier to the carers, flexible forms of work including home-office are good tool. Although in the Czech Republic those persons are quite widely protected, combining of caring and wage-earning roles has not been supported yet. Home-office being considered the tool for work-life balance is rather exception than standard”.

As for the labour law field, home-office was understood more as an employee benefit until recently. But this is no longer the case, because as a result of the coronavirus crisis, it has become a widely used form of work performance. It has to be considered as a fairly established working regime, during the use of which many questions have arisen in practice. Employers often proceeded by trial and error, as the legislation provided only minimal support for such type of work. This situation should be corrected by an amendment to the Labour Code, which adjusts the rules for home-office. This paper tries to discuss whether those adjustments can be useful for the practice.

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The Czech Statistical Office declares that within the pandemic Covid-19 in 2021 60 % of employers enabled partial work at home to their employees. This trend has remained used by many employers even after this crisis. Of course, home-office regime cannot be used by every field; in some areas, home-office cannot be used at all, contrary to that, in some areas home-office is easy to be used such as administrative, IT, media (Český statistický úřad, 2022). At the same time, it is necessary to react to the fact that development in technologies brings new options of flexible working arrangements. Modern trends include home-office, teleworking with smart working or cloud computing, when physical presence of the employee is not necessary. Legal regulation has to react to a dynamic development of dependent work and decline in its traditional conception, mainly in some professions (Bělina, 2017).

Home-office in the sense of the law means that the employees do not work at the employer's workplace, but according to the agreed conditions, they perform the agreed work for him at another agreed place. For home-office, the decisive feature is the place of work, which determines and at the same time distinguishes the employment relationship of employees who do not work at the employer's workplace from the employment relationship in which employees work at the employer's workplace. Such setting requires a higher amount of employer's trust towards employee and a higher amount of employee's independence and responsibility (Vrajík and Marada, 2021).

New legal regulation makes the rules for home-office more precise. The request for written agreement conclusion is determined and home-office working regime is to be ordered only in exceptional cases determined by the law. Nevertheless, there is no content of this agreement adjusted so contractual parties are left to their will to stipulate conditions for home-office work. The law regulates working hours schedule in case the employee sets it by himself as well as costs compensation arising in relation with home-office work to the employee. The absence of costs compensation in the law has been considered by the practice very contradictorily. Morávek (2022) mentions that some employers adopted wrong opinion that compensation does not have to be provided with at all or can be added to the salary as a bonus. At last, it is needed to say that home-office is adjusted specifically for carers but only as an option not as an entitlement.

The aim of this paper is to draw attention to changes in home-office legal regulation and to answer the question whether this regulation sufficiently responds to the practice needs and whether it makes the usage of this legal tool easier for participants in labour relations.

2 Methods

This paper is elaborated on literature review and interpretation of legal regulation using relevant judicature. To achieve the results, methods of analysis and deduction are used in this paper, too.

3 Research results

In order to achieve the aim of this paper, there is an analysis of new home-office legislation carried out. Attention is also paid to some problematic issues related to this form of work performance and the practice of employers and employees, which are not being sufficiently addressed by legislation.

3.1 Agreement on home-office by the Labour Code Amendment

The written agreement on home-office work between an employer and an employee is a formal condition, which has to be fulfilled to make such agreement valid. This agreement can become a part of employment contract or can also be concluded separately. Condition of a written agreement does not apply only in situations of crisis or public health protection, when the employer can order remote work (Act No. 240/2000 Coll., Crisis Act, as amended and Act No. 240/2000 Coll., on the protection of public health, as amended). The law does not regulate a content of the agreement on home-office though, nevertheless, in the explanatory report to the Labour Code Amendment, there is recommended what is suitable and, in the author's opinion, necessary to be adjusted for the practical use. For sure, it is the place of remote work performance, or more places. Judicature can be used to specify that the workplace is a municipality, region, territory of the Czech Republic, an organizational unit or another designated place where the employee has committed to work for the employer in the employment contract. (Supreme Court: 21 Cdo 4596/2014). They way, in which the employer would conduct the employee's work, assign the tasks and control their fulfillment is another important provision of agreement on home-office. By such way, email, phone contact or personal tasks overtaking are meant. Agreement that the employee would work some days at employer's workplace, some days at home is not excluded. The questions of working hours, occupational health and safety (OHS) or duration of agreement should be taken into consideration, too.

The law implements unequivocal process of agreement on home-office termination. The agreement can be terminated in two ways – by written mutual agreement or by written notice. As for the agreement, there is the date of home-office ending important, reasons do not have to be specified. The employer and the employee can terminate the home-office agreement without giving the reasons or for any reason. There is 15-day termination period but there is an option to agree

on different termination period (but the same for both employer and employee), or the option of termination can be excluded. In such case, contractual parties can terminate the agreement on home-office only by mutual agreement.

The question of home-office working hours is adjusted for cases when there exists mutual agreement that the employee is entitled to plan his working time. Such regime is said to be full-fledge home-office. The Labour Code determines that in such cases, a working hours schedule, an idle time and working eruptions due to adverse climatic conditions will not be applied. The employer though has to determine a fictive distribution of working hours into a shift for the purpose of compensatory wage at temporary capacity for work and for leave. But, general requirement applies that the length of the shift must not exceed 12 hours. In the full-fledge home-office regime, the employee is not entitled to compensatory wage at other important personal obstacles to work (e.g. visit at the doctor, accompanying the child when visiting the doctor, child birth). The second variant of the home-office, prevailing in practice, non-full-fledge home-office is. In this regime, the employee is not entitled to plan his working hours. This type of home-office is not influenced by the special regulation of distribution of working hours. It is important to stress that the home-office work does not free the employer from the duty to keep the records of working hours. Based on the decision of Supreme Court: 21 Cdo 1916/2004, the Labour Code does not determine how the working hours should be administrated. It is the only employer's responsibility what way of working hours' record he would choose in order to make provable whether the employee fulfilled or did not fulfill the determined or agreed working hours, when he did it, in what range or any other facts being important when assessing entitlements.

Another very important question when considering home-office, the reimbursement of expenses incurred in connection with the home-office performance of work is. Such regulation has been significantly lacked by the practice. There are two options. Either the employee applies the reimbursement of costs arising during home-office work and he proves it, or the employer would provide him with lump amount to compensate him the costs. Lump amount could be agreed in the agreement on home-office or it could be regulated by internal company regulations. The amount is determined in the regulation by the Ministry of Labour and Social Affairs of the Czech Republic. As for the tax law, such compensation is not considered the income. In case, the employer would give the employee compensation higher than determined one, the difference between determined and factually given compensation is considered the income, though. The aim of lump amount regulation is to make the agenda of costs related to home-office easier. The Labour Code Amendment also adjusts the option of mutual agreement between the employer and the employee thus the costs compensation would not be provided at all. Here, it is necessary to draw attention to a possible polemic whether such agreement would be in accordance with the rules of dependent work and in accordance with the constitutional order of the Czech Republic (Liškutin, 2023).

The Labour Code has newly amended the possibility to apply for home-office for pregnant employees and employees taking care of a child under the age of 9 or taking care of a dependent person for long time (i.e. a person who is dependent on assistance of another person in providing basic life needs). Those persons can apply for home-office work; in case the employer would not oblige, he would have to give reasons for such decision in written. In this context, the author stresses the fact that original amendment included an entitlement not only option for said person to work at home (above that, taking care of a child up to 15 years of age). A denial of such request should have not only been justified by the employer but also proved by serious operational reasons. If at least the proposed rejection of the application for serious operational reasons were to be maintained, the implementation of home-office for these persons would be more respected by employers, referring to the analogous use of case law regarding the definition of serious operational reasons. For example, the decision of the Supreme Court No. 21 Cdo 1821/2013 determines the criteria for assessment of serious operational reasons. Those are: number of employees, their mutual replaceability, determination of those employees' work and intensity of possible disruption of employer's operation in case application for home-office would be agreed. By the operation, tasks and other activities fulfillment is meant. Denial of application for home-office could be taken into consideration in case such work would make the operation impossible, disrupt it or somehow seriously put it into danger (Supreme Court: 21 Cdo1561/2003). In the case of an obligation to justify the rejection of an application on the basis of the above criteria, it would necessarily be more difficult for the employer to defend such a procedure and, in principle, it would only be possible for employees, in view of their specialization, whose presence at the employer's workplace would be objectively necessary. It can be assumed that due to this, the current home-office arrangement will not greatly improve the possibilities of the mentioned persons in relation to the requirements for increasing the flexibility of employment relations and work-life balance. However, this does not fully comply with the requirements of Directive 2019/1158/EU on work-life balance for parents and carers.

Finally, it should be mentioned that compliance with the set rules for home-office is also supported by the new regulation of sanctions that can be imposed on employers for non-compliance. According to the amendment contained in the Labour Inspection Act (Act No. 251/2005 Coll., as amended), the control body - the labour inspectorate - can impose a fine of up to CZK 300,000. This is a violation of the obligation to conclude a home-office agreement in written, a violation

of the obligation to schedule working hours into shifts for the purposes of taking vacation and wage compensation, and a violation of the obligation to provide compensation for costs to which the employee is entitled. In addition to these cases, the employer may be fined up to CZK 200,000 if he does not justify the rejection of a home-office request of pregnant women and carers (as described above) in written.

3.2 Safety, health protection and control at home-office

The Labour Code does not have any special regulation for the occupational safety and health at home-office thus it is necessary to solve this topic individually accordingly by general law. Individual cases are solved by concrete environment conditions, in which the home-office is provided. It is clear, that general rules of OHS are not easy to be applied at home-office but the employer should provide with at least the minimum, mainly OHS training, safety equipment, e. g. first aid kit and fire extinguisher. In the home-office agreement, it is more than appropriate to regulate the possibility and method of checking the workplace. It can be a remote control, e.g. in the form of photo documentation or a webcam, but a physical control can be also provided. Rejchrtová (2021) also admits an option to replace the control by the employee's statutory declaration on suitability of place for home-office. It must be emphasized that home-office employees are obliged to respect the principles of occupational safety and health like all other employees, and if they do not cooperate with the employer in this regard, they risk that in the event of health damage the employer will be released from responsibility for an occupational accident. According to the findings of the state control authorities, accidents at work occur at a minimum when working outside the employer's workplace. However, this does not mean that employers should not pay attention to this issue. For this reason, an agreement between the employer and the employee in the event of an occupational accident is important, which will allow the employer to enter the workplace to investigate the causes and circumstances of the occupational accident. Any occupational accident will be investigated in the same way as, for example, an occupational accident that would happen at the employer's workplace in the late afternoon or evening, when the employee himself was present. Among employee's obligations as it comes to the occupational safety and health field the obligation not to work under the influence of alcohol or other addictive substances is. A control by the employer cannot be ruled out even in the case of a home-office, however, certain conditions have to be followed; the control would be e.g. provided at an open door to the employee's apartment, where an orientation test for alcohol with a detection tube by an employee authorized by the employer would be provided (Brůha, 2021). Rejection of such control could be considered the violation of employee's duties. It is evident that as for occupational safety and health, an application of legal regulation of home-office is unsuitable and hard to be executed. Therefore, it would be very appropriate to adjust special conditions for duties of both employers and employees in this area.

Employers should also pay attention to IT infrastructure and cyber safety. Home-office usually demands the usage of modern technologies. Employees often work with the Internet, use the virtual private net (VPN), email etc. By the Czech Statistical Office, 97 % of big companies with more than 250 employees offer VPN access to their employees and 57 % of small companies with up to 50 employees (Český statistický úřad, 2022). Therefore, it is necessary to keep in mind a possible data and information leak. The possible use of BYOD – bring your own device – is not without risk, as the home-office regime does not absolve employers of their obligations to protect personal data, and it is difficult to prove any violation and enforce any sanctions on employees (Vrajík and Marada, 2021).

Another area employers have to deal with individually without much support of the law is the control of the employee's work performance and the fulfillment of his work tasks. The employer's right to control the employee's work results from the nature of dependent work and also applies to work performed in the home-office mode, where physical and remote control (phone, online forms) can be considered. Certain difficulties can relate to physical control, as it is necessary to respect the protection of personality, the right to privacy and the inviolability of the home. The employer should not carry out the control in a bullying manner, e.g. too often, early in the morning, late in the evening or at the weekends (Brůha, 2021). It is also necessary to remember that the employee is not obliged to let the representative of the employer (carrying out the control) into the apartment or house. However, at least the employee's minimum cooperation is requested, i.e. communication at the door or through the open window. To specify what is no longer the employee's obligation during such a control, the Supreme Court Decision: 21 Cdo 5126/2014 can be cited containing that the employee's obligation to allow the employer the control and to provide the necessary cooperation does not include his obligation to mark the place of residence with the necessary data, such as name on the door bell or on the mailbox. The said court decision concerned the control of the regime of an employee who is temporarily unable to work, but it can be assumed that the court would process the control of the employee in the home-office regime in the same way. When dealing with the question of control, it is necessary to remember that the home-office employee cannot of course be at the employer's disposal 24 hours a day. The employer should determine a time for the rest - a time without contact, especially for employees who work in a full-fledged home-office. The control of working hours in the home-office regime depends on its type. If the employee plans his working hours by himself, the control is irrelevant. Just to make it clear (Brůha, 2021), the home-office with flexible working hours can be controlled by the employer but only its compulsory basic part. Similarly, when

hybrid type of home-office is concerned (partial work at home, partial work at employer's facility). Logically, the control is allowed only within days determined for home-office.

In the end, the proposed amendment to prevent the social isolation of employees in the home-office regime did not make it into the Labour Code. Sometimes referred to as the "the right to the friend" (Morávek, 2022). During the home office regime, social isolation is obvious and can have negative not only social, but also psychological and health consequences. It would be suitable not to abandon this topic and pay attention to it in further legal regulations; despite the fact that many employers who use home-office to a greater extent do not underestimate these issues and try to take measures to support contacts between employees, e.g. in the form of coworking.

4 Conclusions

In the latest amendment to the Labour Code effective since 1st October 2023, the legislator introduces the home-office adjustment, which aims to answer the most frequent questions of employers arising from the practice. The legislator adjusted the home-office on the principle of contractual freedom. The condition for home-office is a written agreement between the employee and the employer, but the law does not stipulate its content. It is thus left to the will of the contracting parties how they agree on this work performance regime. On the one hand, it has to be appreciated that this agreement is left fully under the direction of the specific employee and the specific employer, knowing that it will be possible to solve the specifics of different practice flexibly. On the other hand, however, it has to be admitted that the legal regulation of certain requirements would be a certain guarantee of the relevant content of the agreement. After all, even the explanatory report to the Labour Code Amendment states that employers should pay attention to the content of this agreement and adjust the conditions essential for the home-office regime. The Labour Code determines specific rules for terminating a home-office agreement. It also regulates how to proceed employee's working hours being scheduled by himself as well as the reimbursement of costs in the case of a home office.

However, only the practice will show whether the implementation of new legal regulation would fulfill employers' expectations. Unfortunately, some questionable points can be already mentioned now as addressed in the Research results. Those are mainly OHS aspects, solution of which is left to the employers while respecting the general legislation. As for the practical execution of the control, it is problematic issue as well. Questions regarding measures preventing the social isolation of employees in the home-office regime, which will inevitably be dealt with in the future, are left aside. The adjustment for carers also failed to meet expectations, as the original intention to enshrine the entitlement of these persons to a home-office was changed only to the possibility of applying for it with no guarantee that the employer would grant it.

When evaluating new Czech home-office legislation, a comparison with the legislation of this institute in the EU states suggests itself. Home-office, more precisely telework, is governed by the European Framework Agreement on telework of 2002. It defines telework and sets up a general framework for working conditions of teleworkers at European level. Another document being relevant to this issue is the European Social Partners Framework Agreement on Digitalization of 2020 related to "connections and disconnections" which are to be provided in accordance with practice in particular member states. In 2021, the European Parliament adopted a resolution with recommendations to the Commission on the right to disconnect. It should also establish minimum requirements for remote working and clarifies working conditions, hours and period for the rest. In the EU, there is no universal approach to the home-office regulation yet. Different sectors and businesses in member states require different arrangements and procedures and this fact needs to be taken into account when preparing EU legislation in this area (Eurofound, 2022).

Slovakia and Poland can be mentioned briefly as examples for comparison. Just as the Czech Republic, both states implemented new home-office regulation to their Labour Codes based on similar principals as the Czech one. However, compared to the Czech regulation, Polish and Slovakian are more detailed; they consider the questions of occupational safety, to which the Czech legislation has not reacted yet and could be inspired by. Among other things, the Slovakian Labour Code explicitly requires the employer to ensure the protection of data used during teleworking and to prevent the isolation of employees working at home by enabling them to meet with other employees. The Polish Labour Code, for example, determined the employer's obligation to draw up an occupational risk assessment and the principles of safe work to be respected by the employee before allowing a home-office. The paper author anticipates a more detailed elaboration of the home-office issue in EU countries. It is a topic for an individual study based on the comparison of legal regulations and home-office functioning in the Czech Republic and EU member states.

This paper clearly shows that home-office is a topic that deserves attention. There is a room for further consideration of issues that have not yet been sufficiently addressed by legislation, but, at the same time, those that are regulated by the Labour Code Amendment. As the effective period of new legal regulation has been short so far, it is necessary to wait for feedback from the practice and based on it relevantly assess its consequences as it comes to the rights and duties of both

employees and employers. Only practical experience will show whether the new regulation adequately addresses this legal instrument and creates suitable conditions for its realization.

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Implementation of the environmental management system in order to build the image and increase the competitiveness of the company

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Abstract: Based on the research studies of several authors who perceive the environmental management system as a tool that helps to increase the competitiveness of the company, the main goal of the contribution is the identification of barriers in the framework of building the corporate image and increasing the competitiveness of the company through the implementation of the environmental management system according to the requirements of the ISO 14001 standard in selected company. By applying a structured guided interview with the managers of a specific department of a multinational food company, based on their answers, we investigated the current situation and limitations within the framework of building the company's image and increasing competitiveness through the implementation of the environmental management system.

The result of the work is the finding that the implementation of the environmental management system in the selected company does not go through the entire organizational structure of the company, and managers in a specific department identified many reserves in the framework of building the corporate image and competitiveness. Based on the above, the managers of a specific department in the company do not perceive the implementation of the company's environmental management system as a tool that contributes to building a positive image and competitiveness of the company.

Keywords: environmental management system, ISO 14001, ISO, company, corporate image, competitiveness

JEL Classification: L15, L22, Q50

1 Introduction

Climate change is a constantly inflected term. According to Durán Romero et al. (2020) it represents a growing threat to our society that requires collective action. According to Lemkowska and Wiśniewska (2021), the impact of man on the state of the environment has been troubling humanity for centuries, and it was the arrival of the 20th century that brought awareness of the irreversibility of environmental changes and encouraged humanity to take steps to protect it. The aforementioned attention of society towards climate change is also mentioned by Barrow (1999), who also talks about the need for an integrated approach full of proactivity to environmental issues. According to Thabit (2021), this is considered one of the most important elements, thanks to which civilization was created. In addition, according to the author, it also contributes economically, by providing natural resources that also serve as production factors. Therefore, in recent years, according to Abid et al. (2021) to monitor the increasing number of new laws or policies for those sectors in the country that are directly responsible for the protection, but also the destruction of the environment. Attention is also directed towards business, which, according to Ociep-Kubicková, Desková and Ociepová (2021), must be carried out hand in hand with care for the environment. According to Thabit (2021), several procedures are emerging, the aim of which is to preserve and protect the environment or strive for sustainability. The solution is various environmental programs, which, according to Sam and Song (2022), stand out as a tool that complements the control process and makes it possible to reduce environmental pollution through procedural changes, redesign of products and packaging, or through innovation of control technologies. According to Arocenao, Orcos and Zouaghi (2023), environmental management and the environmental management system become a central topic in companies.

Karkalíková (2017) refers to the environmental management system as a business management system, which, according to Uberoia (2003), is implemented in a complex, formal, planned, documentable way, and in addition, according to Murmuraová et al. (2018) also in a systematic way. Gazoulitová and Oubal (2021) consider the environmental management system also a management tool and add that it allows organizations to control their impact on the environment. Murmuraová et al. (2018) state that the environmental management system forces companies to perform regular audits. Uberoi (2003) also claims that the environmental management system must go into the organizational structure, be a part of planning, but only its implementation is not enough, it must also be maintained.

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Arocena, Orcos and Zouaghi (2023) argue that several certifiable environmental management standards have been developed to help minimize negative environmental impacts. ISO 14 001 is according to Bashir et. al (2022) one of the most frequently issued and, according to Arocena, Orcos and Zouaghi (2023), also one of the most important certifications in the environmental field. According to Sam and Song (2022), it continues to grow and is widely adopted by organizations around the world. The ISO 14 001 standard was, according to Murmurová et al. (2018) published on September 1, 1996, by the International Organization for Standardization (ISO) as added in their works by Sam and Song (2022) and Ociepa-Kubicková, Desková, Ociepová (2021). It provides a kind of basic framework for the creation of an environmental management system on an international scale, say Murmurová et al. (2018). According to Sam and Song (2022), ISO 14001 is a voluntary program, which, according to Turk (2009), is an internationally recognized system enabling the continuous improvement of environmental behavior at the organizational level, which is carried out through the minimization of harmful environmental impacts and also continuous improvement. According to Rin and Salvador (2017), the ISO 14001 standard, with its full title Environmental management systems: requirements with instructions for use, was developed with the intention of helping to find a balance between financial and economic interests and environmental impacts, while this effort was directed to organizations and businesses. In addition, Bashir et al. (2022) add that it is aimed at providing various management practices or necessary principles necessary for the development and implementation of the environmental management system in organizations. Arocena, Orcos and Zouaghi (2023) also confirm the assistance to companies in the implementation of environmental impact management systems. However, they also add that the adoption of ISO 14 001 signals companies' commitment to environmental protection, which can help polluters or companies from developing countries overcome the legitimacy deficit. According to Cañón-de-Francio and Garcés-Ayerbe (2009), the international standard ISO 14 001 allows to increase the awareness of interested parties that the given organization applies an environmental management system, and at the same time it is a tool for promoting legitimacy.

According to Karkalíková (2017), the ISO 14 001 standard allows companies to differentiate themselves from their competition, because it improves the image of the company, helps increase market share, create better working conditions, but also expands awareness of the organization, which is ultimately reflected in the growth of the number of new customers, namely those who are more aware in the field of environmental protection and thus have higher demands. López-Gamero, Molina-Azorín (2016) mention "green customers" who increase the demand for sustainable products and appreciate the environmentally conscious behavior of companies. Environmental investments can have a positive effect on the competitive advantage and the performance of the organization itself, as claimed by Molina-Azorín et al. (2015). According to López-Gamero and Molina-Azorín (2016), companies with proactive management focused on environmental protection can benefit from a premium price, and thus, according to Molina-Azorín et al. (2015) benefits not only the company, but also the environment.

The result of the research of Irald, Test and Frey (2009) is the following finding: in order for the ISO 14 001 standard acceptance certificate in the organization to act as a competitive advantage, the environmental management system must be implemented in the company to the extent that it permeates the entire organizational structure. According to the authors' research, the competitive advantages associated with the adoption of the ISO 14001 standard are often poorly perceived in the market. This is because companies do not adequately communicate the information that they hold the ISO 14 001 standard acceptance certificate to the external environment, i.e. to customers. In order for the ISO 14 001 standard to serve as a tool for competitive advantage in the organization, the authors suggest that organizations strengthen external communication and also suggest increasing customer awareness of environmental guarantees through various public communication campaigns.

As part of the research, we decided to obtain primary data from Nestlé Slovensko, s.r.o., which is considered the largest food manufacturer and distributor in the Czech Republic and the Slovak Republic. The company Nestlé Slovensko, s.r.o. is a holder of ISO 9001:2015, EN ISO 14001:2015 and ISO 45001:2018 certificates.

2 Methods

The main goal of the contribution is the identification of barriers within the framework of building the corporate image and increasing the competitiveness of the enterprise through the implementation of the environmental management system according to the requirements of the ISO 14001 standard in the selected enterprise. By applying a structured guided interview with the managers of a specific department of a multinational food company, based on their answers, we investigated the current situation and limitations within the framework of building the company's image and increasing competitiveness through the implementation of the environmental management system.

We decided to carry out the research activity in the form of a structured interview with two managers in the infant nutrition department at Nestlé Slovensko, s.r.o. In recent times, we have observed an increased level of interest of companies in Slovakia in the environment for these products, mainly due to the fact that manufacturers are replacing

product packaging with packaging that has less impact on the environment. In addition to the environmental interest of the companies themselves, we also observe a higher level of environmental awareness among current mothers who are thinking about the sustainability of products.

When creating the questions for the structured interview, we were inspired by the research by the authors Irald, Test and Frey (2009), who claim that the implementation of ISO 14 001 provides benefits in terms of not only environmental but also economic performance. Karkalíková (2017) claims that thanks to ISO 14 001, the company can increase its market share, expand awareness of itself, which, according to her, leads to an increase in new customers. The advantages are also mentioned by the authors Molina-Azorín et al. (2015): improving relationships with stakeholders, where we can also include customers. However, some studies according to Iraldo, Testao and Frey (2009) revealed that the mentioned benefits are not always possible to quantify. Therefore, the authors decided to test the effects of adopting an environmental management system on environmental and competitive performance on a sample of companies. The goal of their work was to identify and evaluate the impact of the environmental management system on competitive performance.

The structured interview consisted of ten questions, while these questions are divided into areas oriented to market performance, innovation performance, resource efficiency, questions focused on the intangible side and orientation to environmental performance itself.

Based on the research of the authors Iraldo, Testa and Frey (2009), the questions of the guided interview were as follows:

a) *aimed at market performance:*

- Has your organization achieved higher customer satisfaction thanks to the environmental management system?
- Has your organization gained an increase in market share thanks to an environmental management system?

b) *aimed na innovation performance:*

- Has your organization improved its capacity for technical innovation thanks to the environmental management system?
- Has your organization improved its ability to innovate its organizational or management structure thanks to the environmental management system?

c) *aimed at resource efficiency:*

- Has your organization experienced cost savings through reduced resource use, reuse or recycling as a result of the environmental management system?
- Has your organization experienced cost savings through waste reduction thanks to an environmental management system?

d) *aimed at intangible side:*

- Has your organization achieved greater employee motivation and participation thanks to the environmental management system?
- Has your organization perceived an improvement in image and reputation thanks to the environmental management system?

e) *aimed at environmental performance:*

- How has the environmental behavior of your organization changed in recent years?
- How does your organization's environmental performance compare to other organizations in your sector?

As part of the actual implementation of the interview at Nestlé Slovensko, s.r.o. we personally approached two representatives. Key account manager for the infant formula division focusing on the modern and traditional market and key account manager for the infant formula division focusing on the medical environment. The addressed managers are the only managers responsible for the infant formula division at Nestlé Slovensko, s.r.o.. For this reason, we consider their opinions to be representative. Both managers gave us answers to questions at a personal meeting that took place in person on March 14, 2023 in the ROSUM building, Bajkalská 19B, 821 01 Bratislava.

We subjected the received answers to analysis and then comparison with the aim of formulating proposals for improving the current situation.

3 Research results

The company Nestlé Slovensko, s.r.o. realizes that the quality of food products is extremely important and is an instrument of trust between customers, consumers and the company itself. The company has been building this trust since its inception, precisely by setting high requirements for the quality of its products. Ensuring the quality or safety of products is the second most important point that the company has determined in its ten "Principles of Business". It is precisely with this principle that Nestlé Slovensko, s.r.o. it makes a promise to consumers that the product the company sells is safe and also meets high quality requirements. In addition to the fact that the company aims to offer only products that meet the expectations and preferences of customers, the company also complies with all food safety requirements, whether internal or external, quality and regulatory. In all the countries in which Nestlé operates, it maintains safety standards in the production, distribution and sale of food because it believes that quality is a responsibility. Nestlé has also developed a Nestlé Quality Policy document, as part of its Business Principles, in which it informs about its "Good Food, Good Life" concept ("good food for good life"). They do it by providing food or drinks of the highest quality. In addition to the aforementioned documents, Nestlé Slovensko, s.r.o. has also own internal system for quality management. This system consists of three parts: the management cycle and its continuous improvement, the management system based on processes and the most important part, which is the quality standards - various requirements, based mainly on the local legislation and regulations of the country.

The findings within the individual areas, resulting from the implementation of a guided interview with the managers of the selected company, are as follows:

3.1 Orientation to market performance

From the point of view of focusing on market performance and because, according to de Fonseca (2015), the ISO 14 001 standard makes it possible to increase the satisfaction of companies' customers, we were interested in whether it is possible that thanks to the implementation of the environmental management system, i.e. the ISO 14 001 standard, customers can be of Nestlé Slovensko, s.r.o. really more satisfied in the field of infant formula.

However, the manager of key customers focusing on the medical environment first informed us of the fact that he does not have the data available from his position, thanks to which he could clearly answer our question. However, if he had such data, and if he could see a data-supported connection between the implementation of the ISO 14 001 standard and the satisfaction of customers of Nestlé Slovensko, s.r.o.'s infant formula products, he would certainly include them in communication with customers.

However, the manager of key customers with a focus on the modern and traditional market is convinced that the majority of customers in general, as well as customers of Nestlé Slovensko, s.r.o., already take into account factors such as price and quality during their purchase, as well as many others, while environmental. According to her, the area is one of the most frequented. This is also why, according to her, the company's customers appreciate the fact that they are made in a company that has recently devoted itself very intensively to the topic of environmental protection. At the same time, he believes that, thanks to the environmentally conscious approach of Nestlé Slovensko, s.r.o., customers of infant formula also have reason to be more satisfied.

As part of the market performance, we were also interested in whether the company's market share in the field of infant formula increased thanks to the implementation of the environmental management system, while we found that the growth or decrease of the market share in the category of infant formula products has an impact a wide range of factors, but at the same time, as a result of the implementation of the ISO 14 001 standard, the company gains prestige and a good name on the market, which ensures trouble-free trading, especially with customers such as retail chains. We have found that it is very difficult to quantify the effect of the implementation of the environmental management system at Nestlé Slovensko, s.r.o. on the change in market share, or its increase. The company does not have direct evidence of the extent to which the implementation of the environmental management system can increase market share in the field of infant formula. However, he believes, on the basis of consumer research, that it is possible to confirm the opinion that, in general, the implementation of an environmental management system increases market share in the field of infant formula.

3.2 Orientation to innovative performance

Innovative performance is a very important component in companies, and that is why we were interested in whether Nestlé Slovensko, s.r.o. was able to improve its capacity for technical innovation in the field of infant formula thanks to the adoption of the ISO 14 001 standard. We found that not only the infant formula division, but also the entire Nestlé organization is subject to constant technological changes and innovations, while both managers involved in the survey could not unequivocally confirm or deny the fact, if Nestlé Slovensko, s.r.o. was able to improve its capacity for technical innovation in the field of infant formula by adopting ISO 14 001 without evidence based on concrete data. Although the

field of technical innovation is affected by a combination of factors and one cannot be separated from the other, the ability of technical innovation is also very closely connected with the environmental management system in the company.

3.3 Orientation to resource efficiency

Among the main advantages of the ISO 14 001 standard by Murmurová et al. (2018) and Karkalíková (2017) also consider more effective cost management and their reduction. For this reason, we were interested in whether Nestlé Slovensko, s.r.o. has also seen cost savings through reduced resource use, reuse or recycling thanks to the environmental management system, specifically in the area of infant formula. Here we learned that the managers contacted by us do not receive information about the amount of cost savings or even about the existence of cost savings as a result of the adoption of the ISO 14 001 standard, and monitoring this is not the content of their work. However, they are aware that recently recycled materials have been increasingly used, especially packaging materials, but they also do not know the percentage of how much packaging has been replaced with new, recyclable or recycled ones. However, according to them, this does not mean that there are cost savings. In general, they believe that the introduction of an environmental management system in a company does not even equate to cost savings.

In addition, we were interested to see if they had experienced cost savings through reduced infant formula waste due to the environmental management system adopted by the company. We found that the managers we contacted do not have such information and add that even in this case it is true that, according to them, it is not an equation of two unknowns and they believe that waste reduction is not directly related to cost savings.

3.4 Orientation to intangible side

We were interested in whether the infant formula department of Nestlé Slovensko, s.r.o. thanks to the implementation of the environmental management system, improving the image and reputation of the company. We learned that between the implementation of the ISO 14 001 standard, i.e. the implementation of the environmental management system and the improvement of the company's reputation or image, it is mainly in the field of infant formula, but rather as a result of the already mentioned various innovations that the company adopted thanks to the certification of the ISO 14001 standard. The consumer base of baby food products in the company changes logically approximately every 3 years, therefore they monitor this area in the company, and thus they can clearly confirm that consumers are very sensitive to the topic of the environment and the certificate on the implementation of the ISO 14 001 standard should be a guarantee for consumers quality, and even more so when it comes to such unique products as infant formula.

3.5 Orientation to environmental performance

In terms of environmental performance, we were primarily interested in how the environmental behavior of Nestlé Slovensko, s.r.o. changed. in recent years in the field of infant formula. Nestlé is the largest food company in the world and is all the more aware of the impact of its decisions. Therefore, it approaches the fulfillment of obligations connected with the environment with all seriousness, including through the environmental management system. The manager of key customers with an orientation to the medical environment mentioned to us specific examples of changes, namely the change in the composition of products to reduce the use of palm oil, which, according to him, the company replaced with more ecological variants. In addition, he also mentions again the change of packaging materials, where the company is aware of the highest carbon footprint, and therefore replaces these packaging with recyclable ones. Here, the manager of key customers with an orientation to the modern and traditional market adds that Gerber brand infant formula, which falls under Nestlé Slovensko, s.r.o. is the first of its kind to use packaging made of mono material, which significantly simplifies recycling. The managers also mention the change in the form of ending the production of those infant formula products that were too difficult to produce, even from the point of view of the environment.

Since the topic of the environment is increasingly in the foreground and the main advantage, and at the same time one of the goals of the ISO 14 001 standard is mainly to reduce the burden of companies on the environment, at the end of our structured interview we were interested in whether the company Nestlé Slovensko, s.r.o. make constant efforts in the environmental field to maintain or improve the company's position on the infant formula market. The manager of key customers with an orientation to the medical environment answered our question absolutely unequivocally, namely that Nestlé Slovensko, s.r.o. in general, and not only in the field of infant formula, it must and wants to make constant efforts to maintain its market position or improve it, as it is aware of its impact on the environment, but also its impact on the public. The manager of key customers with an orientation to the modern and traditional market mentions Nestlé's philosophy here, which is continuous improvement, and according to her, the environmental field is no exception. He claims that the company is taking all steps to make progress in the field of infant nutrition, and commitments to the environment are a challenging but important part of that.

4 Conclusions

From the structured interview, it follows that the company in the field of infant formula monitors and evaluates the impact of the implementation of the ISO 14 001 standard only to a very small extent, which causes that the advantages that, according to several authors, the environmental management system should bring in organizations, are perceived by managers from the department of infant formula very poorly, although they are aware of the importance of implementing the ISO 14 001 standard. The structured interview does not show that the implementation of the ISO 14 001 standard in Nestlé Slovensko, s.r.o. in the area of infant formula products could increase the company's competitiveness on the market. In this case, managers in the field of infant formula mainly lack concrete data from which they could evaluate the benefit or effect of adopting the ISO 14 001 standard. One of the managers' answers shows that they do not even communicate to customers the fact that Nestlé Slovensko, s.r.o. holds the certificate of acceptance of the ISO 14 001 standard. This indicates that the company in the field of infant formula does not inform its customers about the fact that it holds this certificate in a sufficient way.

The result of our structured interview is that Nestlé Slovensko, s.r.o. in the field of infant formula, it does not adequately communicate to customers that it holds a certificate of acceptance of the ISO 14 001 standard. This is mainly due to the fact that the Nestlé company does not investigate and evaluate the impact of the implementation of this standard on the company's competitiveness. Managers do not have relevant information that they could communicate to customers in order to build a positive image of the company.

We believe that, as in the research of Iraldo, Testa and Frey (2009), the environmental management system must be implemented in the company to such an extent that it penetrates through the entire organizational structure. If it is insufficiently communicated to customers, it will not help build the corporate image, nor will it act as a competitive tool for the company's capabilities. Also, if the company does not provide customers of infant formula products with information that the company holds a certificate of acceptance of the ISO 14 001 standard, it cannot then evaluate the contribution of this standard to the company's competitive ability, and thus not even provide specific data to its managers.

According to Tourani (2022), organizations should communicate with their customers in order to better understand their needs, but also in order to better satisfy these needs and for this reason we decided to propose to Nestlé Slovensko, s.r.o. for the infant nutrition department, a communication strategy oriented towards the external environment.

For Nestlé Slovensko, s.r.o. we suggest to improve internal and external communication, by designing and implementing a suitable communication strategy in retail chains on the packaging of the products themselves, by designing and implementing a suitable communication strategy on the website and on social networks. The company Nestlé Slovensko, s.r.o. should, in our opinion, focus on the communication of the fact that it holds the certificate of acceptance of the ISO 14 001 standard, primarily on the packaging of the infant formula products themselves. In this way, the company communicates with the BEBA brand that the packaging and the measuring cup are made of renewable bioplastics. We believe that, in addition, the company should also state on the packaging that it holds the certificate of acceptance of the ISO 14 001 standard.

The company Nestlé Slovensko, s.r.o. together with Nestlé Česko, s.r.o. has created a website specifically for mothers called Nestlé Baby & me, on which the company promotes its infant formula products, but mothers can also find useful advice and become members of the club Nestlé Baby & me (Nestlé baby & me). In our opinion, this page is a suitable tool that can be used to improve internal and external communication of Nestlé Slovensko, s.r.o. about the fact that the company holds a certificate of acceptance of the ISO 14 001 standard. We suggest that the company prepare an informational article and then publish it on the mentioned Nestlé Baby & me website.

According to Tourani (2022), social media is one of the types of communication channels that companies currently use to support their communication strategies. According to Tourani (2022), the use of social media leads customers to easier access to information that social networks allow to spread quickly and efficiently. We suggest the company Nestlé Slovensko, s.r.o. to communicate the information that it holds the ISO 14 001 certificate through its accounts on social networks about their infant formula, regularly, in the form of creative graphic processing of the information and through the use of third parties that closely work with the company they collaborate on the promotion of infant formula products.

Not only communication towards customers is important, but also the communication of the company towards the managers of key clients, who subsequently have to communicate with these key clients and also other employees of the company. The company Nestlé Slovensko, s.r.o. we propose to organize internal trainings, educational courses, seminars and webinars for managers and other employees in the infant formula division, through which they will learn about what the ISO 14 001 standard, respectively the environmental management system, means on a theoretical but also a practical level and will also be familiar about the benefits of the implementation of the ISO 14 001 standard for Nestlé Slovensko, s.r.o. overall, but also to the infant formula department.

The company should also make an effort to improve the communication strategy in the form of internal trainings regarding the development of human resources. Last but not least, we recommend that the company develop and implement a methodology to start monitoring the benefits of ISO 14001 implementation in the infant nutrition department.

We suggest that the company uses several methods for the objectivity of the results, namely consumer surveys, monitoring of financial and economic indicators after the implementation of communication strategies in business chains, on websites or social networks. We also propose to develop a methodology for evaluating the impact of the implementation of the ISO 14 001 standard on the market position in the field of infant formula products.

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Possibilities of applying ABC analysis in terms of increasing the share of Fairtrade-certified products on the food market

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Abstract: The article deals with the application of the ABC method for fairtrade products on the spot market of food products. On the basis of Pareto's principle, the aim of the article is to define key items of specific consumption of food products from the point of view of a selected retail chain, which in case of their substitution by Fairtrade-certified products would significantly increase the market share of certified products and potentially also their consumption. According to the results of the analysis performed on a set of 4,405 stock items, a group of 140 items was created that represent the most significant part of the business range, since in the cumulative sum of the sub-items they represent the highest share of the annual turnover of the entire company and thus represent the most potentially significant groups for the expansion of the Fairtrade product range.

Keywords: Logistics, ABC analysis, Fairtrade

JEL Classification: M19

1 Introduction

Fairtrade can be defined as a social movement that promotes a more democratic development of the global economy by under-promoting access to global markets for small-scale producers from developing countries located in the global south (Stiglitz & Charlton, 2005). Currently, Fairtrade represents the most well-known and globally widespread social certification concept, according to Petersen and Snapp (2015). Conventional trade has serious environmental, social, economic, and political impacts, which raises to engage fair trade as an ethical idea behind various issues. The co-consumer is confronted daily with a series of ethical decisions that can be summarized in the main motivation of "doing good". There, the consumer's engagement is expected to have a positive impact on ethical behaviour related to broader issues of sustainability (Kutaula et al, 2022).

The Fairtrade social system represents more than 1.6 million farmers and workers, mainly from developing countries, with nearly 1,600 products certified by producer organisations in 75 countries. Farmers and workers producing mainly bananas, coffee, cocoa, sugar, tea, flowers and cotton earned €178 million in premiums, a 19% increase. Global retail sales of fairtrade products reached \$8.5 billion in 2017. The largest countries by retail sales are the UK, Germany and the USA (Bhavsar et al, 2021).

In the retail sector, according to Berry and Romero (2021), fairtrade products are becoming more prominent, thus bridging the gaps in assortment between conventional and fairtrade goods. Global sales of fairtrade products, approximately US\$ 9.2 billion, are steadily increasing. While the initial focus of fairtrade was on fruit and coffee, there has been an increase in the number of products being marketed with this type of label. Awareness of Fairtrade has made more consumers aware of consumption patterns that lead to environmental damage in the production of, for example, clothing or flower growing (Rashid, Buyn, 2018).

The principles of fairtrade are currently becoming more and more familiar to Czech consumers and are already influencing their purchasing behaviour to a large extent. However, in terms of overall market share of food products, certified production is still a minority, as current data show. The most traded fair-trade commodities are currently coffee, of which 1,399 tonnes were sold in the Czech Republic in 2022, followed by cocoa, of which 4,536 tonnes were sold. This huge increase in sales of Fairtrade cocoa or Fairtrade cocoa beans, which was already recorded in 2021 compared to previous years, is mainly due to the introduction of the Fairtrade Cocoa product label, which is included in all products containing Fairtrade cocoa. It is also worth mentioning the growth in sales of Fairtrade cotton, which is most often offered in our conditions in the form of cotton shopping bags or company uniforms, Fairtrade bananas, which have been offered since this year in addition to the Kaufland chain also in Lidl chains, and Fairtrade flowers, which can be considered a kind of breakthrough in the mainstream offer of non-food Fairtrade goods. Over 4 million cut stems were sold last year.

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This is a relatively large increase compared to the previous period. Customers can find cut fairtrade flowers in the Kaufland and Lidl chains.

The authors' ambition in this article is therefore to define, on the basis of Pareto's principle, the key items of specific consumption of food production from the perspective of a selected retail chain, which, if substituted by Fairtrade-certified products, would significantly increase the market share of certified products and potentially their consumption. This is, according to the authors, one possible way of giving more support on the market to produce that meets social, economic and environmental standards that contribute to more sustainable economic development.

The ABC method is traditionally used in logistics as a method of differentiated inventory management, which is based on the fact that it is often difficult and impractical to pay the same attention to, monitor and manage all items of a given type of inventory in the same way. Therefore, ABC analysis is applied, which allows inventories to be divided into three specific groups and then to treat these groups differently in terms of their management methodologies (Emmett, 2008).

The analysis of ABC is based on a regularity defined by the Italian economist and sociologist Vilfredo Federico Damaso Pareto at the turn of the 19th and 20th centuries. This regularity states that very often 80% of the consequences result from only 20% of all possible causes (the so-called 80/20 rule). This method can thus be used to advantage, for example, to optimise the frequency and method of delivery with regard to the potential for reducing the financial capital tied up in inventories. The method, based on Pareto's principle, means that the improvement of one objective must be achieved at the expense of but-at least one of the other objectives. (Steuer, 1989) However, the application possibilities of this method are not exhausted, as inventory differentiation also allows, for example, the optimisation of the inventory storage system itself in production or commercial warehouses with a view to reducing the intensity of handling and thus influencing the level of overall logistics costs. However, the authors have chosen this method for data analysis with the intention of defining a narrow proportion of the appropriate Fairtrade-certified range that will have the highest possible impact on the consumer market in terms of its preference. In addition, in linking the ABC method with Fairtrade certification, the authors also see some symbolism in the common philosophy on which both principles were founded, namely the ABC method was developed as a recognition of social inequalities in Italian society and Fairtrade certification seeks to redress the social and economic inequalities between developed countries and producing, especially developing, countries.

2 Methods

For the ABC analysis, a retail chain dealing with the distribution of food products in the South Bohemia region was chosen. The sales for a calendar year were analysed. The product range in the period under examination consisted of 4 405 items with an annual turnover of EUR 357,25 million. CZK.

Firstly, the ABC analysis itself is carried out in the paper. Due to the size of the business mix, only selected key A-type items that account for at least 0,1 % of the annual turnover of the entity under examination are examined. These items can potentially have the greatest positive impact on the market share of certified products. For these items, the paper further proposes a system of measures that should lead to a reduction in capital tied up in inventory, a streamlining of handling and warehousing operations and a more efficient purchasing management to make the set-up of an inventory management system for these items cost-effective.

The basic input information for performing the ABC analysis is the total annual turnover of each item in the business mix of the entity under consideration, which is further expressed as a percentage in relation to the total annual turnover of all items. The items are further ranked according to their share in the annual turnover of the enterprise from the most significant to the least significant and according to the cumulative totals with threshold values of 80% and 95%, they are classified into three basic groups A, B and C. (Toušek, 2016)

3 Research results

3.1 Pareto principle and method ABC

Vilfredo Pareto defined a regularity that reflected the fact that only 20% of the population of Florence at the time owned 80% of the real estate. This rule was later reflected in logistics and was the basis for setting the basic principles of ABC analysis. It divides the assortment according to its share of the firm's annual turnover into three basic groups (A, B, C), with group A having approximately 80% of the firm's total turnover, but the share of items included in this most important group is only approximately 20% of the total assortment. (Bazala, 2003)

However, company turnover is not the only criterion that can be used in ABC analysis. Individual items can be broken down, for example, according to the value of the trading margin realised by the entity in the course of one year, or the volume value of inventory turnover in units of measurement (pcs, kg, l) can also be used for the analysis. However, the authors chose to calculate the ABC analysis according to the turnover of the chain. The ABC analysis is always carried

out for one year, and the period examined may be a calendar year, i.e. January-December, or it may be a period covering the last 12 months for the sake of updating data, as the product range of many trading companies changes continuously and for these entities it is more than meaningful to carry out the analysis on items that are part of the currently traded range. However, the standard approach to performing ABC analysis is to process data for the previous calendar year (mainly for better access to data and also for the possibility of year-on-year comparison), where the main criterion for classifying items into groups A, B and C is their turnover in CZK excluding VAT.

Once the basic breakdown of items has been made, the result still needs to be corrected to reflect the fact that although some items reach the percentage of turnover of the total stock for categories B, it is appropriate to classify them in group A because, for example, they are susceptible to storage conditions and are subject to frequent losses, or they are items that can tie up a high proportion of financial capital in stock in small volumes. Conversely, some A items should be reclassified to Group B because of their low frequency of removal, and in the rare case where large volumes are removed only a few times a year, to Group C. A further adjustment is made at the level of thresholds, where it is necessary to assess whether the split between A and B, B and C is appropriate in terms of the share of threshold items in total warehouse turnover. A split strictly based on compliance with the 80 %, 15 % and 5 % turnover rule for a given group might not correspond to reality, and such a methodologically accurate implementation of the ABC analysis might not give the company the expected result. In practice, it also happens that type A items include, for example, only 78 % of the total annual turnover of a given warehouse, since if group A were to be supplemented by the missing 2 % of turnover, then items which have a turnover drop compared to the high-turnover type A items would have to be included in this group. The same procedure is then followed in finding the appropriate boundary between type B and C items.

Table 1 The result of ABC method application

Category	Border (in %)	Absolute number of items	Ratio of items (in %)
A	80,22	1 422	32,3
B	14,99	1 287	29,2
C	4,79	1 696	38,5
Total	100,00	4 405	100,0

Source: Own processing

As can be seen from Table 1, the application of the ABC method has led to the formation of three groups, with the main group A comprising 32.3% of the items in the total assortment, compared to the assumption of Pareto's regularity, which states that the share of these items should be around 20%. The most important item in group A is M10 eggs, packed in a suction carton, which accounts for 1,26 % of the annual turnover of the investigated entity. On the other hand, the least significant item in Group A is Rio Mare tuna in oil, which accounts for only 0,018 % of the total turnover of the store. The average share of Group A items in turnover per calendar year is 0,0564 %. However, only two items have a share of turnover higher than 1 % and only 140 items out of all items in Group A have a share of annual turnover higher than 0,1 %. These 140 items form a key part of the product range which has the potential to increase the market share of Fairtrade certified food products (see Table 2).

Table 2 The 140 top items of A type analysis

Assortment category	Number of items	Turnover in pcs	Turnover in CZK	Turnover in %
Tobacco products	35	802 340	36 107 841,14	10,11
Table and mineral water	23	1 719 834	15 118 638,60	4,23
Fats and oils	14	470 402	10 472 044,42	2,93
Sweets	16	1 534 299	10 426 829,51	2,92
Colonial goods	9	761 343	9 409 224,46	2,63
Alcoholic beverages	9	93 841	7 586 425,81	2,12
Coffee	10	334 490	7 341 135,78	2,05
Eggs	3	335 416	7 197 207,20	2,01
Canning products	10	502 992	4 877 047,03	1,36
Products for pets	3	10 572	3 224 041,18	0,90
Milk and dairy products	4	180 573	2 580 095,83	0,72
Other soft drinks	3	77 908	1 358 156,31	0,38
Beer	1	113 520	615 777,83	0,17
Total	140	6 937 530	116 314 465,10	32,53

Source: Own processing

As can be seen from Table 2, the overall share of the most important items with an annual turnover of at least 0,1 % is 32,53 %. The main group is tobacco products, which account for more than 10 % of the annual turnover of the whole range (35 items are represented). The second most important group, with a difference of almost 6 % compared to tobacco products, is the range of table and mineral waters (23 items represented). Both of these groups are, however, insignificant in terms of Fairtrade certification, tobacco products are not traded under Fairtrade certification and for bottled table water it is not economically viable to import these products from producing countries into the Czech Republic. However, the confectionery group is significant from a Fairtrade point of view, representing 23,42 % of consumption in the Czech Republic and accounting for a share of 2,92 % in the examined retail chain for 16 types of products; the coffee group is also very significant, representing 2,05 % of the total annual turnover of the chain and including 10 products, canned products are a significant group with a share of 1.36%, as well as other non-alcoholic beverages, of which bottled fruit juices and lemonades represent the highest Fairtrade share (potential for the selected retail chain is 0.38%). Thus, if all products in the selected groups were replaced by Fairtrade products, their share could potentially reach 6.71% with an annual turnover (taking into account the prices of existing products) of almost €24 million. CZK.

If we divide the most important assortment groups of A-type items according to the units of measure exported, the most important group is the assortment of table and mineral waters, of which more than 1.7 million units were exported in the calendar year. The second largest group by number of packages shipped was confectionery, of which more than 1.5 million units were sold.

3.2 Design of measures according to the method ABC

Based on the ABC analysis, the authors recommended the following measures to the retail chain:

Priority should be given to promoting the sale of Fairtrade certified products in the confectionery, coffee, canned goods and soft drinks (or fruit juices) product groups.

For the most significant Fairtrade Group A items, stock levels and movements should be monitored regularly, and master commercial agreements including delivery terms, prices and discount rates should be negotiated with suppliers. It is advisable to establish a list of the most significant suppliers before starting to communicate with suppliers,

as one supplier of Fairtrade production may supply multiple items that appear in both Group A and the other groups. It is therefore advisable to discuss the completed deliveries of all items as a whole, but it is also possible to address sub-items separately, although this form is more time-consuming and organisationally demanding. In new contracts, the frequency of deliveries should be adjusted so as to reduce the normal stock, i.e. to achieve a shorter delivery cycle resulting in a reduction in order batches and a reduction in storage costs. In this case, the suppliers should not claim reimbursement of the costs of the increase in frequency of supply, as these are the most traded items for the company in aggregate on an annual basis, i.e. it would be undesirable for the supplier to lose its position in supplying the entity under investigation by increasing prices or worsening supply conditions. It is also possible to negotiate with the suppliers a change in payment terms in favour of an increase in supplier credit, i.e. an extension of the payment terms of the obligations towards the suppliers. Under certain conditions, it is advisable to consider establishing direct supply links with the main producers directly in the countries where the main raw materials are either produced or with the production plants, so that these supplies are not arranged through intermediaries, as is usual with the Fairtrade range (in particular German suppliers, whose trade margins make Fairtrade production significantly more expensive to enter the Czech market).

4 Conclusion

The ABC method is one of the best known methods for the analysis of inventories in logistics, but also for the segmentation of certain files according to the importance of sub-components in other areas of economic practice. The professional logistics literature in the Czech Republic mostly focuses on the general rules of application of the ABC method, so this article aims to present a broader application spectrum of this important method in more specific implications for the area of Fairtrade certified production, while respecting the individual differences and requirements of the food assortment traded by the studied entity. According to the results of the analysis carried out on a set of 4,405 stock items, a group of 140 items was created which represent the most significant part of the commercial assortment, since in the cumulative sum of the sub-assortments they represent the highest share of the annual turnover of the whole company and thus represent potentially the most significant groups for the extension of the assortment with Fairtrade products. In conclusion, the ABC method still has great application potential in the current market sub-market and it is up to the efforts and creative skills of individual managers to determine how this potential will be used and how much economic benefit will be derived from the application of this method.

The authors see the main theoretical contribution of this paper in the possibility of using Pareto's law in the area of the market share of Fairtrade certified products to increase the supply of these products in segments that have the highest market impact in consumer perception.

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Generation Z competencies: A case study of a Blended Intensive Programme (BIP)

Hana Trávníčková¹

Abstract: Generation Z enters the labour market with its specific needs and requirements. Most members of Generation Z are now studying and gaining their first work and international experience. The Blended Intensive Programme (BIP) is an example of the new trend of cooperation between business and university. A case study of the BIP related to modern HR trends can answer the research question of which competence development is most preferred by Generation Z. A CAWI and descriptive data analysis methods explore the attitudes of Generation Z towards the current labour market. This case study can inspire corporate training and corporate management. It can promote collaboration between businesses and universities. Moreover, knowledge of Generation Z's competencies can support selecting an appropriate management direction for the company to remain competitive in the long term.

Keywords: Generation Z, competency, enterprise, BIP

JEL Classification: M12; M53; 015

1 Introduction

The group of people who are linked to a same significant events with a similar year of birth are identified as generation (Brindha & Priyadarshini, 2020). The people born between 1997 and 2013 are called Generation Z or Gen Z (Schroth, 2019). Generation Z has a very close relationship with technology and online communication. This group is strongly connected through social networks and is very good with computers and the internet (Marshall & Wolanskyj, 2020). Connected with technological background they incline towards a visual and image-oriented style (Akpınar et al., 2022; Brindha & Priyadarshini, 2020). This approach can be used in training and development methods through Blended Learning approaches that merge online and face-to-face learning methods (Tolstikova et al., 2023).

The Gen Z also values learning by doing and experiential learning methods (Pueschel et al., 2020). They prefer forms of training and development that integrate the training of practical skills that will prepare them for professional life. Moreover, Gen Z is aware of globalization trends and global workforce need for future years (de Boer & Bordoloi, 2022). Therefore, BIP with international participants and cooperation with particular companies can attract Gen Z.

The Blended Intensive Program (BIP) is a learning approach that combines both university and company practices and can conclude a strategic and systematic approach (Rahman et al., 2020). This method is especially beneficial for group of participants who are technologically savvy yet value experiential learning. These include problem-based, blended learning methods connected with learning experiences. The advantages of blended learning at an university and workplace have been acknowledged by both academic and company tutors (Amenduni et al., 2021).

Blended learning integrates face-to-face and online interactions using appropriate communication technology (Amenduni et al., 2021). Companies must considered a holistic approach to their corporate training (Loumpourdi, 2021). The development of competencies is necessary during the studies before entering regular employment (Coelho & Martins, 2022). The competence gap are mostly in communication skills, technical knowledge and digital competencies (Machová et al., 2021). There are different approach to competency needs. A practical summary of needed business competencies bring Continual Vocational Training Survey (CVTS, 2023).

2 Methods

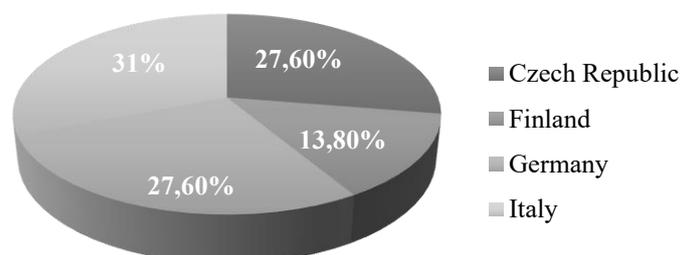
There still needs to be more literature and global research on labour market-related competencies of Gen Z. To investigate this further, a case study was conducted on the Blended Intensive Programme (BIP), which focused on modern trends in HR. The aim was to understand the approach of Gen Z and the competencies they wanted to develop related to labour market. For this purpose, the CAWI and descriptive analysis method was chosen.

The BIP focused on the field of HR and the current needs of companies in terms of the labour market and digitalisation. The BIP took place in the form of 3 online meetings and a 5-day face-to-face meeting at the Technical University of Liberec in the Czech Republic in May 2023. Together, 53 university students from four European countries - Germany,

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Italy, Finland and the Czech Republic - participated in the programme. Figure 1 shows the distribution of participants in this BIP who reflected this BIP and share their feedback. The most participants came from Italy (31%), same distribution (27.6%) belongs to Czech and German participants and 13.8% from Finland.

Figure 1 Distribution of BIP reflection by country



Source: Own processing

Feedback on this BIP was conducted using the CAWI method. An electronic questionnaire was sent after the program with a return rate of 51.72%. The age composition of the respondents was mainly between the ages of 20 to 25 years. The majority of the respondents already had work experience (89.7%) and had participated in another BIP program (86.2%).

The link to corporate training was also made using the results of an international survey conducted by Deloitte among 1,531 respondents globally in 2020 (Deloitte, 2020). In addition, the results of the 2022 GWI global survey conducted in the third quarter of 2022 in 50 countries were also used. A total of 246,761 respondents participated in GWI global survey related to Gen Z (GWI, 2022). According to the GWI survey, 48% of the Generation Z population in 2022 is already employed or in business. 42% of the Generation Z population is studying.

The BIP responses on competencies were compared with the results of the Continuous Vocational Training Survey (CVTS), which is a long-running European-wide survey on corporate training from a company perspective. Eurostat coordinates the survey which is mandatory for EU countries and other contracting countries in Europe. The data is collected on the basis of an EU regulation and is carried out in each country every five years. Eurostat is responsible for the overall evaluation and for the statistically relevant data, latest data was published in 2023. The questionnaire is relevant for enterprises with more than 9 employees across almost all business sectors and is conducted every five years. Aggregated data from the reference year 2020 from 29 European countries were published in January 2023, with 113,000 business units responding (CTVS, 2023).

To determine the usefulness of the BIP method for Gen Z education, the Net Promoter Score (NPS) metric was chosen, which is used in various industries to measure customer loyalty and satisfaction. It is calculated based on responses to a single question: "On a scale of 0 to 10, how likely are you to recommend our company/product/service to a friend or colleague?" (Sugant, 2020). In the case of BIP, the question was "How likely is it that I would recommend the BIP to a friend or colleague?"

The main research questions asked by the author in relationship to the case study of selected BIP (Blended Intensive Program) are following:

1. What competencies can Gen Z develop through a BIP?
2. Is the BIP method suitable for Gen Z?

3 Research results

The literature research in the introduction revealed that Gen Z has specific skills. According to current worldwide surveys, it is essential to understand Generation Z, one of the most diversified generational groups (Deloitte, 2020). According to GWI research, 48% of the Gen Z population is already employed or in business in 2022. 42% of the Generation Z population is studying. Regarding social relationships, 10% of the Gen Z population is married, 14% have one or more children, and 73% of Gen Z respondents are without a permanent partner.

However, the impact of various global events, such as recession, rising prices, wars, and the abundance of information, has greatly influenced their competencies and development (Deloitte, 2020). This complex issue requires deeper exploration to understand which competencies Gen Z need to develop. Therefore, a case study was selected to explore the need of competence development using the example of an international Blended Intensive Program (BIP) attended by 54 university students from four different countries.

3.1 Competencies of Gen Z

As shown in Table 1, the BIP improved the competence of teamwork most (26.9%). The second most represented improved competence area was communication skills (19.2%). 7.7% of the respondents also mentioned intercultural competencies, which may also include intercultural communication. Related to this, 11.7% of respondents also improved their English language skills due to the international feature of the BIP where English was an official language. Presentation skills were developed during the BIP for 9.6% of the respondents. Content-wise, the BIP can also provide professional knowledge and skills, with 17.3% of responses indicating this as a benefit.

The table also compares which competencies 27 European organizations in average consider essential within the next three years. The table shows some common tendencies but also differences. The importance of developing competencies through teamwork is visible in the table; 26.9% Gen Z and 41.9 % of companies recognize the importance of developing this competency. However, communication skills, which are developed by Gen Z (19.2%), are less important to companies (6.3%). Almost half of the companies (43.2%) see it as crucial to developing employees' hard skills, such as specific or technical skills, compared to 17.3% of Gen Z. In the case of foreign language, 11.5% of Gen Z respondents and 8.5% from the perspective of companies feel the need for development. A more significant difference is in the case of presentation skills, which are also an essential part of business and customer-related skills, which are important for 26.9% businesses. There is also a discrepancy in problem-solving skills, which 25.2% EU companies plan to develop in next three years. In contrast, Gen Z (7.7%) considers this competency as an area to be developed. Intercultural skills were also developed through the participation from different EU countries, as reported by 7.7% of the BIP respondents. This could also be included under other skills companies will develop due to advancing globalization.

Table 1 Comparison of the competences developed through the BIP from the participants' point of view with the EU companies' view of the direction in which they will develop competences in the next three years

Competence	BIP participants	EU Companies (average 27 countries)	The difference
Teamwork	26.9%	41.9%	15
Communications skills	19.2%	6.3%	12,9
Hard skills/ Technical skills	17.3%	43.2%	25,9
Language skills/ English	11.5%	8.5%	3
Presentation skills/ Customer handling skills	9.6%	36,5%	26,9
Problem solving	7.7%	25.2%	17,5
Intercultural communication/ Other	7.7%	8.8%	1,1

Source: Own processing, based on CVTS 6

This comparison shows that the development goals of companies and Generation Z sometimes differ. The most significant difference is between Presentation Skills, which is also related to Customer Handling Skills, where the difference is 26.9 percentage points. It should be a guideline for companies and educators preparing Generation Z for the job market to add more opportunities to develop customer-oriented or listener-oriented presentation skills to their training methods. Similarly, the hard skills required by companies also need to be addressed, which is what BIP can bring as one possible form of linking companies and the university environment.

Table 1 also shows the current priorities of companies in the area of teamwork, which is one of the competencies identified by BIP participants as having been developed through this method. Therefore, from this perspective, it is also possible to recommend the BIP method as one of the methods of developing competencies that are also demanded by the current business environment (CVTS, 2023).

However, given the output of the literature that identifies Generation Z as tech-savvy, image-oriented and using social networking styles (Akpınar et al., 2022; Brindha & Priyadarshini, 2020; Marshall & Wolanskyj, 2020), this generation will also need to focus more on communication skills themselves, which are not seen as a priority by companies at the moment.

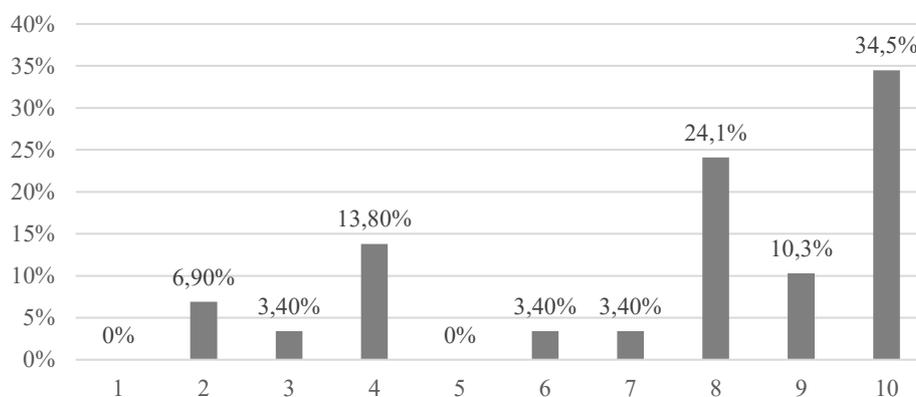
On the contrary, as the results of this case study show, Generation Z can help firms solve problems, which, for example, is also developed through the BIP method. Only 7.7% participants appreciated this advantage of BIP but 25.2% companies see the problem-solving as a priority in next three years.

3.2 Recommendations of the BIP method

One possible guide to satisfaction is the Net Promoter Score (NPS), used in various fields and industries to measure satisfaction. It is calculated based on the responses to a single question: "On a scale of 0 to 10, how likely are you to recommend our company/product/service to a friend or colleague?" (Sugant, 2020). This also inspired asking whether participants would recommend BIP to their friends on a scale of 0 to 10, where 10 means completely recommended.

As shown in Graphic 2 below, almost half of the participants in this case study chose 10 or 9, which means that they would recommend BIP to their friends (34.5% and 10.3%). Ratings such as 7 and 8 are considered neutral. On the other hand, dissatisfaction is expressed by ratings of 6 or less. It always depends on the content and the organization of the program. The BIP included, for example, lectures by experts from practice or a visit to a renowned Czech manufacturing company or a business incubator. Not all activities during the three online days and five days present meetings satisfied all participants. The Figure 1 shows a relatively large diversification, which also corresponds to the conclusions of Deloitte survey. This is where companies and BIP organizers should prepare for a greater diversity of satisfaction with this development method. The participants of this selected BIP mostly had already experienced another BIP (86.2%), so they can be stricter with their evaluation. As shown in Figure 1, Generation Z is also not afraid to express that they would not recommend the program to their friends. Companies who may not be as used to this approach need to be prepared for some critical attitude of Gen Z.

Figure 1 Recommendation of BIP to their friends on a scale of 0 to 10, where 10 means completely recommended



Source: Own processing

Nevertheless, Figure 1 shows the higher level of satisfaction with the BIP. Therefore suggests that this is a suitable method for Gen Z. Despite a few dissatisfied responses, it can be seen that almost a majority would recommend this BIP to their friends to attend this BIP (44.8%), some participants are neutral (27.5%) and more than a quarter of participants would rather not recommend this particular BIP to their friends to varying degrees (27.7%). However, no one refused to recommend this BIP to their friends entirely. However, it depends on the specific content of the BIP. However, it is also necessary for companies and pedagogues to be aware of the sensitivity of this generation, as shown by the different level of dissatisfaction of some participants.

Despite the research and case study limitations, there is a research gap for further exploration in this area. There is a need to consider a larger sample size, to include more countries and to extend the literature search and analysis of secondary sources to explore Gen Z competencies more, which will also be the subject of further investigation by the author.

4 Conclusions

Gen Z competencies are influenced by the time when this generation is growing up and starting to enter the labour market. As a result, there is a need for competence development to keep up with the changing times. In line with the literature search results, Gen Z is powerful in competencies related to technology and digitalization. On the other hand, however, they also need to develop their other competencies related to business needs. This generation can develop competencies through different methods. One of the possible ways is the Blended intensive programme (BIP). BIP combines online and face-to-face development methods, both in the form of lectures or practical workshops. This method benefits both workers and students. It can also provide important insights for companies on how to develop Generation Z, as well as for educators preparing Generation Z for the labour market. Due to the complexity of the topic, a case study was selected to field two critical research questions, namely, what competencies are currently being developed by Gen Z and whether a BIP form is appropriate method to develop Generation Z competencies related to labour market.

Despite the limitations of this paper, which needs to be extended in terms of the literature review and the sources of primary and secondary data in the future, it is clear that BIP has a positive impact on the development of Generation Z competencies. In this BIP case, participants developed the most teamwork competencies, communication skills and HR expertise (hard skills). Teamwork and professional skills are one of the most in-demand skills by companies today (CVTS, 2023). By including BIP in university studies, it can prepare Generation Z for the demands of the labour market. The BIP method is based on a combination of online and face-to-face methods that reinforces problem-solving skills, which is also in demand by businesses today. This case study, however, also highlights the sensitivity of Generation Z and the need to develop communication skills as well, which companies should also prepare for. Generation Z therefore requires a new approach from companies and teachers, as evidenced by the findings of international research by GWI and Deloitte. According to a questionnaire based on the NPS principle, a satisfaction survey metric, it is likely that BIP would recommend Gen Z as a method of competency development to most of its friends as well. Thus, BIP could be a suitable training method for developing employees and current students at the university who fall into Gen Z. However, this requires further scientific research and investigation.

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Session:
Digital Economy



The use of digital technologies for positive economic benefit in the preparation of students

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Abstract: The article deals with the interdisciplinary approach of interested social sciences (in particular, economics, social work, sociology, pedagogy, etc.) when introducing digital technologies into the educational process of students going on a practical internship. At the same time, the investment process of human capital appreciation in the preparation of students is looked at here. In the empirical part of the contribution, the need to introduce digital technologies into teaching is presented not only in connection with the process of human capital appreciation, but also from the point of view of the country's social issues.

Keywords: implementation of digital technologies, evaluation of human capital, foreign internship students

JEL Classification: A13; F01; I23

1. Introduction

Digital transformation, as an integral part of the emerging era of Industry 4.0, has changed society and the economy, its impact on everyday life continues to deepen. It demonstrated the need for higher levels of digital capacity in education and training systems and institutions. The covid-19 pandemic only further accelerated the already established trend towards online and hybrid education. This shift has revealed new and innovative ways for students and educators to organize their teaching and learning activities and to communicate more personally and flexibly over the Internet. In addition, the implementation of digital technologies for education has revealed challenges and inequalities between those who have access to digital technologies and those who do not (e.g. individuals from disadvantaged backgrounds), and issues related to the digital capacities of education and training institutions, teacher education and the overall level of digital skills and competences. These changes required a strong and coordinated effort at European Union level to support education and training systems to deal with the challenges that the covid-19 pandemic has exposed and exacerbated. At the same time, we cannot do without a long-term vision for the further development of European digital education.

The emerging era of Industry 4.0 technologies from the start of the second decade of the 21st century also brings fundamental challenges within all forms of educational programs, including student mobility. At the same time, the calls for economic and social stabilization of regions of interest within development programs to support sustainable development are a clear example for the implementation of digital technologies for the preparation of students. A specific example is online tutorials. The Faculty of Theology of the University of South Bohemia in České Budějovice specifically participates in a pilot project to introduce digital technologies into the teaching of students who, as part of their studies at the Faculty of Theology of the University of South Bohemia in České Budějovice, will do a practical internship in Zambia.

2. Processing methods and approaches

Student mobility, especially its Erasmus program part, has also become an important research topic. It is characterized by a focus on socio-economic characteristics as variables that play a primary role in participation or non-participation in mobility. This is probably also because they can be influenced relatively easily with specific public policy instruments such as quotas, scholarships and other supporting funding. The results of studies of this type also result in public policy

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recommendations. In this context, it is possible to draw attention to the importance of the usefulness of student mobility from the theoretical concept of human, cultural and social capital.

For these reasons, the use of analysis, comparison, synthesis and generalization methods prevails in the process of understanding the reality of observed phenomena and processes within the framework of the paradigm. The interdisciplinary approach of social sciences and humanities (especially economics, economic policy, sociology, social work, pedagogy, andragogy...) is also applied to the current development trend of implementing online technologies within Education 4.0.

3. Research results

3.1 Initial philosophy of the issue

Managing one's own development belongs to the basic natural aspects of the existence of human society. If these activities are to stand on a rational basis, appropriate forecasts representing realistic, scientifically based ideas of future development cannot be dispensed with. Within these ideas, all sectors of the economy cannot be neglected, including the field of education. This, especially with the onset of the era of Industry 4.0 technologies, is gaining importance, and with it also questions of global importance about sustainable development or a "sustainable way of life". In the foreground is a concept that represents a synthesis of economic, social and environmental goals clearly oriented towards the qualitative aspect of the growth of human life. By its very nature, this development meets the needs of the present without undermining the ability of future generations to meet their own needs. At the same time, digital technologies play a significant role, as they are a key element of "green growth" in all sectors of the economy. Increasingly, one can meet initiatives referred to as "Green information and communication technologies", etc.. It can therefore be stated that the implementation of digital technologies reaches a global dimension, which also concerns investments in human capital. As a result of these investments, from a global point of view, it is possible to contribute to the appropriate reduction of significant social and environmental differences, poverty and other undesirable phenomena in regions of interest in the world, of which Africa is a priority.

Rapid adaptation to changes within interest systems and their surroundings, preparation for personal development, response to external stimuli and innovation trends that are constantly coming, all of this is accompanied by the implementation of Industry 4.0 technologies. All of this is connected to globalization tendencies in the current world. At the same time, as a result of globalization, every individual is forced to constantly improve, not only within the social system, but globally. For some it is a "punishment", for others a certain form of motivation. Globalization, however, is not the only thing that pushes for continuous development, information and communication technologies play a role in this as well. Individual approaches of people to what surrounds them and what they are a part of are also a non-negligible fact. Many have already understood that the way to maintain their own competitiveness on the labor market, how to be an active citizen, how to develop further, how to prosper economically or how to find a way to other people and new areas is through a lifelong learning process.

Precisely because there is a large range of non-formal education options, when its participants mainly reach for various courses, seminars, workshops, webinars, e-learning courses, this work deals with what goes into adult learning. Today's digital age is characterized by the availability of a number of modern technologies that not only bring many possibilities and interests, but also make the life of every member of society easier. The digital era is an upheaval that has significantly affected human society, as few people today in the postmodern type of consumer and information society can imagine life without a mobile phone, laptop or the Internet. They become an integral part of the life of all age groups. Digital technologies thus make it possible to always be within reach, to handle things from the comfort of home, and last but not least, they are a source of information. Crisis events since the beginning of the third decade of the 21st century clearly prove the validity of the mentioned statement. These are specifically the effects of the covid-19 pandemic and the war in Ukraine (Tarkar, 2020; Opanasenko & Novikova, 2022; Tadesse & Muluye, 2020; Tarkar, 2020).

3.2 Technological transformation of the information society into Industry 4.0

Since the 1970s, Western society has been accompanied by transformations of opinion and value systems of social consciousness. An indication of the mentioned transformation can be seen already in 1962, when the Canadian philosopher and sociologist Herbert Marshall McLuhan defined the postmodern type of society in the book *Gutenberg's Galaxy* as a society characterized by the development of audiovisual media (McLuhan, 1995). In 1973, the American sociologist Daniel Bell presented a vision of the future orientation of post-industrial society primarily on knowledge and knowing, where access to information will play a fundamental role (Steinbicker & Steinbicker, 2011). This post-industrial society has been clearly formulated since the 1980s with the adjective "informational" (Beniger, 2009). By its very nature,

this is a society in which working with information is more efficient than classical work with matter. An integral part of this society is the information economy, which consists of a global market, where almost every producer is characterized by one of these characteristics - its owners are abroad or from there they at least fully or partially use technologies, ideas and other intellectual capital of other entities that are locally completely different. Through this process, a global marketplace of innovative development ideas is created in both quantitative and qualitative dimensions, growing in breadth and depth. Its cycle can be characterized in macroeconomic and microeconomic dimensions. In the macroeconomic case, we are talking about the period of coal and steam, railways and electricity - that is, with the achievements of the 1st industrial revolution from the turn of the 18th and 19th centuries, in contrast to that the onset of Industry 4.0 technologies (of the second decade of the 21st century) means the shortening of innovation cycles and the lawful acceleration of scientific and technical development, there is talk of the era of microprocessors and the information stage of the economy. In the microeconomic dimension, the concept of cycles occurs especially in the ability to rapidly innovate. In this context, the era of Industry 4.0 technologies is characterized by the massive expansion of the Internet and its penetration into almost every industry. The environment is digitized as a result of interconnection through the "internet of things", which connects the physical with the digital, and thus enables qualitatively better access, manipulation and understanding of the environment of interest.

The above-mentioned facts are duly reflected in the quantitative and qualitative dimensions of human capital. Its theoretical concept has also been formulated within economic theory since the second half of the 20th century. Which essentially represents the knowledge, skills, abilities and characteristics of an individual that facilitate the creation of personal, social and economic well-being and become increasingly important for the prosperity of the entire post-industrial society. It is therefore logical that all technological changes within the company are a reflection of investments in human resources on the one hand. At the same time, these technological changes can significantly contribute to investing in human resources in regions of interest in the world. From a regional and global point of view, they clearly contribute to sustainable development (Lutz & Kc, 2011).

3.3 Adaptation of students to the dynamics of social and technological trends

The decision to complete the entire university study or a certain part of it abroad is influenced by many factors, and not only socio-economic ones. It can be internal factors, such as educational aspirations, values, different types of capital, self-confidence, or external factors in the form of mobility conditions, university climate, etc. (Salisbury et al., 2009). The decision to participate in mobility or the motivation for it or against it can be directly related to the personality of the students and also to what stage of life or socialization they are in (Orr, 2012). In this sense, important circumstances are age, family background, whether students are already employed, etc. Monitoring the psychological-social dimension of student mobility has become increasingly important in recent years and is the focus of this study (Orr, 2011).

On the basis of the conducted research, it follows that students who rate their standard of living better and whose families have a higher socio-economic status are more likely to participate in mobility (Otro, 2008; Messer & Wolter, 2005). Although there are other, rather partial, studies conducted among students of a single field of study that do not show this connection, this is, for example, a comparative Norwegian-American study among marketing students (Payan et al., 2012). Research also focuses on the question of the relationship between mobility towards prestigious universities and high socio-economic status.

The mobility of scientists, scholars and students regardless of national borders is one of the oldest ways of spreading knowledge. At the same time, the motivations to move from one country to another change greatly over time. Only in the 20th century, the migration of knowledge, or its mediators, was forced by the dangerous political situation in the countries of origin (e.g. the departure of scientists but also artists from Hitler's Germany, or the exodus from Russia a year after the Bolshevik Revolution of 1917, etc.). Or it was and still is led by the efforts of some countries to attract promising scientists to their territory for good working and living conditions. We are witnessing such a "brain drain" especially at present (Burke, 2013).

Based on these cited facts, student mobility is far from being a new phenomenon within the European continent, on the contrary, it has a long history that reflects broader socio-political changes. Long before the emergence of nation-states, there was something that could be understood as a kind of European university space in which students, information, knowledge and culture were exchanged. A clear proof of this is the period of the Middle Ages, the Renaissance and partly the Enlightenment can be considered the golden age of student mobility, when there is talk of a "republic of scholars" existing regardless of the borders of the state entities of the time (Burke, 2013). But the emergence and development of nation-states was, on the contrary, accompanied by an emphasis on domestic, i.e. national, education, which in some countries took the form of an official ban on studying abroad. However, for a large part of the 20th century, an interest in

international cooperation is already characteristic. But this was often motivated or directed ideologically and politically, which led to the fact that student mobility was supported only within some countries (De Wit, 2009).

In the Czech case, for four decades (1948-1989), as a result of the monopoly position of the ideology of the then communist party, belonging to the socialist bloc meant that students could study only in friendly countries and only for politically verified people or from the other side, the mobility of students coming from selected, socialist oriented, developing countries (Urbášek, 2012). In Czechoslovakia, with the opening of the borders after 1989, the question of studying abroad acquired a new "free" dimension, which was characterized by great "mobility optimism". However, it was not until the beginning of the 21st century and the accession to the Bologna Declaration that there was a real increase in mobility, especially through European and other programs or school programs. The Czech Republic joined the Bologna Process in 1999 and within its framework accepted internationalization and thus student mobility as its priority. In addition to student mobility, there is also the mobility of academics and internationalization in the field of cooperation with companies and business.

In addition to program mobility, individual mobility has also increased significantly since the beginning of the 21st century. This can be understood as the result of a general trend in which higher education obtained abroad is considered a competitive advantage in the labor market (Brooks, Waters, & Wilson, 2012). It is not only such education that leads to the expansion of knowledge, skills (i.e. increase of cultural capital) and to the expansion of social relations to the international level (increase of social capital), but mainly it is perceived as more prestigious and increases the so-called symbolic capital. This is especially true for studying in countries such as the United States of America or Great Britain (Kurzmann, 2014). For example, efforts to increase cultural capital through studying at foreign, especially prestigious, universities are most characteristic for students coming from families with already high cultural capital and with sufficient financial resources (Espeland & Sauder 2007).

3.4 Justification of the required mobility

Study mobility is often a significant life experience for students. It helps them grow professionally and academically, expands their social ties and develops intercultural and language skills. All this has a positive effect on their future employability. Student mobility also affects educational systems and individual educational institutions, where it stimulates the acquisition of an international perspective, the expansion of the scope of their activities and the overall improvement of quality. The way to the free movement of students, researchers and other learners in Europe is still limited by some obstacles, such as problems related to the portability of grants and loans, the recognition of qualifications and credits, the availability and relevance of information and advice or language skills. All this calls for a systematic reform that would facilitate participation in mobility and its accessibility.

Internationalization of higher education is mostly understood in close connection with globalization: *"Internationalisation is changing the world of higher education, and globalization is changing the world of internationalisation"* (Knight, 2008). But the problem of the relationship between globalization and internationalization is more complex. While globalization is a complex process in which universities are only one of a number of actors, internationalization is a specific reaction of universities to this process, which at the same time further strengthens globalization as such. Internationalization and globalization lead to the fact that not only their organizations are changing, but also the self-concept of universities. In a globalized environment, universities are mutual competitors on the "education market", managerial management is applied in them, they try to make money from each other as companies, etc. (Mitchell & Nielsen, 2012). Internationalization is currently also one of the success criteria in various rankings and evaluations of universities, and this also increases the motivation of schools to support it (Knight, 2011). Student mobility as an important part of internationalization is primarily connected at the European level with the existence of the Bologna Process, the aim of which was to create such a space that would allow the free movement of students and academic staff in Europe. Among other things, the original and very ambitious target state was that every university student would spend at least one semester abroad and this study would be recognized as part of his home study program. The study abroad experience has become a part of university studies for a large number of young people, despite the problematic realization of the planned goals. This does not only apply to mobility programs (the most famous of which is Erasmus), but also to extra-curricular mobility, when students go abroad to study with the aim of completing either the entire study program here or some specific part of it (completion of a bachelor's or diploma thesis, a language course or summer schools, etc.). This study deals with both mentioned forms. The purpose of the study is to find out what obstacles and expectations students have associated with foreign mobility. Focusing the study on students' opinions can also lead to an answer to a more general question regarding the contradiction between public-policy goals and the real situation in the field of higher education.

In today's global environment with intensive cross-border activities, it is possible to find an adequate solution only through international cooperation, which, on the one hand, confronts different perspectives at the professional collegial level and, on the other hand, allows different approaches to converge. Current economic models do not reflect dynamic changes in real economic life, in which the importance of some economic factors decreases, or grows. The stated fact becomes even more urgent, as new determining factors are emerging in the current turbulent times, with which Industry 4.0, for example, is already working.

For the reasons mentioned above, the initial philosophy of the cooperation project is also determined. Its purpose is based on the reality that any entity oriented towards achieving maximum performance can never be completely satisfied with the setting of its internal processes and the way they are implemented. The entity must constantly look for ways and implement rationalization measures in order to better fulfill its mission and create higher utility value for its customers. In today's view, the term "better" expresses the effective and purposeful use of all assets (resources, potential) of the organization and the reduction of costs for all performed activities. In the process of strategic management, we can talk about the need for permanent adaptation of the subject to challenges coming both from the external environment and internal functioning.

The entire project system would work in a sliding manner; therefore, it would not be a jump (firmly stage-fixed way). The input and output variables of the system would include the appropriate data by means of which the system communicates through input and output links with its surroundings. The overall success of the system will depend on the implementation, especially in terms of the need to update input documents from the economic sphere and its links. The credit mobility program within the area of interest will thus lead to a synergistic effect in the output, which will take into account the unique and unique conditions that determine the behavior of each economy and its sub-subjects.

3.5 Online technology in education

"Online technologies can be defined as a wide range of tools, applications, systems and services that were designed, developed and are operated primarily in the environment of digital networks, i.e. the Internet" (Zounek, Sudický, 2012). The involvement of technology in education must not reduce its quality. Technology should serve us for a better transfer of information, simplify cooperation, help with the demonstration of transmitted information, etc. Technology in education expands the possibilities of self-education beyond classical education. The beginning of the Internet is considered a turning point for the use of technology, not only in education. Nowadays, we can say that the development of the involvement of technologies and their wider use occurred due to the Covid-19 pandemic, which moved education and learning to homes. Projection equipment, audio recording equipment, video, all of these have already been used in education and are still being used. The list of the use of information and communication technologies (is expanding along with technological development and the current era of digitization. The biggest task of the present time is the correct integration of digital technologies into education. A number of studies and researches are dedicated to monitoring the influence and possible benefits for the educated. One of the important factors, why the use of digital technologies is important in education is the fact that only in the ideal case, after completing initial education, an individual is equipped with the key competences and professional knowledge that he will need for his future profession. However, the journey does not end with integration into the work process. there is constant development and self-education. Here, the motivation for further development is primarily based on work results and the environment of the organization. An equally frequent phenomenon is a change in the area in which the individual works. The ability to respond flexibly to changes related not only to work performance, but also to changes in the global scale, is facilitated precisely by information and communication technologies.

Not all organizations offer the possibility of education and self-education of their employees or do not have sufficient support or their education does not allow the development of talented employees. (Kursch 2022). Also in the Czech Republic, there was an effort to set standards for the inclusion of technology in the education system, the development of perspective future professions and help employees better respond to changes in the labor market.

3.6 Online educational technology in practice

Practically proven online teaching methods in support of student mobility educational programs are also applicable in lifelong learning. For these reasons, the main educational trends of today include emphasizing the practical effectiveness of education and its use in life, especially in the professional life. The second approach is the subordination of theory to practice. Both approaches are interconnected. Education is a tool for acquiring practice - education subordinated to practice. At the same time, the individual is expected to be independent in education - his personal involvement - to demonstrate the willingness to succeed in individual competitiveness. (Kursch, & Veteška, 2018) In education, more and more attention is paid to the concept of quality. By including the concept of quality in connection with education, the

other (non-working) parts of life were summed up, the whole area was perceived from a holistic perspective. The least modern and frequently used term is "work-life balance". Most of the concepts froze on the time distribution of professional and personal life, only some focused on the essence of the quality of both components. In most situations, work-life balance strives for a balance between work and personal life, so that the content of both parts leads to a balance of possible negative influences that await the individual in both parts. By doing so, they try to minimize the risk of burnout. It is important to realize that an individual can achieve a certain balance between work and personal life, but this does not mean that he has a happy and satisfied life.

Considering the above, students of the Faculty of Theology of the University of South Bohemia in České Budějovice, who completed a practical internship in a developing country, Zambia, were asked questions about their opinion regarding the application of virtual reality in preparation for the internship.

Results and interpretation of research investigation

Research objective:

The aim of the research was to find out the students' opinion on the benefit of using virtual reality or videos in their preparation for a practical internship in Zambia.

Research question:

The following research questions were used to fulfill the research objective:

Do you think it would be beneficial to get into the Zambian environment as part of the preparation?

Research method:

The question regarding the contribution of the introduction of digital technologies to teaching is part of the ongoing research with students who completed a practical internship in Zambia as part of their studies at the Faculty of Theology of the University of South Bohemia in České Budějovice. The research technique is semi-structured interviews lasting about 30 minutes.

As part of the entire interview, their experiences with the internship and possible improvements in their preparation are discussed with the students. An open coding technique is used to analyze the interviews.

Research sample:

The research sample consisted of 4 female students of the Faculty of Theology who completed a practical internship in Zambia.

For the purposes of the research, female respondents are referred to as follows:

R1: Student 1

R2: Student 2

R3: Student 3

R4: Student 4

Research site

The research was carried out in the premises of the Faculty of Theology in České Budějovice.

Results:

The benefit of digital technologies in the preparation of a practical internship

Respondents R1, R2 and R3 agreed that the introduction of digital technologies (videos, virtual reality) is "very interesting, but hard to imagine for them". At the same time, they say that the "Intecity bus station in Lusaka" environment would be seen before departure, where there is a high turnover of local people. Furthermore, the students mentioned that it would be good to have a documented environment of the local market in Mongu (the city where the students do their practical internship) and at the same time to prepare the students for "beggar children", as students during the internship are often exposed to the ethical dilemma of whether to give them money or not.

Only one respondent, R4, answered that "it is not beneficial to introduce digital technologies into the preparation, and at the same time she pointed out that there is a need to send students who are balanced and resilient".

Discussion

From the results of the research, it is evident that the majority of female students who participated in the practical internship in Zambia evaluate the introduction of virtual reality, or other digital technologies as beneficial. This can be a consequence of the great "culture shock" that the country brings with it and at the same time a lot of attention from the local population. The authors of the article see a big advantage in the clearer preparation of students, who will have a better idea of what awaits them thanks to digital technologies. Another big advantage can be preparation for ethical challenges that are connected with a practical internship. It is no less important to mention that digital technologies (virtual reality and videos) can bring Zambia closer to disabled people or seniors who do not have the opportunity to visit this country.

Another pro - economics - it's sustainable and not expensive

Risks – Dehumanization

Sustainable development, or "sustainable way of life" is no chimera from the reality of detached intellectuals. It is a way of thinking, the basic principle of which is not to impoverish the current inhabitants of the planet in their quality of life, while preserving the possibility that the life of future generations can be of the same quality. It does not only mean environmental protection, but is an effort to combine economic and social development with environmental aspects. He's not even a scarecrow that "normal people" should be afraid of, he's not a step back. On the contrary, it strives for modernization, the use of new effective technologies and techniques that save time, energy, fuel and the environment. But even that is not enough, only a responsible life, not a wasteful one, a considerate life, not a selfish one, is sustainable.

4. Conclusion

The Faculty of Theology of the University of South Bohemia thus supports strategies leading to the practical deepening of its activities in real practice within the aforementioned project. In accordance with the goals of the United Nations, the concept of "sustainable development" is understood in its complexity, where, in addition to the environment, it also includes areas such as quality education, equal opportunities, health and quality of life, innovation and others. Fulfillment of these goals require special attention in some African states, such as the aforementioned Zambia. For this reason, the Faculty of Theology has much to offer. At the same time, thanks to the education of the next generations and research, it also bears its responsibility for further development, both at the national and international level. For this reason, it is necessary to respect the principles and principles of compatibility of interoperability with other participating domestic and foreign institutions within the framework of specialized training programs corresponding to Education 4.0 standards. Here, the implementation of online technologies is one of the strategic pillars.

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E-commerce and online retail in the digital economy in China

Mike Djesa¹

Abstract: China's ascent as an economic powerhouse has been accompanied by a remarkable digital revolution, placing the country at the forefront of the global digital economy. This paper takes a closer look at the intricate landscape of E-commerce and Online Retail in China, uncovering its growth, innovations, and implications for businesses, consumers, and policymakers. It explores the distinctive features of China's digital economy, which have propelled it to a leadership position in E-commerce worldwide. The paper explores the driving factors behind China's E-commerce success, including the pivotal roles played by digital platforms, mobile commerce, and data analytics. Additionally, it scrutinizes the profound impacts of E-commerce on traditional retail, consumer behavior, and employment patterns.

Keywords: digital economy, e-commerce, online platform, online retail

JEL Classification: G32, G33, C35

1 Introduction

In today's contemporary era, we find ourselves in the midst of a technological revolution and digital transformation that profoundly influences the perspectives and behaviors of individuals and businesses. As consumers increasingly embrace digitalization, enterprises are compelled to adapt, enhance their technological capabilities, and foster innovation to thrive in this digital age, all with the primary objective of expanding their customer base (Hess et al. 2016; Matt et al. 2014).

Electronic commerce, known as e-commerce, has opened up a plethora of new avenues for interaction between the business sector and consumers. It facilitates seamless communication, collaboration, and the buying and selling of products and services (Barnes and Vidgen, 2002). Through diverse online sales channels, including websites, online marketplaces, and search engines, e-commerce empowers market participants to compare, select, and securely acquire a wide array of products and services. Typically, businesses initiate their online presence by providing comprehensive information about their operations and consumer-oriented offerings, thereby complementing their traditional sales channels (Turban et al, 2017; Daimler, 2017).

The emergence of China's e-commerce market represents a pivotal moment in the country's economic landscape. In the year 2021, the digital economy made a substantial contribution, accounting for nearly 40 percent of China's GDP—an achievement of remarkable proportions. Particularly noteworthy is that over a quarter of China's retail sales for physical goods occurred in the online sphere, surpassing the global average of 18.8 percent. Additionally, the e-commerce sector played a pivotal role in generating more than 67 million job opportunities (Wang et al., 2022). This transformative shift has been facilitated by online platforms such as Alibaba, Pinduoduo and Meituan, which have enabled countless customers to conveniently purchase products online with doorstep delivery. Alibaba is a global conglomerate with a significant footprint in the field of e-commerce. The company oversees and operates several prominent platforms, including Taobao, Tmall, and Alibaba.com (Xu and Li, 2022; Li and Ma, 2021).

Even in the face of the challenges posed by the COVID-19 pandemic, China maintained its leadership position in the e-commerce landscape, surpassing the United States by an impressive margin of over \$400 billion in revenue. Currently, China boasts the world's largest population of digital buyers, totaling nearly 850 million individuals. Recent years have witnessed the incorporation of new features like live streaming and rapid delivery into China's e-commerce landscape, significantly enhancing the overall customer experience (Liao et al., 2022).

Important Research Problems/Questions Identified: What are the evolving patterns of consumer behavior in response to the digitalization of markets, and what factors shape their online purchasing decisions? How are businesses innovating and adapting to the digital age to attract and retain customers effectively?

This paper contributes to a comprehensive understanding of the multifaceted impact of e-commerce on China's economy and society. It distinguishes itself by shedding light on both the successes and potential areas for improvement in China's unique e-commerce landscape, especially in comparison to global markets.

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The motivation behind this paper is to provide valuable insights into how e-commerce has become a driving force in China's economic growth and transformation (Zhang et al., 2005). It seeks to explore the various dimensions of this digital revolution and its implications, informing stakeholders, policymakers, and businesses about the challenges and opportunities presented by the ever-evolving e-commerce ecosystem.

2 Methods:

The paper employs a mixed-methods approach, combining both qualitative and quantitative data sources, to investigate China's e-commerce and online retail landscape in the digital economy comprehensively. The primary data sources utilized are secondary, including industry publications, and specific market research reports pertaining to the Chinese e-commerce sector. These sources offer valuable statistical data and market insights, making them suitable for achieving the research objectives.

Quantitative data obtained from these sources undergo basic descriptive statistical analysis to highlight essential statistics and trends within the Chinese e-commerce sector. Due to the paper's limited scope, qualitative data are not included in this analysis. Instead, the focus is on providing a concise yet informative overview of key trends and developments.

The chosen research methods align with the study's objectives, aiming to deliver a succinct yet comprehensive understanding of the Chinese e-commerce landscape within the constraints of a 6-page paper.

It's essential to emphasize that the descriptive approach is employed to offer readers a holistic understanding of the topic's various dimensions, specifically the impact of e-commerce on China's economy and society. This approach enhances accessibility, making the research findings understandable to a broader audience, including policymakers and business leaders without expertise in statistics or econometrics.

However, it's crucial to note that the descriptive approach does not replace statistical, econometric, or modeling techniques. Instead, it complements them and can serve as a foundation for future research endeavors, enabling more in-depth investigations, hypothesis testing, and predictive modeling.

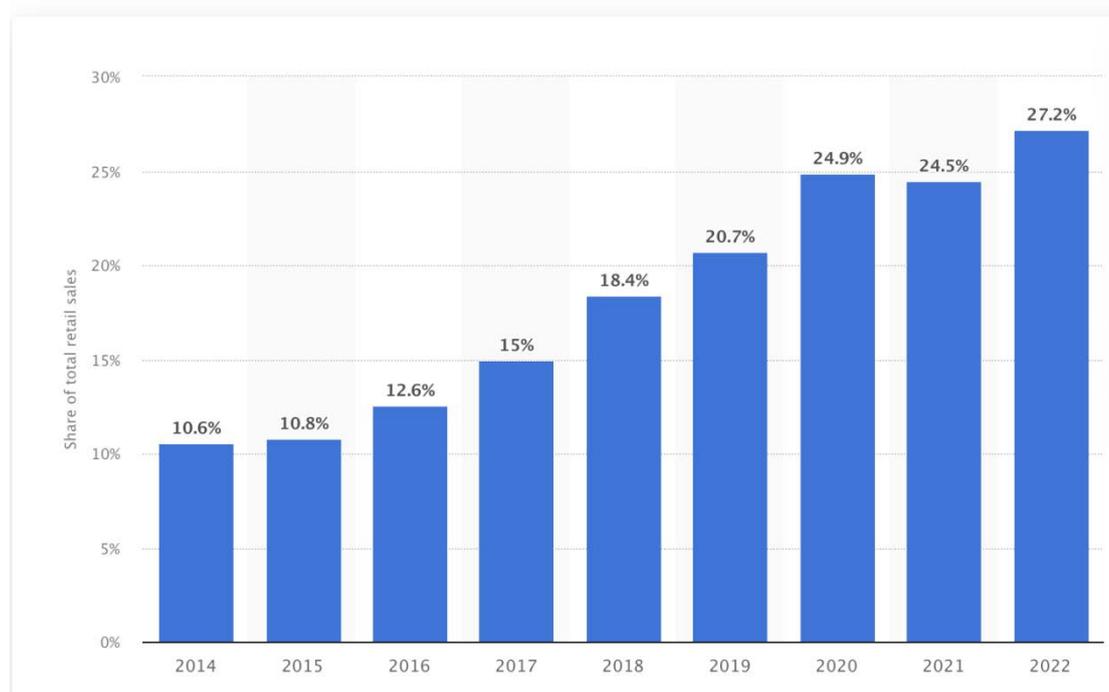
Considering the paper's limited scope, the reliance on secondary data sources is a pragmatic choice. These sources provide access to a wealth of pre-existing information and data, streamlining the research process and offering a broad view of the subject matter.

Acknowledging the limitations associated with secondary data sources, such as potential biases and data gaps, is essential. Additionally, the focus on existing data constrained the exploration of deeper qualitative aspects of the topic, which could be a potential avenue for future research.

3 Results:

In 2022, online sales accounted for approximately 27.2 percent of China's total retail sales, marking a notable increase from the 24.5 percent recorded in 2021 (see Figure 1). This growth signifies a significant expansion of the e-commerce retail sector, more than doubling its share compared to the figures from 2016. It's worth noting that China retained its position as the largest online retail market globally during this period (Statista Search Department, 2022)

Figure 1 E-commerce share of retail sales in goods China 2014-2022



Source: Statista, 2023

3.1 Effects of e-commerce on consumers and businesses

Over the past decade, there has been a remarkable surge in the demand for online shopping opportunities in China. The number of online shoppers in the country has experienced exponential growth, rising from less than 34 million in 2006 to an impressive 466 million users a decade later. This substantial increase has been a driving force behind the rapid expansion of China's e-commerce sector. As of 2022, the digital buyer penetration rate in China reached nearly 59 percent (Liu et al., 2008).

China has consistently held its position as the world's second-largest e-tailing market, following the United States. In 2022, the gross merchandise volume (GMV) of online shopping in China reached approximately 13.79 trillion Yuan. Moreover, B2C e-commerce sales in China were projected to exceed 1.3 trillion U.S. dollars by that time. Tmall, operated by Alibaba Group, emerged as the largest B2C e-commerce retailer in China in terms of GMV, recording a transaction volume of approximately 6.6 trillion yuan in 2020. Meanwhile, the GMV of Taobao, a leading C2C online retail platform also operated by Alibaba Group, had nearly reached 3.4 trillion yuan in the same year (Yang et al., 2021).

China has become a global leader in mobile payments, with over 50% of its population using platforms like Alipay and WeChat Pay. This digital payment trend has not only benefited urban areas but also reached rural residents and small businesses, stimulating economic growth and improving access to financial services. Alipay and WeChat Pay, owned by Ant Financial and Tencent Holdings, respectively, are projected to maintain their dominance, with an expected user base of nearly 2.5 billion. Their success is attributed to integration with social platforms, offering a seamless user experience and solidifying China's position as the global leader in proximity mobile payments (Refer to figure 2).

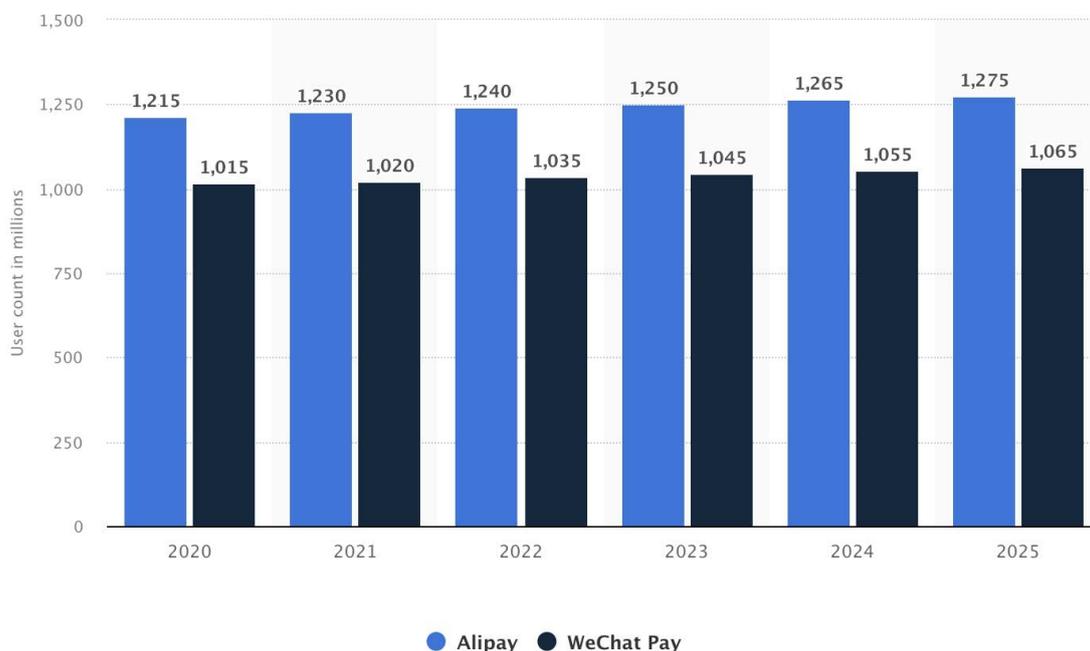
Alipay's immense size and market share bring together a diverse array of participants. The ecosystem of this digital platform includes small and micro enterprises, individual consumers, and financial institutions. Remarkably, users on the Alipay platform can assume dual roles as both consumers and merchants, blurring the lines between traditional roles in the digital marketplace. This multifaceted nature of Alipay's user base underscores its significance as a comprehensive and inclusive digital platform (Alipay, 2009).

When Alipay was initially established in 2004, its primary goal was to establish a financial bridge and facilitate a streamlined, standardized payment system between merchants and consumers on Taobao, one of China's largest and most popular online shopping websites, operated by the Alibaba Group. The initial connection to Alipay was made by merchants who operated within the Taobao marketplace. To reach the vast number of active consumers within the Alibaba ecosystem, merchants were required to adopt and utilize Alipay as their payment solution (Zhu, X. 2016, 17).

Alipay, with 400 million users, is hugely popular in China due to its seamless integration into the digital lifestyles of Chinese citizens. Rapid urbanization, widespread smartphone access, low data costs, and active social media usage have

made mobile payments a convenient and widely accepted method. E-commerce giants like Alibaba have already built large customer bases, setting the stage for Alibaba's mobile payment system's success in Chinese society (Zhu, X. 2016, 17).

Figure 2 Number of users of Alipay and WeChat Pay in China in 2020, with forecasts from 2021 to 2025 (in millions)



Source: Statista, 2023

3.2 E-commerce and stock market

Alibaba, traded as "BABA" on the NYSE, had a market capitalization of about \$560 billion in September 2021. However, by October 2023, it had significantly dropped to around \$216 billion. This decline is attributed to various market factors, including stock price fluctuations, economic conditions, and investor sentiment (Alibaba, 2023). Please note that financial figures can change rapidly, and it's advisable to refer to current sources for the latest data on Alibaba's market capitalization and performance (See figure 3).

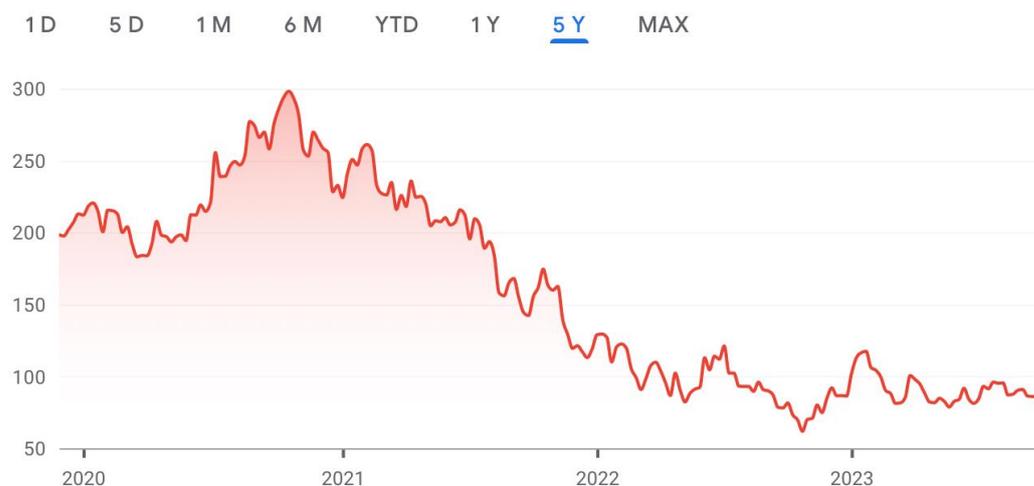
Figure 3 Alibaba Group Market Cap on NYSE



Source: Nasdaq

It appears that Alibaba Group's stock performance on the Hong Kong Stock Exchange (HKSE) has followed a similar trend to its performance on international stock markets, with a decrease in market capitalization in 2023 compared to previous years (Hong Kong Exchanges and Clearing Limited, 2023). This parallel trend suggests that Alibaba's stock is experiencing similar challenges or market dynamics in both domestic and international markets (See figure 4).

Figure 4 Alibaba Group Market Cap on HKSE



Source: HKEX

4 Conclusion:

In the dynamic landscape of the Chinese digital economy, the remarkable growth of e-commerce and online retail stands as a testament to the nation's unparalleled transformation. Over the past decade, China has witnessed an explosive surge in online shopping, with a substantial increase in the number of digital buyers. This rapid adoption of e-commerce has led to a significant rise in its share of total retail sales, marking China as the world's largest online retail market.

The year 2022 showcased the continued dominance of China's e-commerce sector, with impressive figures in gross merchandise volume (GMV) and B2C e-commerce sales. Tmall and Taobao, both operated by Alibaba Group, emerged as leaders in the B2C and C2C segments, underscoring the influence of digital platforms in shaping consumer behavior and retail dynamics.

As China maintains its position as a global e-commerce powerhouse, it does so amid evolving consumer preferences, innovative technologies, and dynamic market competition. The digital economy's transformative impact on retail, employment, and consumer lifestyles is undeniable.

In closing, China's ascent in the digital economy is emblematic of its commitment to innovation, adaptation, and the relentless pursuit of progress. The nation's e-commerce journey serves as a remarkable case study in how a digital revolution can reshape industries and redefine the consumer experience. It is a testament to the enduring power of innovation in the digital age, and it paves the way for further exploration into the ever-evolving landscape of the Chinese digital economy.

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Ecoinnovation as a driver of positive environmental benefits in Czech textile industry in context of EU

Pavla Herclíková¹, Martina Novotná²

Abstract: In the modern world, innovation is a prerequisite for a company's competitiveness in any industry. Nowadays, emphasis is also placed on sustainable growth of the company, which includes, among other things, the environmental dimension of economic development, especially energy savings, optimization of water consumption, elimination of water waste, minimization of waste, use of secondary raw materials in production, etc. The aim of this article is to identify innovative activities of enterprises in the textile industry of the Czech Republic in the context of the EU. These are innovations that both contribute to environmental protection and are thus effective for the enterprise. The evaluation of innovative activities of textile enterprises is also made from the perspective of environmental benefit. Although it has been found that eco-innovations are being implemented in this sector across the EU, which provide significant savings especially in energy consumption, hence transforming the sector towards sustainability and environmental friendliness, this progress is very slow. It is mainly the cheaper products from developing countries that are very significant competitors for European textiles in the eyes of consumers.

Keywords: innovation, sustainability, textile enterprises

JEL Classification: O31, Q01, L67

1 Introduction

The textile industry is one of the world's most important global industries (Hansen and Schaltegger, 2013). Textile products are very important to human society as they are used to make not only clothing but also many other products that play a key role in people's daily lives. The importance of the sector for European industry is also undeniable. This is mainly due to the textile industry's high contribution to job creation. In 2021, almost 1 298 000 workers will be employed in the EU textile and clothing industry (EURATEX, 2022). However, the production and use of textiles has a significant negative impact on the environment, climate and society through the consumption of resources, water, land and chemicals, and the production of greenhouse gases and other pollutants (Thiry 2011). Textile manufacturing is the third most water- and land-intensive sector in the EU, with the fourth largest negative impact on the environment and climate change. Moreover, the growing demand for clothing encourages the unsustainable use of non-renewable resources, as exemplified by the production of synthetic fibres from fossil fuels (European Commission, 2022).

To be competitive in the market, companies need to constantly monitor the costs related to competitiveness and quality, which can be considered added value, innovation, environmental access and export opportunities (Huggins and Thompson, 2017). Sustainability can be a driver of innovation (Melane-Lavado, Álvarez-Herranz, 2018). Staying competitive in the market requires changes that specifically target the sustainability status of value chains, products and services, and business models (Nidumolu, Prahalad and Rangaswami, 2009). The ability to innovate in the context of sustainability is an essential business capability, whether it is associated with small incremental steps or radical, disruptive innovations (Adams et al., 2012). Increasing sustainability also helps to reduce the amount of raw materials used in production, and recycling waste into new production inputs also has a positive impact. For this reason, profitability should be the driving force behind companies' efforts to protect resources and the environment (Kislingerová et al., 2023).

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„Eco-innovation refers to any innovation that reduces impacts on the environment, increases resilience to environmental pressures or uses natural resources more efficiently“ (EC 2011). „Eco-innovation is essential for achieving the objectives of the European Green Deal, such as the transition to a climate-neutral, circular economy“ (EC 2019). The Eco-innovation Scoreboard gathers data on eco-innovation performance across the EU to monitor and evaluate progress, made since 2010.

The authors Arena, Michelon and Trojanowski (2018) identify eco-innovation as the most important driver of economic development, as it continuously changes the external environment and our way of life. Eco-innovation is the key to resolving the tension between economic growth and environmental degradation. It is a combination of green and innovation-driven development (Zhang Zhu, 2019). Eco-innovation can also be seen in the context of competitiveness. In this case, it is an innovation that allows companies to continuously maintain or even improve their position in a specific market. Eco-innovation can be used as a solution to environmental impacts within business processes and, at the same time, it can improve the product itself, making it possible to gain a better position in the market (Porter & Van der Linde, 1995). As mentioned above, green innovations prioritise environmental benefits and their main difference from conventional innovations is the effect of 'double externalities'. Green innovations provide a positive environmental externality in addition to the positive knowledge spillover externality that results from innovation activities in general (Arfi et al., 2018).

Corporate social responsibility has become an increasingly important issue for achieving market competitiveness and sustainable development (Qian et al., 2010). Just by showing interest in environmental protection and striving for more sustainable behaviour, a company acquires an important strategic tool that can reduce costs, improve corporate governance, increase the company's operational performance and market value, and last but not least, influence the company's image as perceived by society, among other things, reducing negative externalities affecting the environment (Hu et al., 2018).

The aim of this article is to identify the innovation activities of enterprises in the Czech Republic in the context of the EU. The focus is on the manufacturing industry, which includes the textile industry. Innovations have been evaluated from the perspective of environmental benefits. The ideas and findings that have already been researched on this topic are presented in the first part of the article. The following part of the paper is dedicated to explaining the objective of the paper as well as the methodological approach that was used to process the results. This is followed by summarising the most important findings, which are then discussed and compared with those already published. The last part of the paper will consist of a final summary of the results.

2 Methods

The data for this article have been extracted from the Eurostat database, statistics and reports available on the website of the Czech Statistical Office (hereinafter referred to as ČSU). First, there was an observation of the share of business innovations in the EU countries in the period 2018-2020. These innovations were converted into percentages to make clearer and easier to follow for all enterprises in the EU countries as a whole, and then for the manufacturing industry. This was followed by analysing the percentage of enterprises in the Czech Republic reporting innovation activity not only for manufacturing but also specifically for textile manufacturing. This was then analysed in terms of the share of innovative products and services in the total turnover of enterprises in these sectors. The assessment is based on the views of the representatives of the companies interviewed on the environmental benefits of their innovations.

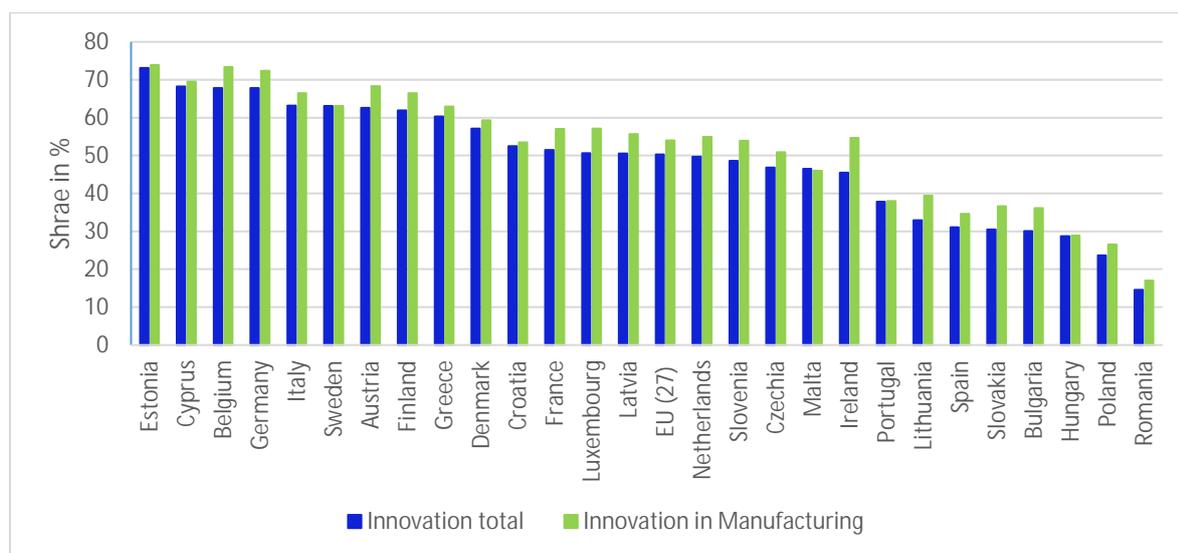
The evaluation of innovative enterprises in the Czech Republic focused on the manufacturing and textile industries. Innovation was understood as the innovative activity of enterprises, while indicators such as sales of innovative products, introduction of innovations were monitored. In the methodological procedure of data processing, the ČSU followed the OECD Oslo Manual of 2018, which distinguishes two types of innovation. The first type is business process innovation. This includes improvements in internal processes, organisational changes in the company or marketing innovations. The second type is product innovation. This involves either introducing new products and services or changing the characteristics of existing products and services (ČSU, 2022). Finally, the positive benefits of business innovation, not only on the company's side but also on the customer's side, were evaluated using selected indicators, such as reduction of CO₂ emissions, reduction of energy consumption, etc.

3 Research results

The share of innovative enterprises in the EU was used to analyse the position of the Czech Republic in the field of innovation. In this area the Czech Republic is below the EU average (the share of innovative enterprises in the Czech Republic is around 47 %).

Figure 1 shows that Estonia, Cyprus, Belgium and Germany have the highest shares of innovative activity in the EU as a whole. In the manufacturing sector, the share of enterprises with innovation activity is assessed as a proportion of the number of enterprises in the manufacturing sector. The highest shares of innovation activity were found in Belgium, Estonia and Germany, followed by Austria and Finland. In the Czech Republic, the proportion of enterprises engaged in innovation activity is higher in the manufacturing sector (around 51 %). Obviously, and also influenced by the structure of the economies of the countries surveyed, innovation activities of enterprises in the manufacturing sector are more applied not only in the Czech Republic, but also in Ireland, Slovakia, etc.

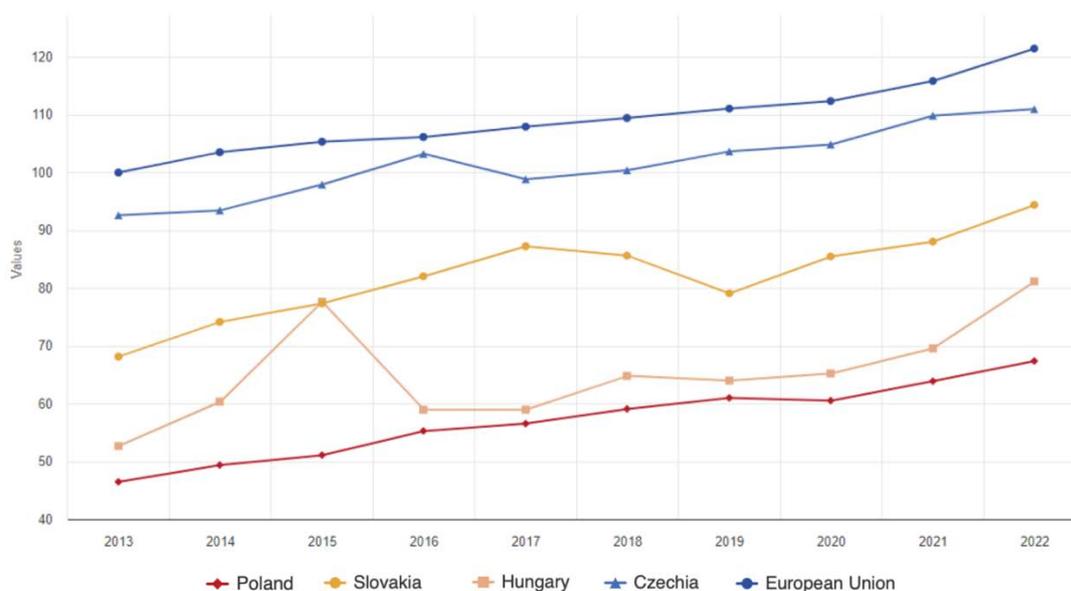
Figure 1: Innovation activities of enterprises in EU countries total and in manufacturing in the period 2018-2020



Source: Own processing based on Eurostat database

The following figure 2 provides information on the evolution of the composite eco-innovation index and indicators for selected EU Member States over the last 10 years (2012-2022).

Figure 2: Eco-Innovation performance of the chosen EU Members States



Source: Own processing based on EC

Table 1 shows the number of enterprises in the manufacturing and textile industries in the Czech Republic and the number of enterprises that implemented innovation activities in 2018 to 2020, including their percentage shares. More than half of the entities (58.3%) in the manufacturing industry included some innovation activity in their business activities, while in the textile industry about half of them did so. The situation is no different when looking at the share of sales of goods and services, where 86.4% of total sales are accounted for by innovative goods and services. From the available data of the ČSU (2022), it was also found that the textile industry is the sector of the manufacturing industry with the lowest costs of innovation activities. In the Czech Republic, relatively few enterprises operate in the textile industry, probably due to outdated production processes caused by lack of innovation activity of enterprises and competition from cheap products from third countries.

It is also clear from Table 1 that it is the larger enterprises that are more innovative and have a higher market share, for example, the innovative enterprises in the textile industry account for 75% of the total turnover of textile enterprises.

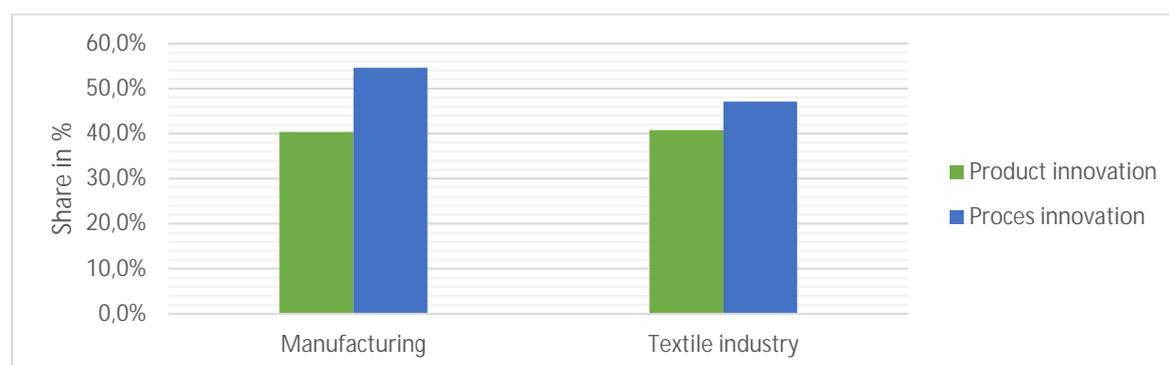
Table 1: Economic characteristics of innovating enterprises in the Czech Republic in manufacturing in the period 2018-2020

Indicator	Number of enterprises			Sales of goods and services (billion CZK)		
	Total	innovating	share in %	Total	innovating	share in %
Manufacturing	11 826	6897	58.3	4 346.8	3754.5	86.4
Manufacture of textiles, wearing apparel, leather and related products	651	327	50.2	64.4	48.7	75.6

Source: Own processing based on ČSU

Figure 3 shows the types of innovation in manufacturing and particularly in textiles. The figure shows that process-oriented innovation is dominant in both the manufacturing industry and the textile industry. This is understandable given the nature of both industries. However, product innovation is not completely neglected, and Figure 3 shows that in textiles the pursuit of product innovation is fairly balanced with process innovation. In this respect, innovation is certainly a priority for the industry in terms of changing the composition of the product (textiles), for example to make it easier to recycle.

Figure 3: Types of innovation in Manufacturing and Textile industry in the period 2018-2020

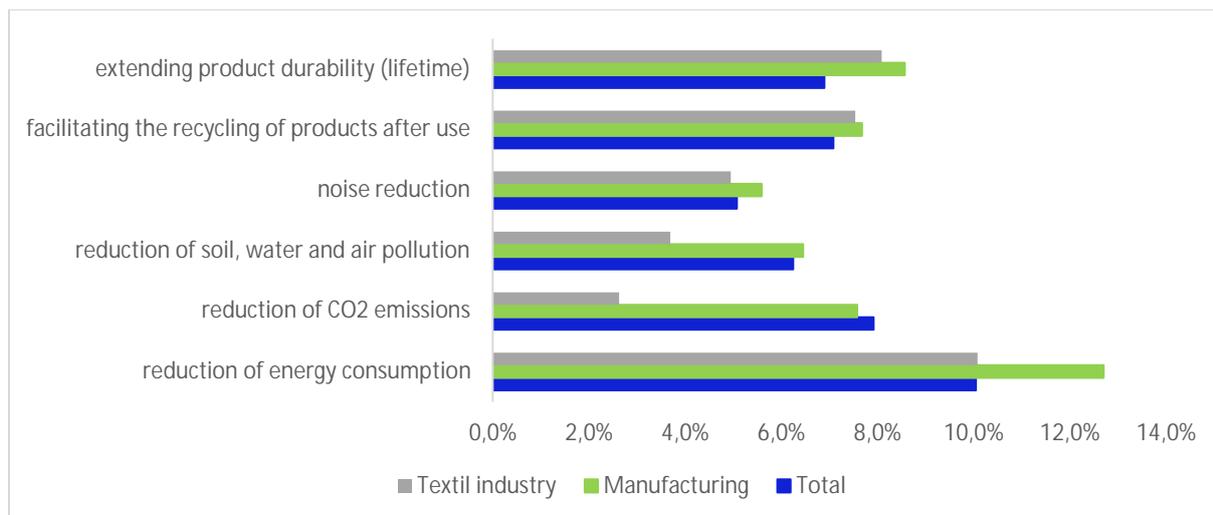


Source: Own processing based on ČSU

Innovation activities were monitored in more detail for enterprises in selected sectors with positive environmental benefits. These were innovations related to the production, distribution or sale of products and services on the part of the enterprise (Figure 5) and innovations related to the use of products or services on the part of the customer (Figure 4).

Figure 4 clearly shows that for enterprises operating in the textile industry, most of the customer-related environmental benefits are recorded for the indicator 'reduced energy consumption', followed by 'extended product life'. This also applies to manufacturing enterprises and to Czech enterprises overall.

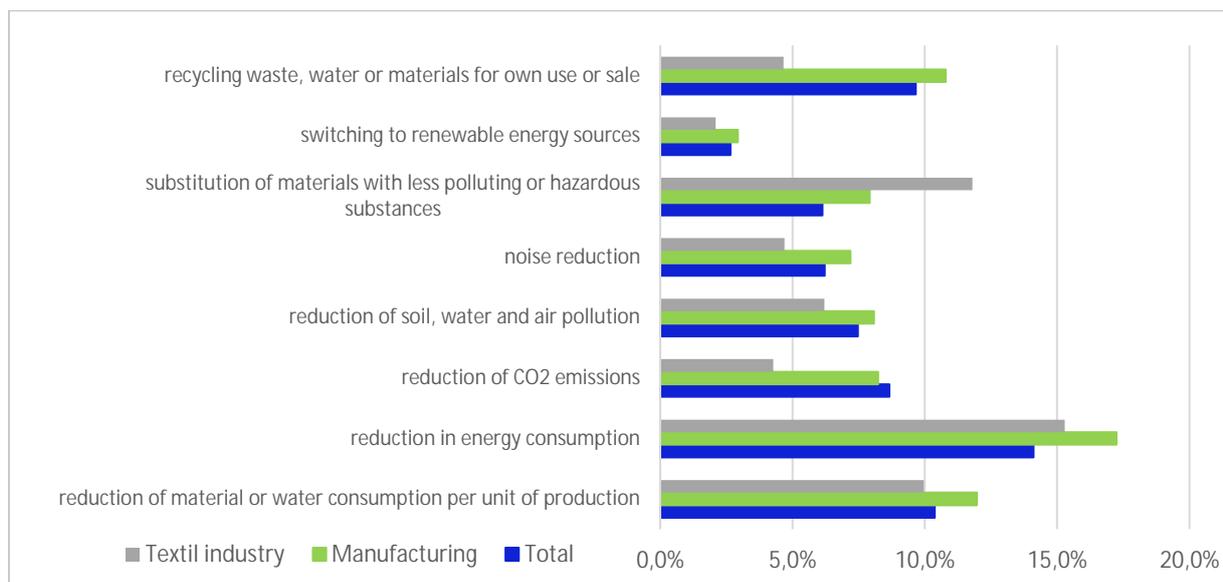
Figure 4: Positive environmental benefits of Innovation on the customer side in the period 2018-2020



Source: Own processing based on ČSU

The environmental benefits on the company side are the focus of Figure 5. Again, the largest percentage for all business sectors compared is the reduction in energy consumption. Substitution of materials with less polluting or hazardous substances comes second for the textile manufacturing sector. For the manufacturing industry, the second most important benefit is reduced material or water consumption per unit produced, and this applies to all enterprises in the country as a whole.

Figure 5: Positive environmental benefits on the enterprise side in the period 2018-2020



Source: Own processing based on ČSU

4 Conclusions

When assessing the innovation activities of manufacturing enterprises in the EU, it was found that the Czech Republic is below the European average. The analysis of the innovation activity of enterprises in the Czech Republic in the manufacturing industry compared to the textile industry shows that fewer enterprises innovate in the textile industry. The percentage of enterprises innovating in the textile industry is around 50 % and it is mainly business process innovation. However, the textile industry is the sector of the manufacturing industry with the lowest level of innovation activity. Among the positive environmental benefits associated with the production, distribution or sale of products and services on the customer side, reducing energy consumption and extending product lifetimes are the clear winners for all three enterprise groups surveyed (total, manufacturing, textile

industry). The benefits to the company as well as to the customer are mainly related to energy consumption, followed by reducing soil, water and air pollution in the textile industry.

A limitation of the research is the data evaluated, which is based only on the respondents' opinions of the innovations implemented. Company data on eco-innovations are difficult to obtain, and the financial statements that companies publish do not yet offer this information.

Innovation in the textile industry has been going on for a long time and it is of vital importance not only for the textile industry but for other industries as well (Hodges, Link, 2019). Furthermore, sustainability is seen as an important driver of current and future innovation. Sustainability and circularity in textile manufacturing are already priorities not only for companies and consumers, but also for public authorities in the EU. Unfortunately, according to the European Commission (2022), the change is gradual, relatively slow and the sector's environmental and climate footprint is still significant. Yes, although it has been shown in this article that there are efforts within the European Union to transform the textile industry towards sustainability, environmental friendliness and economic growth, unfortunately the innovation activity of companies in this sector is currently relatively low in comparison to others. Niinimäki (2015) states that about 80 % of the textile sector involves transporting finished products from developing countries to developed countries. Developing countries are popular locations for manufacturers from developed countries to relocate production due to low labour costs, labour relations and environmental legislation that is less stringent than in developed countries (Niinimäki, 2015).

At the same time, there is considerable pressure on consumers from the supply of cheap textiles from developing countries which, unfortunately, sustainable and environmentally friendly textiles from the EU are not yet able to fully compete with. This is why the attitude of the consumer is also one of the key factors. Do they want more sustainable products, produced using less electricity, chemicals and carbon, or will they continue to prefer cheaper products from countries violating human rights and using highly unsustainable production practices? The solution could be, for example, the introduction of the now much-discussed carbon tariff on imports into the EU, which would compensate for the price difference between domestic goods and imports.

Based on the available information, it is discussed that the starting point for the Czech textile industry to grow is to increase exports, especially to European countries that appreciate top quality and are willing to pay for it. Czech companies should therefore invest in innovation with the aim of improving the quality of products, which will be the result of more environmentally friendly and sustainable production processes. This should ensure the competitiveness of the companies, combined with a sustainable economic growth.

Acknowledgement

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Family businesses in the Czech republic and their involvement in digitization

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Abstract: Our article deals with family businesses according to Czech legal regulations. It summarizes their specifics and typical features, including their involvement in digitization and the use of artificial intelligence. Family businesses have been emerging in the Czech Republic for the past thirty years. The term family business is appearing more and more in the names of already existing companies. The number of these companies is also growing in the Register of Family Businesses. That is why we are thinking about what advantages such a designation can bring to the company and at the same time what it can bring to our Czech society. According to expert estimates, family businesses create more than half of the gross domestic product. They are usually local patriots, invest and plan their development for future generations. The influence of the family business on the education of the next generations, the intergenerational transfer of experience is essentially essential. On the other hand, such a company designation represents new obligations and different expectations of state and other institutions, business partners and customers. Automation and digitization belong to the current and future functioning of family businesses. Research shows that family businesses are not afraid of these challenges, increasing their performance, effectiveness and resilience.

Keywords: small and medium-sized companies, family business, digitization, Register of family business in the Czech Republic

JEL Classification: D22, J21, J49, M20

1 Introduction

The definition of a family business is anchored in the form of a non-legislative regulation, namely Government Resolution No. 899 of October 18, 2021. A family business is a family business corporation or a family trade. A family business corporation is a business corporation in which members of one family directly or indirectly exercise the majority of voting rights and at least one member of this family is a member of the statutory body of this business corporation; the characteristics of a family business corporation are also met if its sole shareholder is a member of one family who is also a member of the statutory body, and at least one other member of the same family is a member of its statutory body, its employee, its proxy or a member of its supervisory board. A family trade is a business in which at least two members of one family participate with their work or property and at least one of the members of this family holds a trade or other similar license or is authorized to do business for another reason.

When starting a family business, it can be considered very important to plan future activities, that is, to create a detailed business plan. For example, determine the scope of activities, the number of family members involved and the division of individual activities between individual members. The reason is primarily the fact that the success of the business falls on several members of one family. This exacerbates the problems and negative effects of lack of funds or other unsuccessful steps. The period before the company starts operating in such a way as to adequately provide for the involved members, not only with current income but also for the future, can also be challenging. It can be assumed that the goal of a family business may be to increase the assets and income of the family, save expenses for employees, and avoid complications with the employment of employees according to the Labor Code.

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2 Methods

2.1 The process of identifying Czech family businesses

Family business corporations and family self-employed persons have begun to register in Register of Family Businesses maintained by the Association of Small and Medium Enterprises and Entrepreneurs from March 1, 2020. They entered the register of family business corporations and family businesses that correspond to the government's definition of a family business. The Ministry of Industry and Trade publishes an overview of companies in the Register of Family Businesses on its portal. Registered companies have the following advantages: use the programs of the National Development Bank (NRB) intended for family businesses from April 1, 2020, namely GEN-Guarantee, Expansion-loans and Expansion-guarantees; have the right to use the official "Family Business Czech Republic" logo. Companies are interested in registering in this Register.

2.2 The digitization and automation process – an important prerequisite for the future development of family businesses

The process of digital transformation involves the use of digital technologies to create new or modify existing business and company processes, company culture and customer experience. Modern and rapidly changing trends in information technology must be met, while business and market conditions must be respected. Velte (2011) wrote that the process of digitization and automation in family businesses takes place in the following areas:

- Basic administrative tasks
- Data storage on the cloud
- Big data
- Chatbots
- Use of artificial intelligence for prediction or decision-making (AI)
- Digital supply chain management
- Enterprise resource planning system (ERP system)
- Use of virtual or augmented reality
- Automation and robotization of production
- Use of applications that provide a quick solution to a specific task

The Association of Family Businesses evaluates family businesses in its research. Here we present some of their findings regarding digitization, automation and robotization in family businesses. For Example, in most family businesses (70%), basic administrative tasks are automated. As a rule, these activities are: preparing and filling in various reports and forms, confirming one's own activities, maintaining various data or information records and tables, and preparing documents for negotiations and meetings.

53 % of family businesses in the Czech Republic use data storage in the cloud (according to a research report).

The use of cloud data storage brings mainly the following advantages to family businesses:

- data in the cloud can be browsed from any device
- minimization of costs associated with the purchase of own servers, thereby minimizing the demands on IT workers
- the user (family business) pays only for the funds actually used
- the system is updated by the cloud provider
- the use of the cloud is reliable and the service is constantly available (the service is located on many physically independent machines, this almost guarantees operation without outages on the hardware side, the usual guarantee of availability over 99.5% of the time)
- backup of company data is located in parallel on several servers.

Family businesses can use these basic models of cloud systems:

IAAS — "Infrastructure as a Service", the lowest possible level, the provider offers virtual hardware

PAAS — "Platform as a Service", the provider provides the entire platform on top of which the entire product is subsequently built (Google App Engine - supports popular development languages with a number of development tools)

SAAS — "Software as a Service", the customer is provided with the entire SW solution and he only uses it, requiring only a minimum of development on the part of the customer (Google Docs - creation of online documents)

DAAS — "Data as a Service", the customer is only provided with access to the data storage (iCloud)

Big data is used by 19 % of family businesses.

About 13% of family businesses use a **chatbot**. These computer programs are mainly used in customer support, where they replace operators. The most common type is the classic chat, where an artificial intelligence answers instead of an operator. Chatbots can also be used by companies to recruit employees. With the help of an automatic test, the chatbot can find out, for example, basic data about the applicant, starting time options, previous experience, knowledge and skills, it can test basic language skills, it may want to work out a task (e.g. creating a graph).

Artificial intelligence (AI) can have a big impact on business in all its areas. This is mainly the automation of processes and tasks in companies, streamlining the management of internal company processes, and using AI to analyze the market and the development of the company, which helps to adjust the offer of companies and better meet the needs of customers. The predictive capabilities of companies today are often still very limited. However, Kod'ousková (2023) adds that, with the development of AI, they can, for example, plan supplies and make a number of strategic decisions better. Even today, family businesses automate their business processes and use a number of tools and applications for this. The ability to sell cheaper, faster, more efficiently and more is one of the goals of artificial intelligence.

Artificial intelligence can also be used in the company's financial management, human resources, for predicting the development of shares, setting appropriate price levels, sorting mail (recognizing spam), predicting machine breakdowns, digitizing company documents, etc.

Artificial intelligence is used by approximately 6 % of family businesses.

Digital supply chain management (SCM system) is used by 8% of family businesses. SCM is a closely coordinated and responsive system that includes all activities from changing raw materials to finished products to selling to customers. Improved SCM practices can transform family businesses, which can thus become more competitive, e.g. by minimizing waste and surpluses while reducing costs and increasing efficiency. They can increase customer loyalty by offering personalized logistics that meet individual preferences.

Enterprise Resource Planning System (ERP System)

15 % of family businesses use ERP (Enterprise Resource Planning) systems, which manage and integrate all or most areas of the company's activities with the help of a computer. ERP systems ensure the flow of data between company processes. By collecting shared data about an organization's transactions from various sources, ERP systems eliminate data duplication and ensure data integrity with a single source of reliable information.

For example, the family company EMCO uses an ERP system in the cloud. The ERP system works on a network of remote servers instead of inside the company. The cloud provider patches, maintains and updates the software several times a year.

The use of virtual or augmented reality is 5% in the case of family businesses.

Augmented Reality (AR), i.e. extended reality, is a revolutionary technology that connects the virtual world with the real environment. It is a digital superstructure of the real world that enriches mobile and web applications with interactive elements through computer-generated text, images or video. It is therefore necessary to determine in advance what point or object the iPhone (or other devices) will respond to. In other words, determine the stimulus based on which the virtual object appears. This point can be a face, a QR code or a specific thing - for example a building.

An example of AR is an application that allows you to explore the interior of Porsche cars in detail and at the same time try driving them on real streets, or try how the car will look in the garage (Porsche AR Visualiser). Family businesses can use Vuforia Chalk – this is a customer support application with augmented reality that visualizes the individual steps of various procedures through interactive elements. Vuforia Chalk combines advanced AR collaboration tools with real-time video communication. It allows connecting a technician in the field with an expert, so both see a certain situation that they can solve together. Technicians and experts can draw digital annotations on a mobile screen or desktop that closely adhere to 3D physical objects in the real world, allowing an expert to guide the technician through the process step-by-step.

Unlike AR projects, Virtual Reality creates a completely new digital environment, and to watch it requires the use of a special headset - VR glasses.

7 % of family businesses use **automation and robotization of production**. In these processes, errors caused by the human factor are reduced. Thanks to the precisely determined and repeatable production process of the automated line, there is no risk of a reduction in product quality.

The robotic workplace brings high precision when handling products from place to place at high speeds. Robots most often perform repetitive activities in the so-called "pick and place" mode or with the help of industrial cameras in the so-called "trace, pick and place" mode. This includes, for example, turning, moving to other positions, loading into machines, possibly stacking into boxes, palletizing and packaging. Robots are also used, which meet the demanding criteria of operational safety and machine operation and can also work in close proximity to humans.

25% of family businesses use **applications that provide a quick solution to a specific task**. This is the use of hybrid, native or web applications.

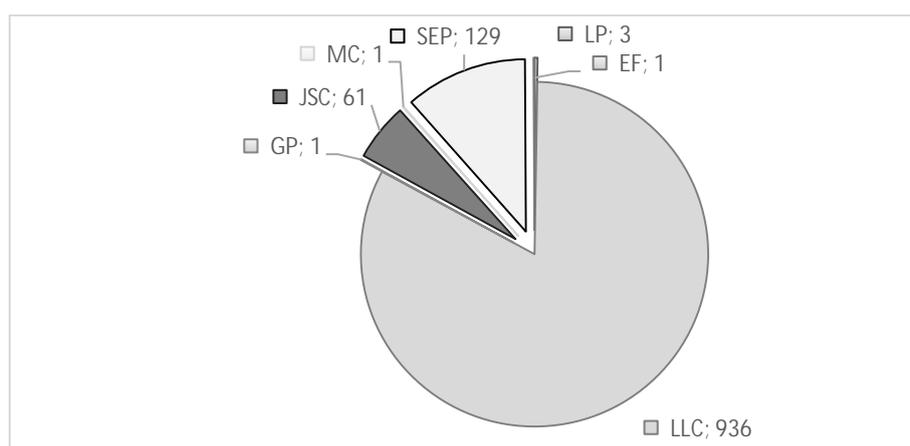
3 Research results

The aim of this part is to identify the representation of legal forms of family businesses in the Register of Family Businesses and to define the aspects that influence family businesses in their activities. Family businesses are the backbone of the Czech business environment. There is great interest in registering these businesses in the mentioned Register. Probably not all businesses that meet the definition of family businesses are registered in the Register. Some family businesses have not yet entered the Register of Family Businesses or are still considering registration. The second part presents aspects that influence the functioning of family businesses.

3.1 Family Firms in Register of Family Business

The Register of Family Businesses accepted 1,132 businesses from the beginning of registration until the end of September 2023. Of the total number of the registered family businesses, 88.6% were family business corporations (i.e., 1003 business corporations) and 11.4% were family self-employed persons (i.e., 129 self-employed persons). The spectrum of the registered family businesses, including the number of individual forms of businesses shows the Figure 1.

Figure 1 Number of registered family businesses by the end of September 2023



Source: Register of Family Business, own processing

Self-employed persons represent 129 registered family businesses. Registered family business corporations represent exist legal forms of the business in the Czech Republic, including the manufacturing cooperatives, where the largest share is held by the form of the limited liability company (abb. LLC) with the number of 936 registered companies. This is followed by 61 registered joint-stock companies (abb. JSC), 3 registered limited partnerships (abb. LP) and one registered general partnership (abb. GP), manufacturing cooperative (abb. MC) and endowment fund (abb. EF). A specific position in the spectrum of the registered family businesses is occupied by the endowment fund with serial registration number No. 555, which, based on proven compliance with the requirements of the definition of the family business according to Government Resolution No. 899, can also be registered. Act No. 89/2012 Coll., Civil Code designates an endowment fund and a foundation as a foundation that serves a socially or economically useful purpose. The purpose of the given registered endowment fund and the objective of its activity is to find, mediate and provide affordable housing to homeless persons with no or minimal financial resource, and to assist these persons in their involvement in a normal, fulfilling life. The registration process takes a maximum of a week when all necessary documents are submitted.

The most common reasons to register:

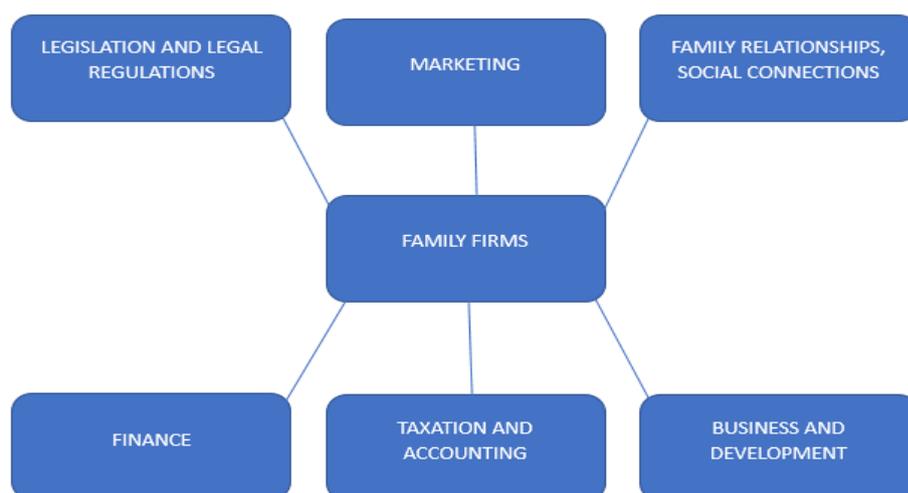
- the desire to belong to some whole;
- the possibility of supporting and developing the business of the family business in the next generations;
- more favorable conditions for the products of the National Development Bank.

From April 1, 2020, registered companies have the opportunity to use programs of the National Development Bank (NRB) intended for family businesses, namely GEN-Guarantee, Expansion-loans and Expansion-guarantees, and on the other hand, they have the right to use the official "Family Business Czech Republic" logo. In this way, family businesses most often financed the acquisition of new machines, technologies, construction, modernization or expansion of production areas, warehouses or administrative buildings.

3.2 Aspects affecting the functioning of family businesses

Creating a detailed business plan and planning future activities is important when starting a family business. The authors tried to define the areas that directly affect the activities of family businesses. Figure 2 graphically illustrates these areas. Below this picture, the authors have added specific aspects that can affect family businesses.

Figure 2 Aspects affecting the activity of family businesses



Source: Own processing

Aspects affecting the functioning of family businesses:

1. **Legislation and legal regulations** – In 2020, the Ministry of Industry and Trade presented a definition of family business corporations and family businesses. The Czech Republic is one of the very few countries in the European Union where family business is legally enshrined in the definition of family business and family trade. The business conditions of family businesses are essentially the same as for other businesses. The National Development Bank in the Czech Republic offers preferential financing to family businesses by directly providing loans or by guaranteeing them.
2. **Marketing** - Businesses use the term "family business" or "family business" in their name. Customers and business partners perceive this supplement positively. This term has become part of the marketing tools. This can lead to, for example, higher trust in honest work, lower costs or better access to customers, etc.

We can assume that the family of the business owner, or entrepreneur, will have a greater interest in quality and long-term sustainable positive results of the business. It follows that the term family business is attractive to the customer, and that is why entrepreneurs and business owners are also interested in this addition to the name.

How family businesses are able to grant the ideas and wishes of their customers is a question. Further customer interest in the future will also develop accordingly. The name "family business" or "family business" can hide a lot of potential, but at the same time, this name may not mean anything to customers.

In practice, you can also meet companies where they prefer to operate without employees outside the family, the so-called "strangers". They assume that "foreign" employees will not perform the relevant work precisely enough and will lack the necessary motivation to maintain the quality of the products or services offered. We can apply this more to micro-enterprises and small companies. Furthermore, we can add the issue of taxation and the amount of tax impact on the company without and with "foreign" employees.

3. **Family relationships and social connections** - the situation of the company is usually also reflected in the social relations in the family. The operation of a family business, where several family members are involved, can help the mutual understanding of family members, their cooperation, communication and understanding. On the other

hand, it is necessary to resolve conflict situations that would not have arisen without the existence of a family business. It is natural that even people who are close to each other can have very different opinions on dealing with work matters. Here we can assume that the family should feel a strong sense of belonging and motivation to achieve a jointly set goal. One of the main goals of a family business is probably long-term gainful activity and the related effort to involve the younger generation, including children, in the company's activities.

We can consider the presence of children as an educational effect and the formation of the children's bond with the family's business activities. Children perceive the functioning of the business and its changes, learn to solve various situations and help their parents who are entrepreneurs. It is an exaggeration to say that children will learn the value of money and the difficulties in obtaining it. In addition, the family business can provide them with additional financial income. They will acquire practical skills applicable to both business and employment. Descendants get to know how to solve different situations, acquire communication skills and knowledge in the field of financial literacy. In this way, an entrepreneurial family can raise a new generation that will continue the entrepreneurial activity that has started. In this way, the company is de facto building its new tradition. Otherwise, the new generation will have a better chance of doing business successfully in another company of their own. Of course, there may be a situation where the descendants are not interested in continuing the business and liquidate or sell the business. In this way, they can obtain funds for other own activities. We can consider it beneficial in this situation. This is also a valuable experience for the new generation.

4. **Finance** – the scope of business activities determines how many people will be involved in the business and whether it will only be family members. From a long-term perspective, the company should generate a profit sufficient to maintain the business and provide for the family members involved. Their involvement brings a higher risk of financial problems for the family, if the business activity is not sufficiently profitable or there is a loss. In the case of family firms, we can assume a greater effort to maintain the company's activity even in the event of a short-term loss. It is therefore possible to recommend diversification of these risks, for example as follows:
 - Expanding business activities according to the abilities, interests and experience or education of family members,
 - Partial involvement of family members, i.e. family members have their own jobs and cooperate in business activities in their free time,
 - Involving only family members who are not employed for any reason
 - Involvement of family members temporarily,
 - Prepare a solution to a situation where one of the family members decides to leave the family's entrepreneurial activity. This also applies to financial compensation.
5. **Taxation and accounting** - in the area of recording the company's activities, it is necessary to comply with legal regulations in the area of accounting and taxation. The legal form of the family business affects the obligations in the area of accounting and taxation and the registration of activities. The same applies when guaranteeing the obligations of a family business.

In addition, problems may arise with the separation of private and business property. Accounting segregation of assets may seem straightforward, but an entrepreneur can actually use business assets for private activities as well. This is difficult for the financial administration to prove. She may not be able to find out during the tax audit.

The entrepreneur must be able to prove the involvement of specific family members in the activities of the family business, for example by means of an employment contract, an agreement on the performance of work, the registration of these persons in the trade or commercial register. If family members are cooperating persons according to § 13 of Act No. 586/1992 Coll., on income taxes as amended, these persons must report themselves to the authorities as cooperating persons. Collaborators are essentially self-employed persons, so they are subject to the same obligations as entrepreneurs.

From the point of view of taxation, family businesses are subject to the same taxes as other businesses. This applies to income tax, value added tax, real estate tax, road tax or consumption and energy tax. However, taxation may affect family businesses differently than other businesses. On the other hand, a family business can benefit from various tax benefits in the area of income taxation in the form of benefits for cooperating persons according to § 13, non-taxable amounts according to § 15 of the Act on Income Taxes, deductible items according to § 34, tax discounts according to § 35, § 35 ba, § 35c or others. One business affects the social situation of several

members of one family. Several members of one family are dependent on the functioning of one business. Family businesses are more sensitive to taxation in this regard.

In the area of tax burden, the social and health insurance of family members involved in the family business cannot be forgotten either. The form of involvement of family members matters here. Thus, the entrepreneur must distinguish whether other family members are employees or cooperating persons according to § 13 of the Act on Income Taxes as amended, etc. Obligations in relation to social security and health insurance arise from these facts.

6. **Business and development** – management in a family business affects the functioning and financial situation of several family members. The company should consider the ability to obtain a bank loan or other loan. The form of business affects this situation quite a lot. In the case where members of one family own joint property, the family has a very limited possibility of obtaining a loan.

Another thing that can be quite specific to family businesses is the development of the business. On the one hand, they may not have such a strong tendency to grow or develop the company or increase the number of branches. A family business may not be interested in expanding further or creating additional branches, establishments, divisions, etc., even if it is doing well and would be able to expand. We encounter this mainly in smaller family businesses. A family business may not be interested in expanding further or creating additional branches, establishments, divisions, etc., even if it is doing well and would be able to expand. We encounter this mainly in smaller family businesses. We encounter these situations, for example, when processing diploma theses, when family businesses often reject the recommendations of the authors of final theses aimed at the development or growth of the company, building other branches, etc. On the other hand, there are family businesses that develop very quickly, have experience with automation, robotization and artificial intelligence. Owners of family businesses correctly assess that the future of their companies is linked to the process of automation and digitization. They are forced to focus on automating routine administrative tasks and speeding up and making approval processes more transparent. The use of mobile devices has been skyrocketing for several years. Their use for everyday business processes and administration is not sufficiently developed in family businesses in the Czech Republic. There are several reasons for this: among the most frequently cited ones are concerns about the security of sensitive company data on devices outside of strict company control, low priority of common administrative or back office processes, fear of introducing new technologies, ignorance, and lack of information. Where they already use trendy digital management tools, they have maximized the efficiency of employees' time spent, speeded up the necessary administration, reduced the error rate and thus increased the resilience of the family business.

4 Conclusions

Family businesses have been creating a new tradition for the past thirty years. The period of socialism broke the tradition of family businesses. The Czech Republic is one of the few countries in the European Union where family business is legally enshrined in the definition of family business and family trade from 2021. The Association of Small and Medium Enterprises and Entrepreneurs ranks family businesses as follows:

- the largest source of jobs in the private sector;
- an important element of regional development;
- they are local patriots;
- it accounts for more than half of the gross domestic product;
- they plan their development for the next generations;
- they are durable;
- they invest;
- the proceeds from their business stay in our state.

The official portal of the Quality Council of the Czech Republic (2023) states that a family business connects family members as family members and those same family members as co-workers and employees of the business. The basic principles of their success include wisdom passed on from generation to generation, pride, trust, flexibility, a stable corporate culture, speed of decision-making, loyalty, honesty, ethics, responsibility towards future generations, the ability to motivate people around them, support the development of the region, etc. Family farms contribute to the prevention of rural depopulation. These characteristic features gradually become an important generator of values, emotional or social,

i.e. non-economic wealth of the family business. In the family business, respect and humility remain for what the founder has achieved. Tradition and family know-how is a guarantee of reliability.

The processes of digitization, automation and robotization also affect family businesses. Owners of family businesses correctly assess that the future of their companies is linked to the process of automation and digitization. Family businesses must also focus on automating routine administrative tasks and speeding up and making approval processes more transparent. The use of mobile devices has been skyrocketing for several years. Their use for everyday business processes and administration is not sufficiently developed in family businesses in the Czech Republic. There are several reasons for this: among the most frequently cited ones are concerns about the security of sensitive company data on devices outside of strict company control, low priority of common administrative or back office processes, fear of introducing new technologies, ignorance, lack of information. Where they already use trendy digital management tools, they have maximized the efficiency of employees' time spent, speeded up the necessary administration, reduced the error rate and thus increased the resilience of the family business.

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The sharing economy as a factor of increasing competitiveness

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Abstract: The sharing economy, as a system based on exchange, is a section of economics that brings a completely new perspective on economic processes. The goal of any economy is to use resources as efficiently as possible. This objective can be achieved by using these resources to the maximum extent possible. The sharing economy then opens up new possibilities for the use of resources, involving not only businesses but also and especially people sharing their private property, which they have hitherto used only for their own personal purposes. Entrepreneurs who are able to take advantage of this mechanism, i.e. the use of private property of non-business persons in return for compensation, can significantly reduce their costs. These costs would otherwise have to be spent on acquiring new property or leasing property from someone else on a long-term basis. The aim of this article is to define the concepts of sharing economy and competition, and to evaluate the relationship between the use of sharing economy elements and increased competitiveness on selected examples by analysing available statistical data.

Keywords: sharing economy, competitiveness, efficiency, business, resources

JEL Classification: M20, K22, F12

1 Introduction

The sharing economy, as a system based on exchange, is a part of the economy that brings a completely new perspective on economic processes. Its goal is the most efficient use of resources. The sharing economy is built on the sharing of commodities or assets based on their rental or exchange. It is not a new concept, the shared economy, or its principles have been with us for a long time. (Hossain, 2020; Cheng, 2016; Platonova, 2023). According to Oxford Learner's Dictionaries (2023), the definition is: „An economic system in which people can share possessions, services, etc., usually by means of the internet“. In academia, the sharing economy is most often defined as an economic ecosystem that is typically based on temporary access to goods or services using Internet platforms connecting various community members (Karobliene & Pilinkiene, 2021). The sharing market is developing rapidly, allowing people to exchange, borrow, or collectively consume almost any good or service. That is also why we can meet the shared economy in almost all areas, among the most mentioned are:

- Transportation,
- Accommodation,
- Financial services,
- Workspaces, work tools or manpower,
- Provision of services,
- Education,
- Music and videos,
- Cloud services etc.

The development of the shared economy concept is to some extent dependent on the development of digital platforms, where some forms are directly dependent on them. Authors Pouri & Hilty (2021) therefore develop the basic definition of the digital sharing economy (DSE): „*The digital sharing economy is a class of resource allocation systems based on sharing practices which are coordinated by digital online platforms and performed by individuals and possibly (non-)*

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commercial organizations with the aim to provide access to material or immaterial resources. Digital sharing systems operate in the space between traditional sharing and the formal market economy.“ The development of the platform model of business (platform model) is associated with problems with ensuring equal access to consumers and possible consumer legal actions, up to legal actions regarding consumer discrimination when using the platform. (Lee et al., 2021).

The sharing economy is for everyone. In certain situations, consumers become providers and offer a certain product to share or offer a service. A typical example is shared accommodation such as Airbnb. Exactly when and under what conditions users become providers of the shared economy are analysed by Lang et al. (2021). At the same time, it allows users of the sharing economy to access services and products that they would either not be able to afford or would not use. The growth in the use of the sharing economy is also the trust of consumers, i.e. the recipients of the service, in the business model of the sharing economy and the associated technologies/platforms (Wagner et al., 2019). Furthermore, users can reduce their costs because sharing often offers more affordable alternatives to traditional ways of buying or owning. But even the shared economy is influenced by new trends in consumption, marketing and working conditions.

The interest in the shared economy is also from the point of view of sustainability, or circularity. After all, one estate is used on a mass scale by several entities at once. However, as Martin (2016) states, it is rather a new form of consumption, which initially did not deal with issues of sustainability, but in the future this element will gain importance. It therefore has a high potential for growth as an innovative model that translates into sustainable consumption and circularity (de Las Heras et al., 2020; Yeganeh, 2021).

Kotler et al. (2017) consider a thriving business to be one that strives to provide more value to the customer than its competitors provide. An entrepreneur must be competitive on the market, that means he must be able to deal with competitive potential. The goal is to prosper, develop, grow in the markets where it operates. It means achieving a strategic advantage and maintaining an edge over the competition. Although it can mean something different for everyone depending on the context, it is always very crucial to adapt to the needs of the end customer. The advantage can be in better product quality, lower costs, innovation and faster adaptation, efficiency, satisfied customers, marketing strategy, sustainability or perhaps in the use of the shared economy.

The sharing economy can significantly contribute to increasing competitiveness. Typically, companies use resources more efficiently, supporting innovation and new business models. The shared economy here offers an interesting tool to reduce operating costs and thereby achieve the same or even higher profits compared to the competition. However, the resulting product offered by the competition will ultimately be cheaper, which is a de facto key element in the competitive struggle. Kathan et al. (2016) but warn that due to rapid development, it may pose a serious threat to some established industries.

The sharing economy plays a significant role in increasing the competitiveness of the economy by promoting more efficient use of resources, expanding market and product access, stimulating innovation, reducing costs, and increasing competition in multiple sectors. Behind the rapid growth of the sharing economy concept is lax regulation and taxation in this area (Yeganeh, 2021). However, it is important to note that with this model comes challenges such as regulatory, security and consumer protection issues that need to be carefully considered and addressed. The aim of this article is to define the concepts of sharing economy and competition, and to evaluate the relationship between the use of sharing economy elements and increased competitiveness on selected examples by analysing available statistical data.

2 Methods

To achieve the set goal, the authors used several methods of scientific work. Among the core methods of the work, it is necessary to include analysis and synthesis, with the help of these methods applied to the achieved scientific knowledge, the authors defined the key concepts for this article, namely the concept of the shared economy and the concept of competitiveness. A sharing economy can be defined as an economy based on the sharing of commodities or property, either for money or based on exchange. Competitiveness is the ability of a company to establish itself in a certain field of business compared to others.

Furthermore, the authors used methods of scientific work based on the evaluation of primary and secondary data. Legislative acts were mainly used to define the framework and safeguards of the shared economy. This is because it is an area that, for the time being, is on the edge of a regulated and an unregulated area. For the time being, the states are taking different advice on anchoring this system in their legal systems. In some states it is anchored quite convincingly, in others it moves completely outside of any regulation. However, most states are on the borderline, meaning that a certain regulation exists, but rather it is an existing regulation, where the state tries to apply already existing rules to a newly created situation. However, explicit regulation of the sharing economy is often lacking in these states. However, the question remains whether this regulation is possible at all. Additionally, the problem is that regulations do not change as quickly as technology, often leading to inconsistencies and liability issues (Kathan et al., 2016).

Finally, statistical data were used to illustrate and evaluate the relationship between the sharing economy and increased competitiveness. Statistical data obtained from the statista.com service was analysed in the preparation of this article. The individual data within the selected examples - namely shared accommodation services, shared workspace or shared workforce and car sharing - pointed to the fact that elements of the sharing economy can open up interesting opportunities for entrepreneurs when the use of these elements generally reduces the cost of using them. Through the reduction of costs or the efficient use of resources, the shared economy can be an interesting factor for entrepreneurs to increase their competitiveness.

3 Research results

Entrepreneurship in general can be defined as an activity carried out independently and consistently, on one's own account and responsibility, and especially for the purpose of making a profit. Every entrepreneur therefore acts in such a way as to achieve the greatest possible profit while incurring the least possible costs. If entrepreneurs can optimally reduce their costs without reducing their profits, they increase their competitiveness. The products and services it offers in this way are, in comparison with the competition, significantly lower than the products and services offered by the competition with higher operating costs.

The introduction of elements of the shared economy brings completely new possibilities to entrepreneurs. Through the sharing economy, entrepreneurs can significantly reduce their costs, thereby increasing the efficiency of production processes and thus competitiveness, as will be shown below with selected examples in the chosen sectors.

The elements of the sharing economy can be used by entrepreneurs as users. That is, as persons who use already existing tools to reduce costs, which we classify in the shared economy. In this case, it will be possible to identify a direct relationship between the use of elements of the shared economy and the savings that this use will bring. Examples include the use of shared short-term accommodation services, shared workspace or shared workforce.

The P2P accommodation segment is a unique segment of the sharing economy (Belarmino & Koh, 2020) that Airbnb has become synonymous with. Airbnb has been around since 2007 and over the years has evolved into a world-renowned digital platform that allows people to rent out their properties on a short-term basis. It brings a number of advantages (e.g. lower prices for users, the possibility of additional income for providers, a diverse selection of accommodation and others), but also disadvantages (e.g. tax evasion, negative impact on the real estate market and disruption of order in houses). The legal regulation of P2P accommodation is insufficient in many respects, also because the segment developed faster than the current legal regulation had time to react. From Figure 1, using the example of the Airbnb accommodation service, it can be seen that the price of a room rented through this service can be significantly lower than in the case of using classic accommodation in hotel rooms. This therefore offers entrepreneurs who use this type of service an interesting opportunity to reduce their costs.

Figure 1 Price comparison of hotel rooms and Airbnb services in selected cities

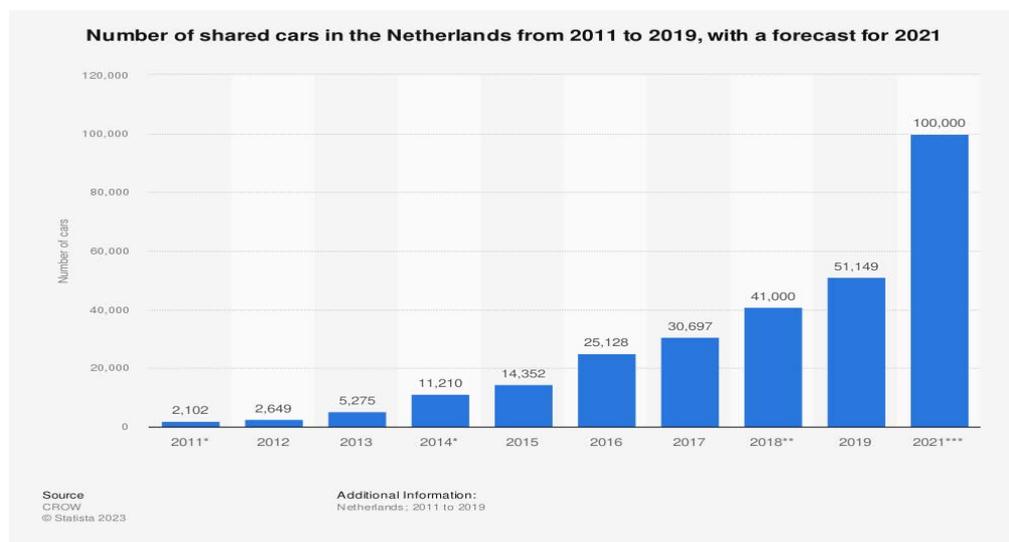


Source: (McCarthy, 2018)

On the other hand, entrepreneurs can also be in the position of service providers in the sharing economy. In this case, the entrepreneur already directly offers temporary access to goods or services using Internet platforms. As can be seen from Figure 2, the trend of using shared goods and services is growing significantly. Using the example of the research

carried out in the Netherlands on shared cars, it is evident that the growth dynamics of the use of this type of transport is following an exponential curve. The same development is evident in many other countries.

Figure 2 Number of shared cars in the Netherlands from 2011 to 2019, with a forecast for 2021



Source: (CROW, 2020)

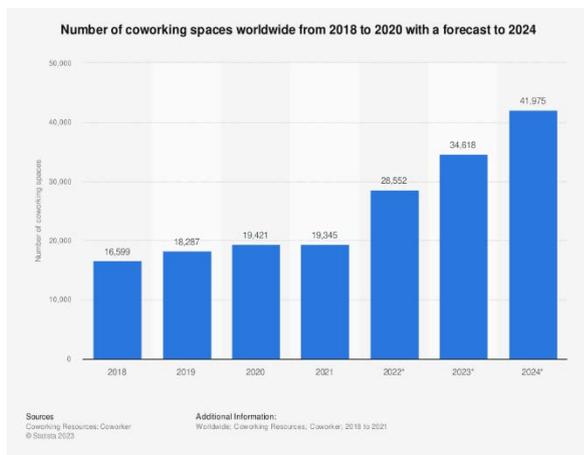
Both variants offer entrepreneurs tools to significantly reduce their operating costs and use resources efficiently. The first option offers a reduction in operating costs by using someone else's resources. While the use of own resources (that is, property owned by the entrepreneur), especially in the case of small and medium-sized entrepreneurs, their potential is often not fully utilized, in the case of the sharing economy this is not a threat. The risk of non-use of resources is assumed by the provider of goods or services that are shared in this way, and the entrepreneur only pays a proportional part for the time he uses the thing. This is best seen in the case of shared transport. If an entrepreneur wanted to use his own property to transport himself or his employees, goods, etc., this would mean that he would have to purchase a car that he would use for these purposes. However, such a car would only be used for a fraction of the time of its existence (business trip, shipment of goods, etc.) and for the rest of the time it would stand unused, its potential would not be used, but the entrepreneur would be obliged to pay the fixed costs associated with car ownership (insurance, vehicle wear and tear, etc.). Of course, there are also entrepreneurs who use the potential of their property to the maximum extent possible, but there are also many entrepreneurs who implement the business model as presented above.

The second option, on the other hand, puts entrepreneurs in a completely opposite position. The entrepreneur is the owner of the thing that he uses for his business needs. However, at a time when this item is not being used, it is offered by the entrepreneur through Internet platforms to other users, so that the potential of using such an item is as large as possible. Of course, even in this case, it will depend on the assessment of the individual conditions of each entrepreneur, no less, even an item that is not used gradually loses its value.

A shared workplace, sometimes referred to as a shared office space, work environment or coworking, is also considered a shared economy concept (Ciccarelli, 2023; Konecka-Szydłowska & Czupich, 2022). Shared workplaces can be run as standalone businesses or part of larger coworking networks. This concept supports the sharing and efficient use of existing office space and contributes to flexibility in the labour market (Kubátová, 2014). Sharing a workplace can have several advantages. Above all, it brings economic efficiency to the subjects when sharing costs for rent, energy and equipment, use of modern office infrastructure. An indisputable advantage is flexibility and networking, as coworking spaces offer the opportunity to meet, share experiences and inspiration. Although, according to the authors, the advantages outweigh the disadvantages, we list some of them, such as limited privacy or information leakage. Depending on the type of shared workspace, the flexibility or availability of the location may be limited, the quality depends on the provider, the price, security. However, these aspects can be solved by choosing a shared location and a contract or regulation with the given provider.

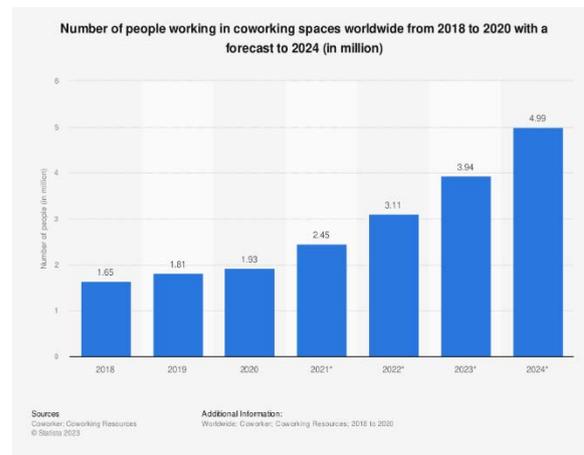
The statistics of shared workplaces, coworking, are also interesting. According to the predictions shown in Figure 3 and Figure 4, there will be a total of 41,975 coworking spaces worldwide in 2024. Almost 5 million employees will work in these jobs in 2024.

Figure 3 Number of coworking spaces worldwide from 2018 to 2020 with a forecast to 2024



Source: (Coworking Resources & Coworker, 2022)

Figure 4 Number of people working in coworking spaces worldwide from 2018 to 2020 with a forecast to 2024 (in million)



Source: (Coworker & Coworking Resources, 2020)

The sharing economy opens new opportunities for entrepreneurs. Thanks to it, they can effectively reduce costs and thus increase their competitiveness. This is also evident from the selected examples. For example, the Airbnb platform allows accommodation to be rented at lower prices than traditional hotels, which is beneficial for entrepreneurs. The trend of sharing goods and services is growing rapidly, as shown by studies from different countries, for example in the Netherlands, where shared cars are gaining more and more users. Shared workplaces, known as coworking, also offer many benefits, including economic efficiency, flexibility, networking, and experience sharing. Coworking statistics are also interesting, which show the increase in coworking places and thus the use of all the benefits.

4 Conclusions

Thanks to cost reduction and efficient use of resources, the shared economy can be an interesting factor for entrepreneurs to increase their competitiveness. But at the same time, for some, due to the rapid development of sharing and use of technology, it can mean a serious threat to some established industries (Kathan et al., 2016). We can therefore state that competitiveness can be significantly influenced by the shared economy. This can bring new factors that can increase, but also disrupt, the competitiveness of entities. The sharing economy brings new players to the market, increases the pressure on the quality of products and services and on reducing prices. Some shared services are often dependent on reviews and therefore customer satisfaction. Again, the pressure is on a quality product and quality customer service. In this case, businesses using the digital sharing economy concept have a competitive advantage. But the sharing economy can disrupt traditional industries, both positively and negatively, which creates the need for adaptation and innovation in these industries, and as a result affects overall competitiveness.

We must not forget one aspect, namely the combination of the concept of sharing and sustainability. The sharing economy also brings benefits for the environment. On the one hand, resources are optimized, products are used more, have a longer lifespan, and thus the need to produce new products is reduced. Products are redistributed and waste is reduced, thereby reducing the amount of waste and carbon emissions associated with the production and disposal of older products. The impact of transportation can be problematic, as sharing usually involves transportation (such as ridesharing or delivery services), but these transportation services often result in less environmental impact compared to the production of entirely new products. The sharing economy will play a pivotal role in promoting sustainable development by striving to use resources efficiently, extend the life of products and minimize waste and carbon emissions. The use of these elements in business will again lead to an increase in competitiveness on the market. It is therefore logical that these elements leading to sustainable development, including the sharing economy, will be increasingly emphasized in the future.

Entrepreneurs who focus on sustainability and resource sharing can reduce the cost of raw materials and energy resources in the long term. This can give them a competitive advantage in the face of increasing environmental constraints. The sharing economy can thus increase competition and innovation, reduce costs, and contribute to increased availability of products and services. The result is an overall increase in the competitiveness of markets, but it is important to ensure that this growth is sustainable, fair and in accordance with relevant legal regulations and ethical standards. And this is where the authors see the main problem. Development in this area is faster than regulatory adaptation. Regulation lags significantly behind development, creating a grey zone in this segment that enables the use of elements of the shared economy without uniform regulation. This means that each entrepreneur can interpret the rules, or their absence, in this

segment according to their needs. The absence of uniform rules thus introduces elements of an unequal competitive struggle, when entities that move on the edge or outside the existing rules will be favoured, believing that they are acting as they are allowed to do. On the other hand, there will certainly be a group of subjects who will want to act in accordance with ethical standards, which, paradoxically, may cause them to be at a competitive disadvantage. However, this area already goes beyond the scope of this article, and it is offered to be explored as part of a separate research following the findings already established.

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Economic benefits of using digital technologies in the education process

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Abstract: The aim of the contribution is to describe the economic benefits of implementing digital technologies within online educational processes. In essence, these are modern technologies that are used for educational programs in non-profit organizations with the subsequent evaluation of human capital for the all-round support of sustainability in the region of interest with appropriate global reflection. For these reasons, the contribution is processed with an interdisciplinary approach of social sciences – economics, sociology, social work and global studies.

Keywords: online educational processes, human capital, supporting the sustainability of the region

JEL Classification: A13; F01; I23

1. Introduction

The article points out the importance of the implementation of digital technologies in educational programs to support investment in human resources with appropriate reflection on sustainable development. For these reasons, he deals with the current issue of the implementation of digital technologies in versatile areas of educational programs as part of supporting the economic and social development of the regions of interest of the Faculty of Theology of the University of South Bohemia in České Budějovice, which is the African country of Zambia. The choice of the mentioned project is the result of the consensus of the faculty with the Charity of the Czech Republic, which considers one of the difficulties in working with the local population of Zambia to be the considerable burden of access to education, as many children and adults could not attend school. They are very stigmatized either by the public or professional society. In this context, within the framework of mutual reciprocity, the aim is to support the projects of volunteers who come from among the people of Zambia and want to be actively involved in aid. This is a very beneficial help, as the locals know the history, culture and customs of the country. Thanks to the art of empathizing with the situation, they are perfect in taking care of clients and know their needs. The aid mentioned makes sense in supporting sustainability, which is an indispensable indicator for the quality of projects.

Based on experience from the covid-19 pandemic period, this is an effective use with appropriate expected benefits for the future. These are investments in human resources with appropriate evaluation of the quantitative and qualitative dimensions of human capital. As a result, potential risks in the economic, social and ecological areas can be expected to be reduced in the direct context of supporting sustainable development in integrally linked global dimensions.

The EU political initiative entitled Digital Education Action Plan (2021-2027) sets, among other things, a common vision of accessible digital education in EU countries. Its aim is to support systems of education and vocational training corresponding to the degree of digitization. The European Commission and the EU member states strive to fulfill their common vision of the European educational space also by focusing their efforts on the issue of digital education (Education, 2022).

The promotion of digital competences should be integrated into the education process as a cross-cutting topic. Provision of basic digital knowledge and competences for adult education should also be aimed at those who have already

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left formal education and training systems. This is the only way to succeed in the professional life, to succeed in the labor market in the age of modern technologies.

2. Processing methods and approaches

For the study of the observed problems, the genetic method of analysis prevails, with the help of which the mentioned issue can be clarified within the dimension of social work and social policy of the state in a global dimension. Other supporting methods are comparison (finding the similarities and differences of the monitored phenomena) and synthesis (to reveal the structure, mutual processes and relationships of individual aspects of the studied phenomenon).

The starting point of the monitored research and the focus of the article requires processing with an interdisciplinary approach of the social sciences involved in the issue (especially economics, sociology, global studies, pedagogy, social work...).

For analysis, we used data from 29 countries, so 27 countries of the EU added Norway and Iceland. The year of research is 2021 due to the fact that the latest data on digital skills is 2021. We used GDP per capita (at current prices in EUR), greenhouse gas emissions (air pollutants and greenhouse gases in kilograms per capita) and digital skills of the population (percentage of individuals with basic or above basic overall digital skills).

The assessment of that relationship was based on hypothesis testing:

Hypothesis A

H0 (null hypothesis): there is no relationship between digital skills and greenhouse gas emissions.

H1 (alternative hypothesis): There is a positive relationship between digital skills and greenhouse gas emissions.

Hypothesis B:

H0 (null hypothesis): There is no relationship between GDP per capita and digital skills

H1 (alternative hypothesis): There is a positive relationship between GDP per capita and digital skills

3. Research results

3.1 Initial philosophy to the issue

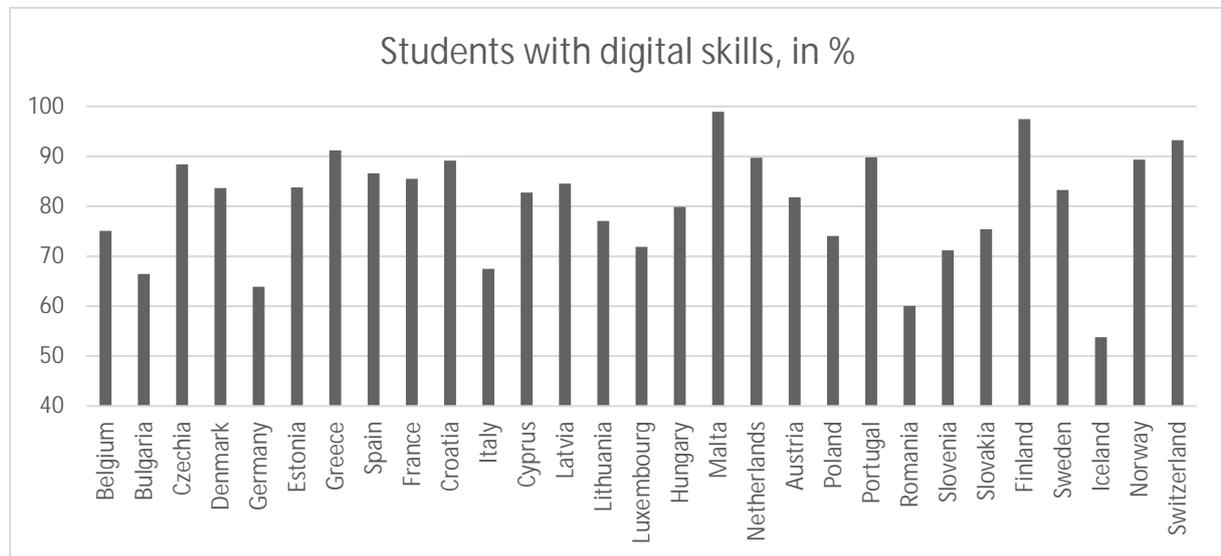
Any dynamic of social development necessarily leads to the dynamics of the economy. In the case of the creation and development of the information society, the influence on the global economy is most often discussed, which is understood both as a global scope in terms of geography and in the sense of impact on almost all economic sectors. Changes in the economy due to the development of the information society are often referred to as the new economy, global economy, knowledge-based, informational or digital economy. It is precisely the new manifestations of this economy that cause, among other things, the creation and deepening of digital divides. Economic changes are closely related to the development of technology. Current economies on their productivity and competitiveness primarily on the basis of information and knowledge. Opinions differ significantly on the use of the term new economy, but in any case, it collectively refers to all the changes in the economy that have occurred thanks to the development of information technologies in the last few decades. They are said to be applied in traditional ways.

As a result of the above-mentioned processes, the world is changing right in front of our eyes, its area is "shrinking" with exaggeration, and the passage of time is accelerating due to the development of information technologies. Space-time compression of the planets thus means its "shrinking". No nation state is any longer an independent unit, but is constantly influenced politically, environmentally, culturally, economically (Bauman, 1999). It is not a controlled project, but a process that takes place independently and spontaneously, it cannot be denied or fought against, but it can be worked with so that it develops for the benefit of the world's population, and not against it. However, a highly integrated global society becomes very fragile.

By its very nature, economics tends to simplify the world around us. Convert ideally into countable commodities that can be easily included in a pre-prepared calculus (Johanisová, 2014). To this end, it is helped by money, an invention that is able to convert into numerical values non-convertible, among other renewable and non-renewable resources, nature, free time, the lives of animals, and even people (Schumacher, 1982). There is already a complete lack of "ethical sensors", as the system of a consumer society based on mass production and huge investments ultimately leads to a crisis with multiple attributes and the erosion of social capital. On the other hand, the smaller activities of a large number of people led to the mobilization of themselves, their thinking and their hands will lead to an improvement in general psychological

well-being (Schumacher, 1982). In this context, it can be pointed out that the standard division of economics into microeconomics and macroeconomics is completely inadequate (Sedláček, 2018). It completely neglects two areas that are crucial for the functioning of society in today's world. The first of them is the nano level, on the basis of which the individual and his narrow circle of people function, the second is the mega level, which, on the other hand, is global and in today's integrated world this sphere cannot be neglected anymore (Johanisová, 2015).

Figure 1



Source: Eurostat

The EU uses the Digital Skills Indicator 2.0 to assess digital skills. This indicator is based on selected activities that are connected to the use of the Internet or software. There are five areas: information and data literacy, communication and collaboration, digital content creation, security and problem solving. Graph 1 shows the share of students in EU countries who are engaged in these activities, the implementation of which is linked to the relevant digital skills.

3.2 The digital divide as a consequence of the manifestations of the global economy

The digital divide is connected with information science and the information society, which is characterized by the use of digital processing, storage and transmission of information (Zlatoška, 1998). In this context, one can point to the fact that "information processing is becoming a significant economic activity, which on the one hand permeates traditional economic or social activities and on the other hand creates completely new opportunities and activities that significantly influence the character of society". Information and communication technologies play a key role in the current information society (Güntherová, 2009). This means that without digital technologies, it is difficult to operate in the information society, and therefore to incorporate and gain access to important information and knowledge. In the new information economy, in which information plays a decisive role, it is therefore impossible to ignore the problem of inequality in access to information technology. It is important to realize that access to digital technologies can lead to increased jobs, improved medical services and serves the overall war on poverty. Bridging the digital divide alone is not self-saving for developing countries, but it is an integral part of solving the whole problem.

According to the OECD (Organization for Economic Co-operation and Development), today's economy is increasingly becoming an Internet economy. The Internet influences today's society, enabling communication, innovation and economic growth. The global network is starting to play an increasingly important role in healthcare, education, and especially in the provision of commercial and government services. OECD countries want to promote the use of the Internet and thus contribute to improving the living standards of the population. The Internet enables the expansion of markets and the customization of products and services. For users, this means in practice that, thanks to better access to information, they can choose between different offers and choose the most advantageous one. This affects the prices of goods, promotes competition and changes the relationship between buyer and seller. The Internet thus enables the provision of innovative services and the development of new business models (Šetek, 2018).

Based on the facts cited above, the term digital divide refers to the widening differences between winners and losers in the information society. These are both questions of access to new information technologies, as well as a disparity in

decision-making powers and control over the direction of new investments, the development of new applications or the creation of content. "Such a division can exist between men and women, urban and rural residents, between more educated and less educated people, between the rich and the poor, between the healthy and the disabled, and on a global scale between developed and underdeveloped countries" (Sýkora, 2002). We understand the digital divide as a multidimensional phenomenon that can be distinguished in 3 aspects. The global gap refers mainly to differences between regions and countries in access to telecommunications infrastructure and in their influence on shaping the political environment. Above all, the countries of the economic South have limited opportunities to participate in the mechanisms of the information economy and are further economically disadvantaged as a result of the international division of labor. The second aspect is the social gap that exists between those who have information and those who do not have access to it, the last of the gaps is democratic – it describes the difference between those who have access to resources and can thus influence public life and those who they cannot (Norris, 2000).

The term digital divide can be dated from the last decade of the 20th century as the disproportion between those who have access to computers and the Internet and those who do not. Access means the physical possibility to use a personal computer connected to the Internet. Statistics published in the 1980s revealed that the distribution of computer technology and engineering is uneven and this fact cannot be ignored (Norris, 2000). At the time, computers were accessible in scientific circles and universities in the Western world. With the advent of the World Wide Web and new technologies, computers have gained mass influence, and the problem of a segment of the population that does not have access has become an issue for companies around the world. The digital divide still exists and is even increasing in some parts of the planet, exemplified above all by the gap between developed and developing countries. The gap exists even in technically and technologically developed societies, where the physical access gap is no longer widening, but on the contrary, it is deepening for a third to a quarter of the population. It is mainly about skills and experience in using computers. In developed countries, this is not primarily a technological problem, but rather a social and political problem. Digital technologies intensify inequalities (social, educational, age, gender and ethnic) and new inequalities appear with corresponding negative effects for the national economy.

3.3 The principle of subsidiarity to reduce the digital divide – an undesirable phenomenon of the global economy

The concentration of capital and the development of industrial technologies have become the "vanguard" of the accelerating dynamics of modern societies and have given it the appropriate qualitative direction. Economics, with its knowledge, participated most prominently among the social sciences in this "construction of a new world". The idea of decentralization movements in society towards the realization of subsidiarity is of interest to the social sciences, which as interested disciplines with different paradigms of implicit anthropological and value ideas are based on different contexts of social and worldview dimensions (Begg, 2008). Therefore, they will not be completely united regarding the assessment of the relevance of the principle of subsidiarity in its practical application. However, the principle of subsidiarity can help the social sciences, as a distinct social science discipline striving for at least partial independence from specific historically, contextually and politically conditioned social policies, to better formulate relations with the least possible dependence between the state and comprehensive care for the quality of life of all members of society. Creating a bond of social interaction not on general philosophical and moral principles (freedom, equality, justice, solidarity, subsidiarity), but on specific doctrines of social justice or human rights formulated in political processes can create a loss of autonomy in favor of service to man within the framework of quality of life care and growing dependence on specific historically, socially and ideologically formulated doctrines and policies. Many newly defined human rights, especially of a social and economic nature, contained in the documents to which the social sciences oriented towards human resources refer, in their essence have a relative character deriving from the consensus in society and from its economic possibilities, so they cannot be in a strict word meaning understood as temporally or regionally universal (Dumont, & Teller, 2007).

However, it is not clear from the facts mentioned whether the subject of the application of well-being, justice and human rights is human freedom and autonomy combined with responsibility, or, on the contrary, rather the realization of the ideals of a concrete idea about the material quality of human life. The reference to increasing "well-being" also points to the fact that ethics in the care of human resources is, in a sense, captive to utilitarian concepts, not ideals based on unquestionable ethical criteria. This problem opens up a frequently debated issue in the field of political philosophy regarding the nature of human freedom and autonomy. While the principle of subsidiarity is mainly intended to protect negatively defined freedom (elimination of oppression by other people and the state) and to leave the widest possible space for the unmanipulated activity of the individual, positively defined freedom (by enabling the realization of human wishes and human happiness) arising from utilitarian liberalism understands state power as necessary agent in the

application of a concretely conceived particular ideal of human life and the idea that the essence of freedom lies in its realization, not in preserving the autonomy of the individual (Bakota, 2016).

The principle of subsidiarity is understood in the modern type of society as a principle integrating personal responsibility with solidarity. It is based on the approach to man as an individual with unique abilities, characteristics, dispositions, which the individual, in the moral sense of the word, is obliged to use for the benefit and social security of himself and his neighbors. This principle also respects the fact that people (individuals, social groups, nations...) do not live in isolation. The principle of subsidiarity emphasizes the importance and necessity of the activities of certain communities to ensure social security and interest, the obligation of the state to support such activities. Subsidiarity is based on a society in which responsibilities are conditioned by relationships between people. The idea of subsidiarity, used practically as a synonym for national sovereignty, was introduced to counter this trend.

Subsidiarity, conceived in the context of the principles, always also means the right of the subject of interest to help from the surrounding community and the right of a smaller community to help from a larger community, this help should be aimed at self-help. This principle also respects the fact that people do not live in isolation. The principle of subsidiarity emphasizes the importance and necessity of the activities of certain communities to ensure social security and interest, the obligation of the state to support such activities. Fulfilling the principle of subsidiarity presupposes a certain education of the population to take responsibility for themselves, including the real social situation, i.e. space for one's own social action. Subsidiarity interpreted in connection with the principles always also means the right to help from the surrounding community and the right of a smaller community to help from a larger community, this help should be directed towards self-help (McKinlay, 1999). This can be implemented mainly through education, i.e. investments in human capital. An integral part of these investments are the implementation of digital technologies within educational programs, which are the goal of sustainable development implemented through development aid to economies in the regions of interest.

3.4 Digitization and education - the phenomenon of "continuous vessels" of postmodern society

Since the start of the 21st century, the global growth of digital technologies in the field of communication has been accelerating in the world economy. As a result, the process of the digital revolution has affected almost all areas of society and has brought potential for many sectors, such as the education policy of the state. This trend gained particular importance with the advent of Industry 4.0 technologies, linked in parallel with Education 4.0. For this reason, the revitalization of the education system has also become the goal of many African states. In order to achieve appropriate positive changes, the Millennium Development Goals were set at the very beginning of the 21st century, which became a binding subject of resolution by the United Nations ((Fall, 2007). The Millennium Development Goals were to be fulfilled by 2015 and defined the main problems plaguing society. The individual parts were specifically concerned with the effort to eliminate extreme poverty and hunger. Furthermore, they sought the possibility of equal access to education for girls and boys from all over the world, regardless of gender, which was followed by the third goal, namely the promotion of equality between men and women. For many countries, thus, the aforementioned goals became a huge challenge, especially with the onset of digitization in the field of education.

There are several ways in which digital technologies can act as a catalyst for the development of education in a strategic dimension. It is about providing tools that teachers use to improve teaching and enabling students to access electronic media. At the same time, digital technologies can reduce inequality, especially between urban and rural communities (Unwin, 2009). Based on some empirical researchers, digital technologies in the educational process can serve to restructure the learning system, diversify teaching methods and procedures, involve all stakeholders in education and quickly adapt to changes in society, increase the effectiveness and productivity of learning, and lead to transformations in the educational and social system (Abrahamyan, 2022). In line with the implementation of digital technologies, self-directed learning can be encouraged, learners can be given immediate feedback and information can be easily accessed, providing practice for further education or future employment (Reeve & Lee, 2014). It is also necessary to train educators to work with digital tools so that they can use technology in teaching. For the possible inclusion of digital technologies in the education policy of the state, it is necessary to consider the overall allocation of capital, to ensure infrastructure and the appropriate alignment between these investments and costs for supporting educators in the use of new technologies (Enyedy & Stevens, 2014). Projects focused on the implementation process of digital technologies thus represent a response to challenges in the field of education, the emergence of new forms of partnership that bring together private business entities, multinational companies, state administration bodies and municipalities, universities and the non-

The results

Assessment of the Results of the Analysis of the Impact of Digital Skills on GDP per Capita and Greenhouse Gas Emissions in European Countries in 2021

In this analysis, we focused on the relationship between three key variables: GDP per capita (at current prices in EUR), greenhouse gases emissions (air pollutants and greenhouse gases in kilograms per capita) and digital skills of the population (percentage of individuals with basic or above basic overall digital skills) in European countries, including Norway and Iceland. Our analysis was based on the use of multiple regression and an examination of 2021 data obtained from Eurostat. Let us now imagine and evaluate the results of the four different models and discuss possible future developments.

Hypothesis A: Impact of Digital Skills on GDP per Capita

Our first model was an analysis of the impact of digital skills on GDP per capita. The model showed an R² value of 0.37, suggesting that 37% of the variability in GDP per capita in European countries in 2021 can be explained by the digital skills of the population. The p-value was very low (0.000261), indicating a statistically significant relationship between the two variables.

This result suggests that improving the digital skills of the population can positively affect economic development (GDP per capita) in these countries. Given the rapidly developing digital economy, it would be advisable to promote the education and development of the digital skills of the population, which could contribute to economic growth.

Hypothesis B: Impact of Digital Skills on Greenhouse Gases Emissions

The relationship between greenhouse gas emissions and digital skills. On the other hand, we tried to examine whether digital skills have an impact on GHG emissions. However, the results were disappointing. The R² value was only 0.16 and the p-value was 0.0345. Moreover, and this is a major problem, the value of the b coefficient (of the regression model) was positive, which means that our second hypothesis that digital skills should reduce GHG emissions was not confirmed. On the contrary, there seems to be a positive relationship between digital skills and GHG emissions. This may be due to the fact that modern technology and the digital age may increase energy consumption and production of electronic devices, leading to increased emissions.

Conclusion and future developments:

Our analysis shows that the digital skills of the population have a positive impact on GDP per capita, which could suggest that investing in digital education and technological development is beneficial for economic growth. On the other hand, the results on greenhouse gas emissions are surprising and seem to contradict our initial assumption. It may be worthwhile to conduct further analysis and research to better understand this relationship.

Future developments should include the following steps:

- **Extended analysis:** We can conduct further analyses with respect to other variables such as renewable energy use, the industrial sector, or government policies related to digital education and the environment.
- **In-depth research:** Gaining a deeper understanding of the relationship between digital skills and greenhouse gas emissions requires interdisciplinary research involving economists, ecologists and information technology experts.
- **Policy decisions:** The results of our analysis can have important implications for policy decisions. We need to consider how digital skills can be promoted to have a positive impact on the economy while minimising the negative impact on the environment.

Overall, we have gained interesting insights into the relationship between digital skills, GDP and GHG emissions, but it is clear that this complex relationship requires further investigation and analysis.

Table 2 Results of analysis from Statistica software

Regression Summary for Dependent Variable: GDP per capita (2021) R= ,62858060 R2= ,39511357 Adjusted R2= ,37271036 F(1,27)=17,636 p<,00026 Std. Error of estimate: 19238,						
	b*	Std.Err. of b*	b	Std.Err. of b	t(27)	p-value
N=29						
Intercept			-30823,6	16400,96	-1,87937	0,071028
digital skills in % of all individuals(2021)	0,62858	0,149677	1160,7	276,37	4,19958	0,00026

Regression Summary for Dependent Variable: GHG per capita (2021) R= ,39386513 R2= ,15512974 Adjusted R2= ,12383825 F(1,27)=4,9576 p<,03451 Std. Error of estimate: 2538,9						
	b*	Std.Err. of b*	b	Std.Err. of b	t(27)	p-value
N=29						
Intercept			2707,527	2164,493	1,250883	0,221709
digital skills in % of all individuals(2021)	0,393865	0,176894	81,212	36,474	2,226560	0,034512

Source: the author's own editing based on Eurostat data

3.5 Reflecting on the digital divide in the African region – the example of the Democratic Republic of Congo

Helping to overcome the global problem of the digital divide in Africa is in line with the United Nations Millennium Development Goals. The Czech Republic, as a member of the European Union and the international community, also actively accepts its share of responsibility and solidarity in solving global problems. As a result of the aforementioned help from the international community, information technology is beginning to dramatically change the lives of African residents. However, the digital divide between Africa and the developed world is still significant. The situation is improving year by year, but Africa is still far behind. Therefore, a significant part of the population of the black continent still does not have sufficient access to telecommunications and information technologies. Africa is also crippling disease, war and poverty. Compared to these problems, the digital divide may seem like a secondary issue, but in reality it is another big problem of the black continent. Africa is cut off from world markets due to poor access to digital technologies, and suffers from an inability to meet demands for education and health care (Šetek & Petrách, 2017).

Digital technologies can help reduce expenditure, improve public services and integrate Africa into the global information society (Hagen, 2007). A typical example is the Democratic Republic of the Congo, which ranked among the economies with the lowest levels of Internet access in the world. This lack of internet access has had a significant impact on the educational opportunities available to Congolese people. This situation began to change with the implementation of satellite internet. As a result, Internet access has begun to be applied to schools and universities, allowing students to access educational resources and connect with their peers around the world (Fall, 2007). The impact of satellite internet on education in the Congo has been profound. Students now have access to online courses, research materials and educational videos. This allowed them to better understand the world around them and develop skills that will help them succeed in their future careers. In addition, satellite internet has allowed students to connect with their peers around the world. This allowed them to share ideas, collaborate on projects and better understand different cultures. This was particularly beneficial for students in rural areas who may not have previously had access to these resources. Overall, satellite internet has had a positive impact on education in the Congo. It allowed students to access educational resources and connect with their peers around the world, helping to improve their educational opportunities. This technology has the potential to revolutionize education in the Congo and help create a better future for the country. In this way, the necessary requirements of economic growth can be ensured in the context of the challenge of sustainable development and the corresponding growth of the all-round quality of life in society (Fall, 2007).

3.6 Pilot project for Zambia

Zambia ranks among the group of rapidly growing economic "lions of Africa", however, despite the growth of the gross domestic product after 2015, it is still among the least developed countries in the world. Economic growth is hindered by the low diversification of the economy, insufficient infrastructure, an insufficient tax system associated with high tax evasion and a lack of qualified labor. High income inequality and poverty, including its extreme form, persist in the country. Budgetary expenditures for healthcare, education or social protection are insufficient (Ministry of Foreign Affairs of the Czech Republic, 2018). Despite rapid population growth, Zambia is among the countries with the lowest

life expectancy. The lack of quality health care, including newborn and pediatric care, contributes to this, resulting in a high rate of maternal and infant mortality (Ministry of Foreign Affairs of the Czech Republic, 2018). Among other things, the Czech Republic's foreign development cooperation participates in state support, which develops in many areas that support the fulfillment of Zambia's development strategy - Zambia Vision 2030.

At the beginning of the third decade of the 21st century, Zambia is facing a widening digital divide, with access to technology and the internet increasingly limited to certain areas of the country. The difference is particularly noticeable in rural areas and smaller cities, where access to digital tools is limited or non-existent. This gap has significant implications for Zambia's economy, education and health care systems, as well as for its overall development. The lack of access to technology and internet in Zambia is twofold. First, the country lacks infrastructure and investment in telecommunications and technology networks. With only 28% of the population having access to the internet, Zambia lags behind other countries in the region when it comes to digital connectivity. Second, there is a lack of digital literacy in the country, especially in rural areas where access to digital devices and training is limited (Guyer et al., 2014).

A number of initiatives have been launched to bridge the digital divide in Zambia. The Zambian government has launched a program to expand access to technology in rural areas and has also launched initiatives to promote digital literacy. In addition, various NGOs, development organizations and private sector companies have launched projects to improve access to technology and digital skills in the country. The government has also adopted a number of policies to encourage investment in the country's digital infrastructure and technology networks. These policies include tax incentives for companies investing in the digital space, as well as a range of subsidies and grants for organizations working to bridge the digital divide. Despite these efforts, the digital divide in Zambia remains a challenge. If the country is to close the gap, it must continue to invest in its digital infrastructure and promote digital literacy. In addition, the government should continue to encourage the private sector to invest in the digital space, as well as encourage NGOs, development organizations and other stakeholders to contribute to bridging the divide. Zambia can thus begin to overcome the digital divide and open up new opportunities for its citizens, primarily through educational programs (Guyer et al., 2014).

The pilot program of the Faculty of Theology of the University of South Bohemia for the implementation of digital technologies in the framework of specialized educational programs for interest groups of the population of Zambia is also an appropriate contribution to the aforementioned call. The created teaching materials of specialized online courses thus contribute to the appropriate professional training of practical skills corresponding to the current standards of technological literacy in the required fields to support economic growth and sustainability in the region of interest.

4. Conclusion

The digital divide, monitored on a global scale, arises mainly between countries that are technologically developed, able to take advantage of new opportunities and are able to apply themselves in the field of digital technologies, and between countries that are not so developed. This division practically coincides with the division of states into developed and developing countries. As a result, less developed economies usually have a low level of telecommunications and transport infrastructure, dysfunctional education systems and an unstable political and economic environment. They are thus unable to participate in the mechanisms of the information economy and continue to lag behind and become relatively poor. The process of implementing digital technologies, primarily in the education system, can significantly contribute to changing this state. This process represents a significant synergistic effect with a positive influence on the sustainable development of not only the national but also the global economy (Sørensen & Christiansen, 2012). It is a certain result of the philosophy of subsidiarity and the virtue of hope "think locally, act globally". The pilot project of the Faculty of Theology is a clear proof of this.

According to the facts cited above, it is also logical that the standard division of economics into microeconomics and macroeconomics in accordance with the innovation process of digital technologies within the development of educational programs of regions of interest is completely insufficient. To monitor and evaluate the economic benefits in quantitative and qualitative dimensions within individual national economies, their external relations and the global space of the mentioned process, it is necessary to use alternative approaches.

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Certification and sustainability as a key tool for competitiveness

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Abstract: While certification is generally understood as a third-party confirmation that the requirements set out in an agreed framework have been met, sustainable development is seen as a type of development that also seeks to eliminate or mitigate the negative impacts of the way human society has developed to date without compromising the ability of future generations to meet their basic needs and maintain their standard of living. In integrating ESG criteria into corporate strategies, ISO standards and other certifications are proving to be important tools. The aim of this paper is to assess the interrelationship between certification and the concept of sustainability in the context of market competitiveness. The authors consider that certification is a key condition for sustainability, especially because it creates standards without which there would be inconsistencies in the applied processes. And it is the alignment of set processes through certification that is a prerequisite for successful sustainable development and market competitiveness.

Keywords: certification, eco-label, ISO certification, sustainability

JEL Classification: Q01, L15, M14

1 Introduction

Sustainable business is an issue that is part of the broader field of sustainable development. Its importance is gradually growing, and companies will have to adapt to sustainability requirements in the future. The way to achieve sustainable business is the introduction of sustainable standards within the company. These standards allow companies to meet the pressures to comply with the conditions of sustainable development, where they help to set rules that bring an element of belonging to future generations into business.

Sustainable standards should be implemented into the strategy of every business, ideally from the very beginning of the life cycle. Demands on entrepreneurs are increasing, whether from the state, the European Union, competitors, or consumers. However, it is ideal if companies approach this voluntarily, as part of the so-called Corporate Social Responsibility.

ESG criteria - environmental, social and administrative criteria, are also related to sustainability, which focus on positively influencing the environment, society and business management. We can think of sustainability as an internal framework, while ESG is an external framework. It is a form of assessment, a result by which we inform the environment, evaluate performance and risk. Related to this is non-financial ESG reporting, which is already mandatory for certain groups of companies; according to the CSRD directive, the range of companies will be expanded, and the rules will also be tightened.

In connection with sustainability, let's also mention the Sustainable development goals (SDGs); UN goals; which mean certain obligations for the member states within the set long-term goals, and integration into sustainable development. Rodriguez-Anton et al. (2019) in a study focused on the analysis of the relationship between the circular economy and the goals of sustainable development of the SDGs state that there is a direct relationship between them. Dentinho et al. (2021) also consider, within the framework of the relationship between the SDGs and sustainability, to specify the assumptions of each study of sustainable development in terms of systemic impacts on the various dimensions of the goals of sustainable development. In their study, Dentinho et al., (2023) use Q analysis and examine the preferences of people across different cities in Europe in relation to the situation of different cities in terms of indicators of sustainable development goals.

Businesses have several options to implement the concept of sustainable business. From non-financial reporting, waste management, introduction of the recycling process, minimization of packaging, support of local and sustainable suppliers and partners, use of sustainable materials, reduction of energy consumption, introduction of certifications and eco-

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labelling, to investments in research and development of new sustainable technologies and processes. Businesses must properly assess their advantages and disadvantages, evaluate the financial and time requirements. But also a benefit in the form of new business relationships, significant cost savings or new income.

Not incorporating sustainable requirements into their business concept will also have an impact on entrepreneurs. Komárková et al. (2022) states that financial institutions adapt the offer of products and services for clients in connection with environmental risks and opportunities. „*For example, banks have expanded their range of products to include sustainable loans related to housing, ecological vehicles, or environmentally focused business projects. Insurance companies proceeded to expand the portfolio of investment products to include products pursuing environmental goals or to introduce extended coverage for insuring buildings with lower energy requirements. Pension companies have started to establish funds focused on sustainable investing.*“ (Komárková et al., 2022). They further state that financial institutions, for example, are terminating, raising prices or tightening requirements for entities with activities that negatively affect the environment and offer the possibility of financing the transition to environmentally neutral/positive economic activity. Machová (2020) states that institutional investors pay more and more attention to environmental, social and governance aspects (so-called ESG reporting) when evaluating the performance of companies. A tightening of the conditions for businesses in incorporating sustainable conditions into business can therefore be expected in most segments over time. Maximilian Ronalter et al. (2023) state that companies with an implemented quality management system and an environmental management system achieve a statistically significantly higher ESG score than companies without such management systems.

The Czech Banking Association has published a sample ESG questionnaire, where you can find out what banks can evaluate. It is evident from the sample questionnaire that the banks also find out what ESG certificates the company owns. They are therefore interested not only in economic indicators and results, but also non-financial aspects, such as certification according to environmental and social standards, energy management certification, waste production, greenhouse gas emissions or water consumption. They require energy certificates for properties or your plans to improve energy efficiency or reduce CO² emissions. (Czech Banking Association, 2021)

As can be seen, non-financial criteria are receiving increasing attention from partners, employees, consumers, financial institutions, competitors, and the media. Companies that incorporate the concept of sustainability into their strategy are more attractive to investors. Non-financial indicators can thus play a key role in evaluating the performance of a company. ISO standards and other relevant certifications will also be essential in integrating ESG criteria into business processes. Therefore, the authors reflect on the relationship between certification and sustainable development and demonstrate to what extent and how certification processes contribute to the achievement of sustainability goals. This analysis is crucial at a time when there is a growing awareness of the importance of sustainability in business and society. The authors assess whether certification does indeed provide an effective framework for implementing sustainable practices. The analysis of the relationship enables the benefits of certification while highlighting areas where they could be improved or enhanced to contribute more effectively to sustainable development. The aim of this paper is to assess the benefits and impact of certifications in relation to sustainable development and market competitiveness.

2 Methods

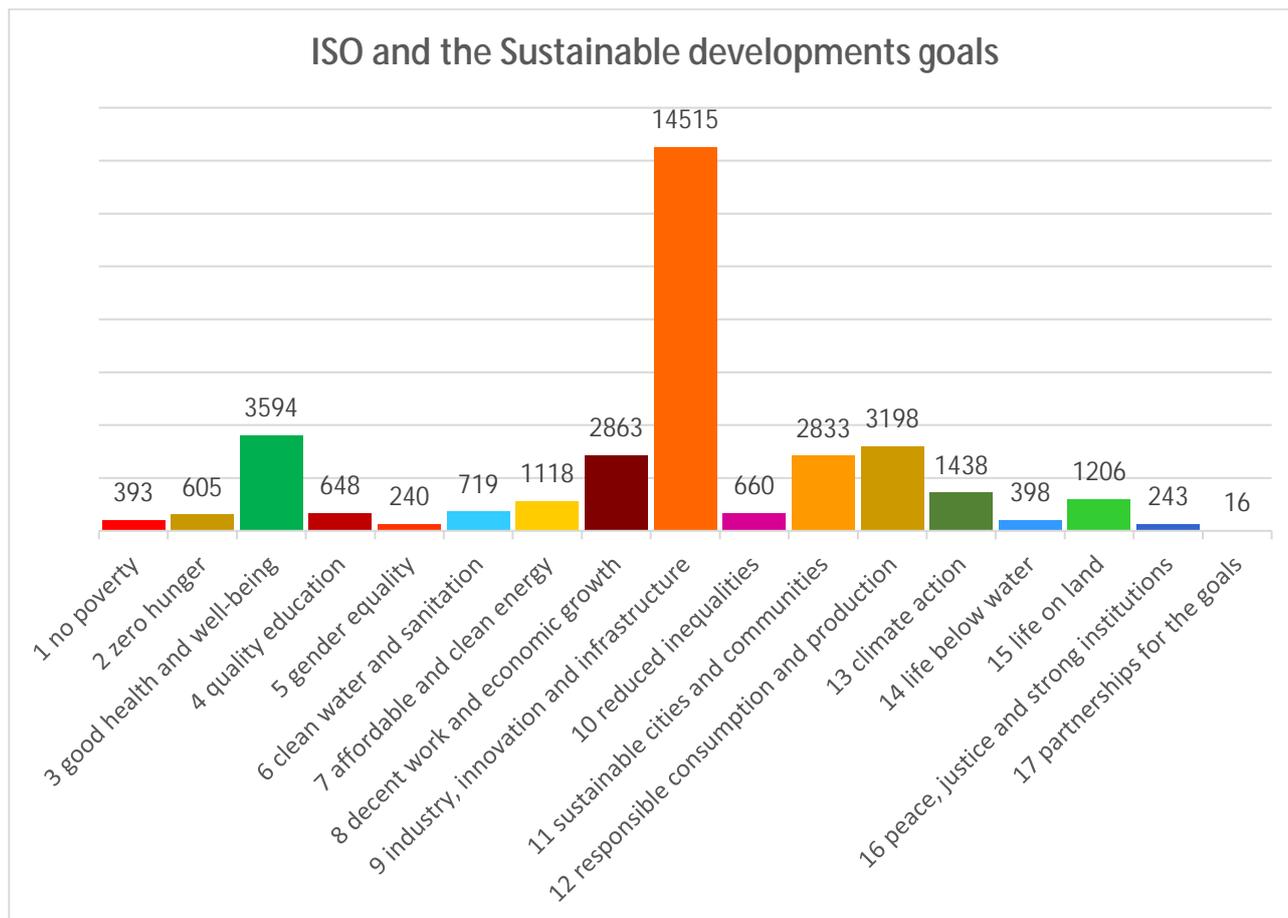
To achieve the goal set in this article, it was necessary to use scientific methods based on the evaluation of existing knowledge in the given area. The methods used by the authors in the preparation of this article include the method of induction, deduction, analysis, and synthesis. First, an analysis of knowledge in the given area and research was carried out. Based on the analysis carried out in this way and subsequently the synthesis of the findings, results were achieved in the form of a precise definition of the concept of certification and sustainable development, so two key concepts, the relationship of which was primarily examined in the article. Using the evaluation of primary and secondary data, especially data from publicly available sources. For the elaboration of the article, official statistical data published by The International Organization for Standardization (ISO) was used. Furthermore, an analysis of ISO standards was carried out, when ISO standards showing elements of sustainability were evaluated. The results are presented below in the Research results chapter.

3 Research results

Certifications are one of the tools companies can use to officially confirm their credibility and sustainability efforts, which can be a significant advantage in today's increasingly competitive market. However, it does not only bring a competitive advantage, but many other benefits that also depend on the specific focus of the given certification. A foundation that is internationally recognized and verified by certified organizations worldwide.

Certification, specifically ISO standards, contribute to the fulfilment of the goals of sustainable development. Figure 1 shows the number of ISO standards that relate to individual goals of the SDGs.

Figure 1 ISO and the Sustainable developments goals



Source: own elaboration by (ISO, 2023a); date as of 21.11.2023

The market offers a wide range of certifications. Environmental labeling and declaration are a globally applied concept based on international standards (ISO14020 series), which are among voluntary information tools. Eco-labeling means the labeling of products and services that are demonstrably more friendly to the environment and the health of the consumer during the entire life cycle. At the same time, they have high quality and useful properties are tested in accredited laboratories. Such products or services may have a so-called eco-label. (CENIA, n.d.) Eco-labels are also a helping hand in detecting greenwashing. In their conclusions, Delmas & Pekovic (2013) state that green certifications should be used by managers to increase productivity, potential employees as a sign of a better working environment, and investors as an indicator of best management practices.

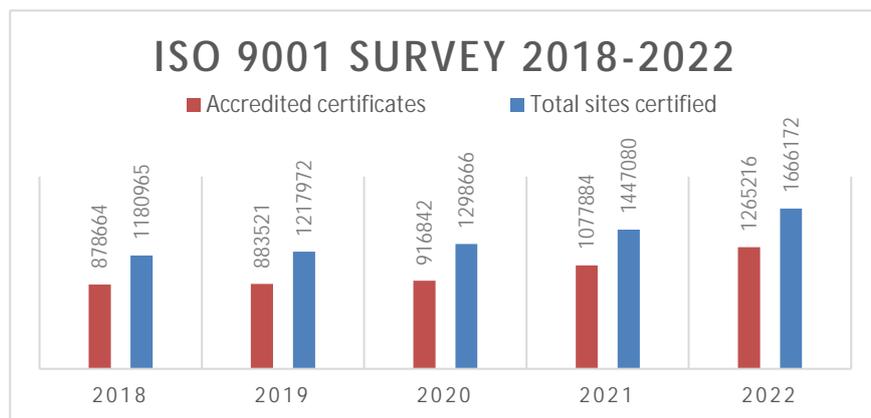
ISO standards are internationally recognized and approved by experts and cover a wide range of activities. In our article, we will be interested in environmental management standards (ISO 14001:2015 standards), which help reduce the impact on the environment, reduce or limit waste, simply be a sustainable business; supplemented by the ISO 9001 standard.

ISO 14001 is an international standard for environmental management that provides organizations with a framework for identifying, evaluating, and managing their environmental impacts. The goal of this standard is to promote sustainability and minimize the organization's negative impact on the environment. ISO 9001 focuses on the quality management system and provides a framework for improving processes and achieving a high level of quality in all aspects of the organization. It is designed for organizations that want to improve customer satisfaction and process efficiency.

Figures 2 and 3 show the number of ISO 9001 and 14001 certifications worldwide. The graphs show a clearly positive trend in the implementation of ISO 9001 and ISO 14001 standards, and it is an extremely important tool for analysing the impact of companies' competitiveness. The number of certifications increases every year, which proves the interest of entrepreneurs in this type of certification in the field of environmental management and quality management system. At the same time, the data indicate an improvement in the quality and efficiency of the work of organizations, which can fundamentally affect their competitiveness. The interest in sustainability and the increase in regulation in this area is also reflected in the higher growth of ISO 14001 certifications, namely by 21% in comparison between 2022 and 2021, for

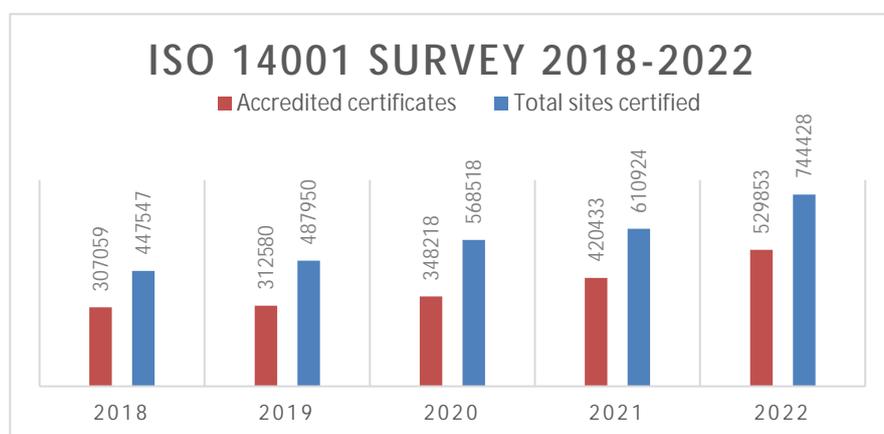
ISO 9001 certifications it was 12% in the same comparison (ISO, 2023b). At the same time, both standards help to achieve the required level of sustainable development.

Figure 2 Number of certificates and sites ISO 9001 worldwide



Source: own elaboration by (ISO, 2023b)

Figure 3 Number of certificates and sites ISO 14001 worldwide



Source: own elaboration by (ISO, 2023b)

Complex management systems such as ISO 9001 or ISO 14001 are designed to improve business processes, effective flow of information, ensure customer satisfaction and other activities. These systems are designed to assist the business in several key areas of management and can bring benefits and unintended impacts to their operations. When making decisions, it is so important that the organization considers both the positive and negative aspects of these systems and ensures that they are set up to best suit the specific needs and goals of the organization. Organizations can implement ISO 9001 and ISO 14001 simultaneously, which is known as an "integrated management system." In this way, organizations combine elements of the quality management system and environmental management into one whole and achieve efficient use of resources while improving the quality of their products and services. The company makes it clear that it wants to focus on both aspects - quality and sustainability. However, the authors point out that the implementation of both systems depends on the specific needs and goals of the organization. Joint implementation may not be appropriate for every organisation. The decision to integrate ISO 9001 and ISO 14001 should be carefully considered and take into account the specific context and strategy of the organization. This is also confirmed by the research of Freitas et al. (2020), This is also confirmed by the research of Peter and Pavel, who assessed the relationship between GHRM and corporate social responsibility (CSR) in Brazilian companies, when they had as control variables the age of the company, its size and ISO 9001 and 14001 certification. Among other things, they found that ISO 9001 certification had a positive and significant effect on CSR, but ISO 14001 certification was no longer relevant (as a control variable) for CSR in the analysed sample. (Freitas et al., 2020).

By defining and documenting its processes and procedures through the implementation of ISO 9001, an organization can better monitor performance, identify weaknesses, and implement improvement measures. This leads to more efficient performance and can reduce the cost of rework or errors. Ochieng et al. (2015) assessed the impact of the implementation of ISO 9001 on the performance of organizations in Kenya, and according to the results of the study, they consider the

benefits of implementing the ISO 9001 standard in organizations with the aim of increasing sustainable quality management procedures. The advantage for the company can also be an increase in the quality of products or services, better control over its internal processes, increase productivity in the organization and optimize overall work efficiency. An indisputable advantage is gaining and/or increasing the trust of customers and business partners. Neves et al., (2023) also verified and analysed the impact of the adoption of ISO 14001 and ISO 9001 standards on the performance of Portuguese companies.

As part of the goal of the article, let's now focus on the identification of environmental influences on the company, with which the introduction of the ISO 14001 standard can help. The fact that the company must conduct a thorough analysis of its activities and identify environmental impacts, whether air emissions, waste production, energy consumption, use of raw materials and many other aspects, brings undeniable advantages to the company. On the one hand, they must subsequently develop a plan for reducing these effects with the resulting more efficient use of energy, optimization of waste processes or the introduction of material recycling. The result can be cost savings (e.g. lower energy consumption or lower waste disposal costs). Sartor et al., (2019) cited the need to improve the company's image, pressure from customers and ethical reasons as a benefit for the decision to implement ISO 14001. Since more and more consumers are interested in the sustainability and environmental responsibility of companies, the introduction of ISO 14001 means a competitive advantage, the possibility to offer more environmentally friendly products and services and thus attract more customers. Companies that have a long-term interest in sustainability have better public prestige, they can use the data in their campaigns to build the good name of the company. The advantage, as in the previous point, is the compliance of the company's processes with environmental regulations. The company will gain both economic benefits but will also contribute to environmental protection and sustainable development, ultimately contributing to the fulfilment of the SDGs. According to Zimon et al. (2021), the introduction of ISO 9001 or ISO 14001 brings dynamic benefits for manufacturing companies and especially across the supply chain for textile companies. Also the research results of Dellana et al. (2020) identify ISO 9001 certified companies that are able to use integrated supply chain risk management (RMI) efforts to positively impact supply chain performance than non-certified companies. Ye et al. (2020) used a quasi-experimental design in their research and came to surprising results, namely that ISO 14001 leads to lower financial risk, but at the same time that standard management systems such as ISO 14001 actually hinder the growth of companies' sales.

By default, the disadvantage is considered to be financial difficulty, as well as the costs of training and related documentation. Apart from the costs of certification, Sartor et al. (2019) also mention the risk of dissemination of confidential information and reduced productivity as barriers to implementation. Employees often consider the introduction of certification to be excessive bureaucracy and see it as an increased administrative burden, in this case training for employees with an emphasis on explaining the benefits to themselves is important. It is also recommended to identify the processes and clearly establish the person responsible for them. For employees, this means more effective communication and they will acquire skills faster in the given area of the documented process. At the same time Delmas & Pekovic (2013) state that companies that voluntarily adopt international practices, ecolabels or ISO 14001 standards have employees who are 16 percent more productive than average, employees in such green companies are more motivated, receive more training and benefit from better interpersonal relationships.

For each certification, its maintenance is important, and the associated regular updating and subsequent audits, associated costs. However, continuous improvement is also linked to this, and thus the company can better identify areas in which it can improve. Thanks to a better flow of information, the company reacts more flexibly to changes in its surroundings and to new conditions and crisis situations, it reacts more flexibly to changes in demand, but also to new legal regulations. When maintaining and updating certification, the business must be aware that failure to comply with standards or their loss can damage the organization's reputation.

To summarize, the implementation of ISO 9001 and ISO 14001 can have a positive effect on market competitiveness in several ways by helping the organization to acquire customers, improve its image and use resources more efficiently.

- Effective use of resources – the company uses its resources effectively, behaves responsibly, reduces costs, uses its financial advantage to ensure competitiveness on the market.
- Compliance program in the field of sustainability - ISO 14001 helps organizations comply with relevant regulations and minimize the risk of fines and legal problems. In addition, the pressure in this area will continue to increase, also due to the fulfilment of the SDGs.
- Image and reputation of the company – if the organization undertakes to comply with a given standard, it signals to the public its long-term commitment to environmental protection and sustainability.

- New customers and business partners – More and more customers prefer products and services from companies that respect the environment. ISO 14001 certified organizations can attract environmentally conscious customers and expand their customer base. Also, as already mentioned, financial investments also follow the environmental aspect of companies (Komárková et al., 2022). The same applies to promoting better environmental behaviour of business partners and integrating them into the organization's business systems.
- Satisfied employees – increased management involvement and employee engagement, they also consider a certified company as a company with a better working environment, and, as Delmas & Pekovic (2013) report, employees also have higher productivity.
- Flexibility to changes – during regular maintenance of certification, control, audit, companies better identify areas in which they can improve.

4 Conclusions

Overall, certification and sustainability are becoming an integral part of the corporate world and has an impact on many aspects of business, including law, accounting, and financial management. Companies that effectively integrate sustainable practices in the form of certifications into their operations and transparently communicate their successes and challenges can achieve a competitive advantage and better meet the expectations of their customers, investors, and regulators. Also Sartor et al. (2019) Also Petr et. al. evaluates that the introduction of the ISO standard 14001 is associated with an increase in productivity and effective management of processes, thus also with a reduction in resource consumption and the overall quality of processes in the company. Also, the public and customers increasingly expect organizations to properly manage their processes and care for the environment.

The ISO 14001 standard may not be necessary for a company, but it can greatly help to improve corporate environmental responsibility. Companies with ISO 9001 and ISO 14001 certificates will improve their quality management practices and sustainable standards in the company. Also from the statistical data in the article, which shows the increasing number of ISO certifications from 2018 to 2022 (ISO, 2023b), they indicate a positive development of organizations in the areas of quality and management. These improvements can increase their competitiveness in the market and contribute to their long-term success.

As a result, certification has a double benefit for entrepreneurs in the field of sustainable development. First, it is a factual contribution in the field of sustainable development. Entrepreneurs, thanks to the effort to obtain a nationally or internationally recognized certificate, try to promote changes in their production processes so that they can withstand the conditions of process quality assessment in relation to sustainable development. As a result, this means that by introducing these changes, a state is gradually reached where companies assume social responsibility for the possible effects of their actions on the environment and thus also on future generations. Secondly, the obtained certification is perceived positively in the eyes of the public, thereby the company builds its credit, brand or name and becomes known to people. In fact, it also implements elements of marketing that can have a positive effect on the evaluation of the company.

In the long term, however, we can summarize that certification is already becoming a necessary condition for sustainability. Although this condition is not enshrined in legislation anywhere yet, the market setting is such that the requirement of sustainable development becomes an integral part of the requirements for entrepreneurs. And certification seems to be the ideal way to achieve this goal.

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New traits to open up the gates: What traits and activities does leadership in small and medium-sized enterprises (SMEs) need to drive digitalization?

Christian Toros¹

Abstract: The purpose of this research work is to create an overall picture of the leadership traits and activities that have been recognized in recent literature as necessary to promote and support digitalization in SMEs. Furthermore, this research work also aims to review the overall picture created for completeness and to identify any research gaps.

The chosen research methodology follows in its approach a systematic literature analysis. The findings of this research lead to an overall view of the most important traits and activities of leadership to promote and support the digitalization process in SMEs. Moreover, this work also leads to the assumption that the topic of trust has been insufficiently considered in the literature studied, both in terms of traits and activities.

The limitations of this research work are mainly justified by the chosen research methodology, but also by the fact that the literature analysis was conducted only on the basis of one literature database.

The value of this research work lies in particular in the fact that an overall view of the traits and activities of leadership has been created from the recent literature. This overall view can serve as a basis for future research projects. In addition, the topic of trust was identified as an important aspect that should encourage future research to examine this aspect more deeply in the context of leadership traits and activities to positively influence digitalization development in SMEs.

Keywords: Traits, Activities, Leadership, SMEs and Digitalization

JEL Classification: M12, M51, O32

1 Introduction

Digitalization continues to gain momentum, and the use of a wide variety of digital technologies are now available to companies to manage their business tasks. In addition, the interfaces to the market and to business partners, for example, are becoming increasingly digital. Of course, this development does not go unnoticed by the responsible leadership teams either (Gilli et al., 2023). However, there is no exclusivity on the path to digitalization. This means that this path is not only reserved for certain companies, but can be followed by large as well as small and medium-sized enterprises (SMEs) (González-Varona et al., 2021; Lee et al., 2021).

The question therefore arises: What can leadership contribute to successful digitalization in SMEs? This not entirely insignificant question acquires substantial relevance through the fact that, according to the view of (Gamache et al., 2019) the topic of digitalization now plays an essential role in the overall context of the global economy. There still seems to be a lack of clarity, especially among SMEs, about the best way to implement the process of digitalization. These ambiguities appear very worrying in view of the fact that ongoing digitalization is ultimately about nothing less than securing competitiveness and thus also one's own economic survival (Azevedo & Almeida, 2021). These concerns are reinforced by the very high importance of SMEs for the global economy. According to the World Bank, at least 9 out of 10 companies worldwide are SMEs. Moreover, they represent the majority in the area of employment of workers with over 50% and are therefore among the central economic factors (The World Bank).

However, the process of digitalization presents SMEs with a wide variety of different challenges that they must overcome in the course of digitalizing their companies. In the context of SMEs from the manufacturing sector, (Elhusseiny & Crispim, 2022) identified several challenges, which were summarized into the following four main groups: Technically driven challenges, organizationally driven challenges, technologically driven challenges, and legally driven challenges. Following the argumentation of (Kautsar et al., 2018), the leadership of a company is the most important factor to bring about change. In particular, leadership performance plays a prominent role in overcoming digital challenges (Luo & Yu,

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2022). One possible reason for this could be that the use of digital technologies in everyday work is very different from previously known business practices (Strilets et al., 2022).

In the following, the three major topic areas of digitalization, SMEs and leadership will first be specified in the context of this research work. Since these topics are areas of research that have been studied very comprehensively and in various sub-aspects in the respective literature, further delimitation is absolutely necessary for understanding this research work and its theoretical framework (Denning & Liyanage, 2022).

1.1 Digitalization

What understanding of digitalization actually exists in the literature? Different sources use different terms for digitalization, for example. In addition to the various digital technologies, terms such as "digitization," "digitalization," or "digital transformation" exist in English-language literature. Due to the fact that, to the best of the author's knowledge, there are no generally valid definitions for the mentioned terms, they will first be explained on the basis of individual definitions from the literature. Subsequently, the understanding of digitalization in the context of this work will be explained.

The term "digitization" is interpreted by (Ritter & Pedersen, 2020) as "... the transformation from analog to digital data ...". A slightly different explanation with "Digitization involves standardizing business processes and is associated with cost cutting and operational excellence." comes from (Ross, 2017), which refers more to the economic aspects of "digitization". "Digital technologies", according to (Bharadwaj et al., 2013), are understood "...as combinations of information, computing, communication, and connectivity technologies...". Furthermore, the consequences of the use of "digital technologies" are assessed by (Martínez-Caro et al., 2020) as "...the introduction of digital technologies implies profound changes in the ways of working and interacting with the environment in organizations." For further classification, according to (Govers & van Amelsvoort, 2023), the understanding of "digitalisation" refers to "...adapting digital technology to business processes." A slightly broader definition of "digitalisation" from (OECD, 2019) is: "Digitalisation is the use of digital technologies and data as well as interconnection that results in new or changes to existing activities." This definition expresses the fact that digitalization also entails a process of change. (Maltaverne, 2017) interprets "digital transformation" very broadly, describing it as "...a digital-first approach that encompasses all aspects of business, regardless of whether it concerns a digital business or not. It leads to the creation of entirely new markets, customers, and businesses (people, capabilities, processes, operating models,...)." Meanwhile, (OECD, 2019) makes reference to "digitisation" and "digitalisation" in its conception of "digital transformation": "Digital transformation refers to the economic and societal effects of digitisation and digitalisation."

The understanding of digitalization used in this research work is based on the last two explanations of "digital transformation".

1.2 SMEs

Following the argumentation of (Alraja et al., 2021), there is no generally valid definition of SMEs. Most national attempts to classify SMEs are often based on individual measures such as the number of employees, the sales volume or the amount of assets, or on a combination of measures (Haider et al., 2019). The European Commission, for example, recommended in its 2003 document that SMEs be defined according to the following criteria: "The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million." (European Commission, 2003). According to (Haider et al., 2019), the criterion of a number of 250 employees corresponds to one of the most commonly used thresholds to describe SMEs worldwide. In contrast, the U.S. Small Business Administration, Office of Advocacy uses a threshold of under 500 employees for SMEs in the U.S. (U.S. Small Business Administration & Office of Advocacy, 2023). In China, conversely, companies with fewer than 2.000 employees are also counted as SMEs (Heinrich, 2018).

However, it is fair to assume that SMEs are an integral pillar of the economy for many developing countries (Belitski & Liversage, 2019) and also in many developed countries (Bokša et al., 2020). (Tewari et al., 2013) even goes one step further in its comments and describes SMEs as an important economic factor for growth and employment. Therefore, the fact that according to (Bellakhal & Mouelhi, 2020) it can probably be assumed that digitalization has positive influences on the economic outcome of companies plays an essential role in the question of the significance of digitalization of SMEs. This is because, although they have great potential, most SMEs have a considerable backlog when it comes to digitalization, which they should catch up on as soon as possible in order to be able to live up to their social and societal responsibility in addition to their economic importance, which has already been addressed (OECD, 2021).

Due to the differences in the definition and delimitation of SMEs described above, no explicit delimitation or definition of SMEs is used for the purposes of this research work.

1.3 Leadership

Following (McKinsey & Company, 2022), leadership is not a kind of gift we come into the world with, but rather a skill that can be learned and improved. Consequently, the view of leadership according to (McKinsey & Company, 2022) is as follows: "Leadership is a set of behaviors used to help people align their collective direction, to execute strategic plans, and to continually renew an organization."

However, the increased use of digital tools has initiated fundamental changes in companies and has also had an impact on the way employees are led, for example (Bersin et al., 2016). In the context of leadership requirements in the digital age, (Diamante & London, 2002) consider the necessary skills that leadership should possess to manage a successful transformation. They come to the conclusion that, on the one hand, the ability to involve all stakeholders, both internal and external to the company, is required in order to operate successfully in the long term. On the other hand, this necessitates a focus of leadership activities on both technological development and people. A study by (Harvard Business Review Analytic Services, 2017) names the ability of leaders for their employees to be prepared to drive digitization in the company, to create images of the future and to depict what new forms the company can take as a result of digitization as an important factor for successful digital transformation. In a paper by (Wakefield et al., 2016), the need to change the development of future leaders has already been recognized by companies, and in this context the need for new leadership traits in particular has also become clear. In addition, the paper also pointed out that the new leadership traits are so urgently needed because the organizational structure in companies is also changing. Companies are moving away from a vertically integrated corporate structure to a networked one that focuses on collaboration with different stakeholders inside and outside the company.

Therefore, the understanding of this research work focuses less on leadership theories or concepts, but rather on the traits and activities of leaders and leadership as a whole that can help to successfully drive digital transformation in SMEs.

2 Research Methodology

The main purpose of this work is to review the literature of the recent past and to identify the main traits respectively activities of leadership that are necessary to support and further drive the digital transformation in SMEs. The research methodology used follows the approach of a systematic literature search, which was chosen primarily to provide a general overview of the existing literature of recent years and to ensure the neutrality of the researcher in the inclusion of literature in the framework of the study (Nightingale, 2009). Furthermore, according to (Mallett et al., 2012), a major advantage of this research method is the disclosure of all steps related to the literature search as well as selection, which makes it possible to ensure the traceability of the research method in this way. Moreover, literature analysis in general also offers the possibility to identify research gaps in existing research and thus the opportunity to pave the way for new research questions (Palmatier et al., 2018).

2.1 Research Questions

The aim of this research work is to explore which leadership traits and activities can contribute to initialize the digitalization process, if not already done, respectively to support or promote it in the context of the digitalization of SMEs. In order to assist and structure this research process, the overall objective of this research is divided into two research questions, which are to be answered within the scope of this research work (Denning & Liyanage, 2022).

Research Question 1: What is the current state-of-the-art in the literature regarding leadership traits and activities to drive and support the digitalization process of SMEs?

Research Question 2: Do the traits and activities of leadership identified in the literature cover the necessary requirements of SMEs in order to drive and support the digitalization process in these companies?

2.2 Literature Search and Selection Process

The literature search for the systematic literature analysis is based exclusively on the literature database of Elsevier's trademark Scopus®, which started its operations towards the end of 2004 (Elsevier B.V., 2023a) and which, according to its own information, is the largest data collection for citations in terms of peer-reviewed publications (Elsevier B.V., 2023b). The search terms used in the literature search aimed to cover the literature sources sought as comprehensively as possible. For this purpose, the following key terms were used: "small and medium size enterprise*"; "small and medium-size enterprise*"; "small and medium-sized enterprise*"; "sme*"; "small and medium size compan*"; "small and medium-size compan*"; "small and medium-sized compan*"; "small and medium size firm*"; "small and medium-size firm*"; "small and medium-sized firm*"; "digit*"; "lead*". The mentioned search terms were combined and summarized to the following search path:

(TITLE-ABS-KEY ("small and medium size enterprise*" OR "small and medium-size enterprise*" OR "small and medium-sized enterprise*" OR sme* OR "small and medium size compan*" OR "small and medium-size compan*" OR "small and medium-sized compan*" OR "small and medium size firm*" OR "small and medium-size firm*" OR "small and medium-sized firm*")) AND (TITLE-ABS-KEY (digit*)) AND (TITLE-ABS-KEY (lead*)) .

This led to a total of 704 results in the Scopus® database. In the following, the large number of search results was reduced by further restrictions. Firstly, only articles that were openly accessible were considered within the search. This reduced the number of results to 264. In order to take into account the fact that digitalization is a rapidly progressing process (Albukhitan, 2020), the search was limited to the last five years. Consequently, only results from the years 2023, 2022, 2021, 2020, and 2019 were considered in the search in order to thereby ensure the greatest possible topicality in the literature search. This reduced the results to 189. In addition, the search was restricted with regard to the type of literature. The search therefore only considers research from articles or accompanying volumes of conferences. This further reduced the number of results to 177. Furthermore, for practical reasons, the results were limited to the languages English and German, which reduced the number of search results to 172. In the last step, only those results were considered whose publication process was finally completed. In consequence, the number of results was reduced to 164. Due to the restrictions made, the search path changed and finally looked like this:

(TITLE-ABS-KEY ("small and medium size enterprise*" OR "small and medium-size enterprise*" OR "small and medium-sized enterprise*" OR sme* OR "small and medium size compan*" OR "small and medium-size compan*" OR "small and medium-sized compan*" OR "small and medium size firm*" OR "small and medium-size firm*" OR "small and medium-sized firm*")) AND (TITLE-ABS-KEY (digit*)) AND (TITLE-ABS-KEY (lead*)) AND (LIMIT-TO (OA , "all")) AND (LIMIT-TO (PUBYEAR , 2023) OR LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019)) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp")) AND (LIMIT-TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE , "German")) AND (LIMIT-TO (PUBSTAGE , "final"))

The remaining 164 articles were then evaluated on the basis of the following evaluation criteria. In the first step, the articles were analyzed with regard to their headlines and the key terms specified in the article. This procedure excluded a total of 68 articles from further investigation, reducing the number of articles to 96. In the second step, the remaining 96 articles were analyzed and selected with regard to their abstracts. This approach reduced the number of articles by an additional 67 articles, bringing the total number of articles under investigation down to 29. The remaining 29 articles were subjected to detailed analysis. This led to the result that, for reasons of relevance, the investigation was reduced by a further 16 articles, so that finally the remaining 13 articles were included in the literature analysis.

3 Analysis of Results

The analysis of the traits and activities of leadership to promote and support the digitalization process of SMEs brought to light the following traits and activities, first discussing traits and then activities.

3.1 Traits

(Yela Aránega et al., 2023) identified a new type of leadership style in their research work, which has developed as a result of increasing digitalization and which they refer to as the "Kinder Leadership style". This leadership style is characterized above all by the following leadership features: "teamwork," "motivation," and "risk-taking". However, (Yela Aránega et al., 2023) go one step further and see the development of additional traits as necessary. In particular, they count "innovation" and "creativity" among these. The research by (Lashitew, 2023), among others, looked at the influence of leadership experience and in this context pointed out that leadership with an intermediate level of experience is more likely to advance digital technologies.

Referring to the insights gained from their research, (Ahmad et al., 2022) consider the following trait of leadership to be conducive to digitalization. In their opinion, leadership should have the trait of being able to form visions. According to their view, this quality would not only promote the formation of novel solutions, but also the establishment of a creative corporate philosophy, which could have a motivating effect on the employees. Further leadership aspects came to light in the work of (Rusly et al., 2021). Their study, which among other things explores SMEs' adaptation strategies with regard to digital transformation, found that leadership has a significant impact on the digitalization process. In their view, this type of leadership should include the following traits: "technology-foresightedness", "technology passion", "technology openness", "digital content knowledge" and "broad view perspective of IR4.0".²In addition, the study by (Rusly et al.,

² Industry Revolution 4.0

2021) identified a correlation between the age of leaders and the speed with which leaders can adapt to digital tools. The study came to the conclusion that younger leaders need less time to adapt to new digital realities and that this trait has a positive effect on employees as well as on the entire digitalization process.

The research work by (Ötting et al., 2021) assigns particular importance to the leadership trait "openness for the new" in the context of digitalization. This openness refers to two aspects. First, it refers to the thematic openness in which the leadership should be interested in various topics, such as further technological developments, but also in cultural changes in the organization. The second aspect relates to the leadership itself, which in the age of digitalization should have the willingness to permanently develop itself further. This in turn presupposes a continuous learning process on the part of the leadership in order to keep pace with the latest developments. (Canhoto et al., 2021) names similar leadership traits as (Ötting et al., 2021) based on the findings from their study. However, the starting point for this assessment is the fact that SMEs have fewer resources than large companies. Consequently, leadership requires traits that can help compensate for this imbalance. Therefore, on the one hand, the trait of openness of leadership is emphasized, which should contribute, for example, to being able to recognize market or technological developments at an early stage. On the other hand also the willingness to continue to acquire new knowledge in the interest of the company.

The paper by (Abdallah et al., 2021) argues that leadership should have different traits to support the progress of digitalization within the organization. These traits include "Flexibility", with which a certain openness to progress is required, similar to (Ötting et al., 2021) and (Canhoto et al., 2021). However, according to the study, the prerequisite for this is an entrepreneurial personality. A further trait required is "Diversified Knowledge", by which is meant the ability to identify and evaluate developments in other industries and, if possible, to adapt them to one's own industry. The third trait is "Priority and Results Focus". This trait is intended to express that great importance is attached to the digitalization process, since this process will ultimately determine the company's success on the market. The last trait, "Ownership and Responsibility," is meant to express that these traits could represent a kind of guiding function for the employees.

In line with (Ahmad et al., 2022), (Jäckli & Meier, 2020) also consider the trait of leadership to form visions to be an essential factor in the digitalization of the company. One other leadership trait that, according to (Jäckli & Meier, 2020), is needed to implement digitalization is a firm will. (Horváth & Szabó, 2019) consider openness and creativity to be important traits of leadership in the course of digitalization. Moreover, the willingness to enter into cross-company collaborations is required as a further trait. In the research work of (Gamache et al., 2019), the following traits of leadership are considered crucial for digitalization. In addition to personal commitment, these also include the will to lead by example.

3.2 Activities

Following the reasoning of (Brink et al., 2023), the assumption is made that it is conducive to the digitalization of SMEs if the individual steps towards digitalization are linked to personal appointments. In this way, it is assumed, the use of cross-divisional competencies could strengthen the understanding of value creation through the progress of digitalization. However, according to (Brink et al., 2023), a basic prerequisite for this is that the leadership changes its previous way of leading and moves from a leadership that is oriented from a top down to a cross-departmental leadership that takes place at one level.

According to (Ahmad et al., 2022), the likelihood of success in the area of digitalization increases if the leadership in the company is prepared to improve and further develop its entrepreneurial leadership skills. In addition, another important activity of the leadership on the way to digitalization of the company is to communicate the process openly and transparently within the company in order to be able to efficiently involve the workforce in the overall process. The study by (Ötting et al., 2021) sees the leadership, in its efforts to drive forward the expansion of digitalization in the company, as being challenged above all in the areas of communication and strategy. The digitalization process requires clear and unambiguous communication from leaders, which should ideally extend across multiple communication channels in the company. Another key aspect that is highlighted in the study by (Ötting et al., 2021) is the need for greater action on the part of leadership with regard to strategic orientation in the context of digitalization. This means, on the one hand, that leadership should pay more attention to the timing of its decisions and that it needs to make decisions more frequently. In addition, on the other hand, leadership should steer its activities to show the company various ways of dealing with the changes initiated by digitalization and cultural progress. One further point raised by (Ötting et al., 2021) in connection with strategic orientation calls on leadership to focus on innovation not only on the pure creation of results in the sense of products, but also to actively contribute to promoting innovation in the area of collaboration.

For (Buechtl et al., 2021), employees are a central factor on the company's path to digitalization. For this reason, the leadership of SMEs should gear their activities toward involving their employees in the process of digitalization. Among other things, this also requires the leadership to address the specific needs or concerns of their employees. One of the measures to involve the workforce in the digitalization process could, for example, be to provide training opportunities

for employees. In addition, the study recommends that the digitalization process be carried out carefully in order to avoid overburdening employees. Furthermore, leadership should lead by example in the use of digital tools as part of the digitalization process. Finally, the organization of the individual digitalization steps is the responsibility of the leadership. This includes both budget planning and cost-benefit analyses, as well as the continuous updating of digital products. According to (Okfalisa et al., 2021), in contrast, the main activities of leadership to support digitalization are to manage changes in corporate structure and culture and to promote the creation of networks.

The study by (Jäckli & Meier, 2020) essentially revealed two fields of activity which, in the view of the study, are elementary for the digitalization success of companies. First, leadership should ensure that the fundamental importance and scope of the digitalization process is anchored in the company and thus in all organizational areas and processes. The second field of activity concerns the explicit creation of structures and processes for more effective control, coordination and enforcement of digital initiatives in the company. In this context, (Jäckli & Meier, 2020) emphasize, analogously to (Ötting et al., 2021), that these efforts require a corresponding strategy. In the view of (Horváth & Szabó, 2019), the activities of the company and thus ultimately also of the leadership with regard to the progress of digitalization should first focus on creating a uniform understanding of change in the organization. Furthermore, it should also be one of the main activities to break new ground in the conception as well as in the provision of training opportunities.

4 Conclusions

The purpose of this research work is to provide an overall picture of the leadership traits and activities that are considered necessary in recent literature to promote and support digitalization in SMEs. From the literature review, it became clear that digitalization itself and also the understanding of digitalization in SMEs have still not reached a satisfactory level (Gamache et al., 2019) and there is clear potential for improvement. For this reason, this research work makes a valuable contribution to the successful progress of the digitalization process in SMEs. In the framework of research question 1, which was adequately answered in chapters 3.1 and 3.2, a systematic literature analysis was conducted and an overall picture of the most essential leadership traits and activities was created. Moreover, research question 2 examined the completeness of the overall picture created. According to the author, this analysis led to the conclusion that not all required leadership traits and activities considered to be necessary for the digitalization progress were fully depicted in the overall overview created.

In the author's opinion, the topic of trust, for example, was insufficiently considered in the literature examined, both in terms of traits and activities. Although trust-building activities were listed in some cases, such as the creation of transparency (Ahmad et al., 2022), an overall concept or a systematic approach to the formation of trust as a promoting and supporting activity of leadership in the digitalization process of SMEs could not be found in the literature examined. This can also be applied analogously to the area of traits; here, too, no explicit study could be identified that systematically addressed trust-building leadership traits in the digitalization process of SMEs. Especially in view of the many uncertainties among employees caused by digitalization (Buechel et al., 2021), trust-building traits and activities of leadership appear to be urgent as well as necessary for promoting and supporting digital transformation within the organization. This assessment is in line with the research work of (Jäckel, 2020), which is of the opinion that the importance of the trust aspect between leadership and employees will become even more significant in the future in the context of increasing digitalization.

5 Limitations and Future Research

The research work is subject to various limitations. These are mainly due to the systematic literature analysis carried out, which is furthermore based only on the search results of one literature database. Future research can use the results from research question 1 as a basis for further research projects. In addition, the results from research question 2 in particular can be used to examine the trust factor in the context of the traits and activities of leadership to support and promote the digitalization process of SMEs in further research.

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The relationship between R&D expenditures and environmental performance in EU countries

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Abstract: Investment in research and development (R&D) can play a key role in improving the environmental performance of EU countries. R&D contributes to a more efficient use of natural resources, which reduces negative environmental impacts. Investment in R&D often leads to innovations that can have a positive impact on sustainable development and on addressing environmental challenges, thereby improving environmental performance. The aim of this paper is to assess the correlation between R&D expenditure and improvements in countries' environmental performance. The paper focuses on EU countries. The analysis also focuses on the structure of R&D expenditure. The study uses changes over a ten-year period. The analysis found that over the period under review, the link between the size of R&D expenditure and environmental performance as measured by the EPI is very low. Significant differences were found between the countries with an initially high EPI (Nordic countries) and the post-communist EU countries.

Keywords: R&D, environmental performance, EU

JEL Classification: E23, G01, F41

1 Introduction

Increasing R&D spending can have a positive effect on economic growth. If we want to assess the impact of these investments, it is necessary to take into account not only the economic effects but also the environmental effects. R&D expenditures can play a key role in improving a country's environmental performance, especially if such investments are targeted at innovations and technological solutions that bring real environmental benefits. The aim of this paper is to assess the relationship between R&D expenditure and improvements in countries' environmental performance.

The importance of investing in R&D to bring about technological change was pointed out by Solow (1957). His study delineated the role of technological change in economic growth showed that technological change is one of the key explanatory factors of economic growth and productivity. The neoclassical production function can be defined in the form $Y = F(A; K; L)$ where A is the level of technology, K is the capital stock and L is the quantity of labour. The cyclical evolution of the economy, and in particular the economic crisis, has an important influence here (Sirucek & Pavelka, 2013) as financial crisis (Sirucek & Setek, 2023). Technological progress occurs through R&D expenditures, which increase over time. Therefore, A represents the current state of endogenously determined technology (Barro, 1999). This relationship was confirmed by the firm study of Wakelin (2001), which found that a positive and significant role of a firm's own R&D expenditures in influencing productivity growth. Prior research has focused on the effects of R&D investment on economic growth, technological progress or competitiveness.

In the last few years, the direction of research into R&D investments has also focused on environmental impacts. This change of perspective is mainly due to the speed of climate change due to global warming. Carrión-Flores & Innes (2010) in their US-focused study, pointed out that environmental innovation is an important driver of toxic emissions reductions and that tighter pollution targets are spurring investment in environmental innovation. This conclusion at the European Union level is confirmed by García-Álvarez and Moreno (2018), who report that eco-innovation is a key theme in the environmental policies of Member States with excellent environmental performance (Sweden, Austria, Denmark, Italy and Germany). On the contrary, according to Beltrán-Estevé and Picazo-Tadeo (2017) study, the Member States that joined the EU in 2004 are far from the environmental technological frontiers of the EU average and therefore a major boost is needed to catch up with the developed EU countries in field of environmental performance.

A corporate study by Alam et al. (2019) found that R&D investments have a significant negative impact on energy consumption and carbon intensity. The analysis found that investment in R&D improves the environmental performance of the firm. At the same time, a study by Verma et al. (2022) points out that while higher R&D investment improves

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environmental performance, it has a negative impact on firms' financial performance. The question is whether R&D investments have a positive or negative effect on environmental performance in the long run. The term "environmental performance" according to Jahn (1998) describes the level of pollution in a country and its changes over time. This term implies that environmental pollution is a process that can improve or worsen.

Bucher (2016) points out that environmental indicators can generally be divided into two types of indicators: end-of-process indicators, otherwise known as lagged indicators, or in-process indicators, also known as leading indicators. Lagged indicators are easy to quantify and understand; they are preferred by the public and regulators. The main advantages of using lagged indicators are that they are usually easy to quantify and understand and the data are often collected for other business purposes. The main disadvantage is that, as the name suggests, they lag or reflect situations where corrective action can only be taken after the fact. This study will use lagged environmental performance indicators of economies. Every country in the world needs to improve its environmental performance, and this requires looking at data on the factors associated with success in achieving environmental sustainability goals. The main indicator showing environmental performance is The Environmental Performance Index (EPI). This indicator (provides a data-driven summary of the state of sustainability around the world. Using 32 performance indicators across 11 issue categories, the EPI ranks 180 countries on environmental health and ecosystem vitality (Wendling et al., 2020). Measuring environmental performance today does not only look at the macro level but also at the level of regions (Dusek, 2019; Redlichová et al. 2019), municipalities or firms (Mura & Hajduová, 2021; Vrchota et al., 2020).

2 Methods

The paper focuses on how changes in R&D spending affect the evolution of countries' environmental performance. Changes in R&D spending are examined in terms of the Government sector and the Business enterprise sector.

The environmental performance of EU countries is assessed through the EPI aggregate indicator, which is a registered trademark of Yale University. The analysis focuses on all EU countries. The study uses changes over a ten-year period. The EPI results for EU countries were obtained from the results database (<https://epi.yale.edu/epi-results/2022/component/epi>). The data source for R&D expenditure was Eurostat.

The EU countries were divided according to the change in the structure of their economies over 10 years, i.e. the percentage point change by sector, into 3 groups, namely

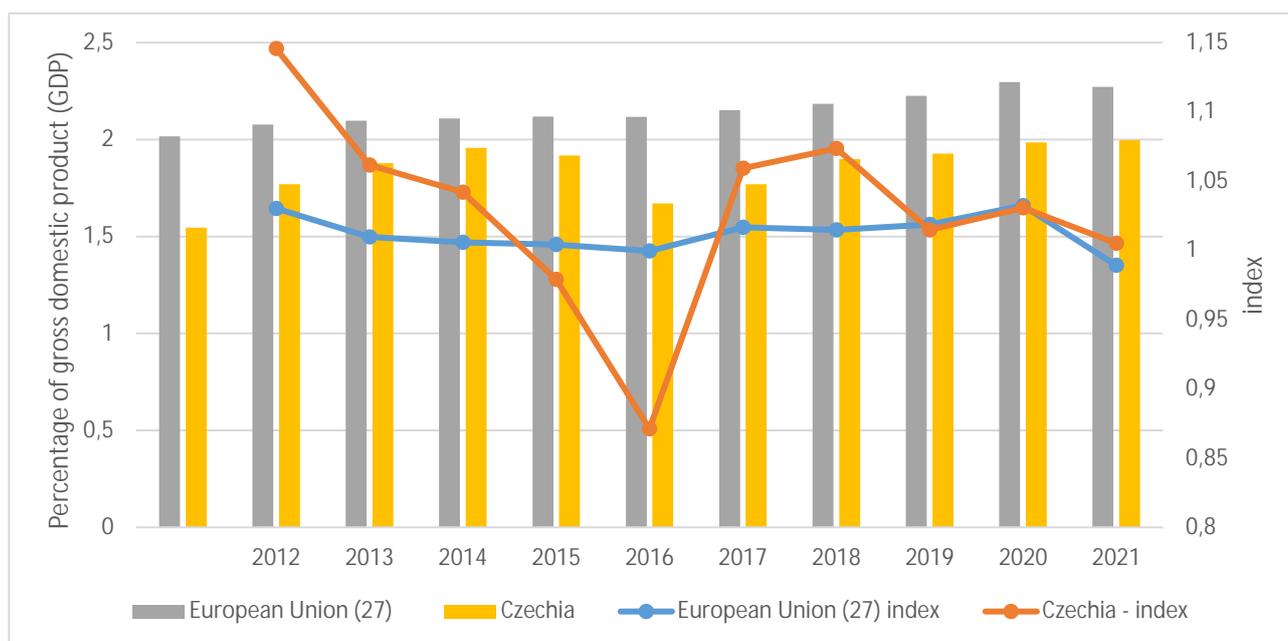
- Negative percentage change (<1),
- a very small change in percentage points (0 - 1),
- positive change in percentage points (>1).

Subsequently, the level and change in the 10-year EPI was assessed for these groups of countries. A correlation matrix (Montgomery & Runger, 2007) was used to test the dependence of each variable.

3 Research results

The first part of the analysis focuses on assessing the importance of R&D expenditure in the EU (27) and in the Czech Republic through the percentage of R&D expenditure in GDP (Figure 1, left y-axis) and the growth rate of R&D expenditure in the EU (27) and in the Czech Republic (Figure 1, right y-axis). Figure 1 shows that the share of R&D expenditure in the Czech Republic does not reach the average level of the EU (27) in any of the years under review. As of 2019, the growth rates of R&D expenditure in the EU (27) and the Czech Republic are almost identical. In the Czech Republic, R&D expenditure has been growing in all years except 2016. In 2016, there was a significant decrease in R&D expenditure in the Czech Republic. This was due to problems with the absorption of R&D expenditure from EU funds.

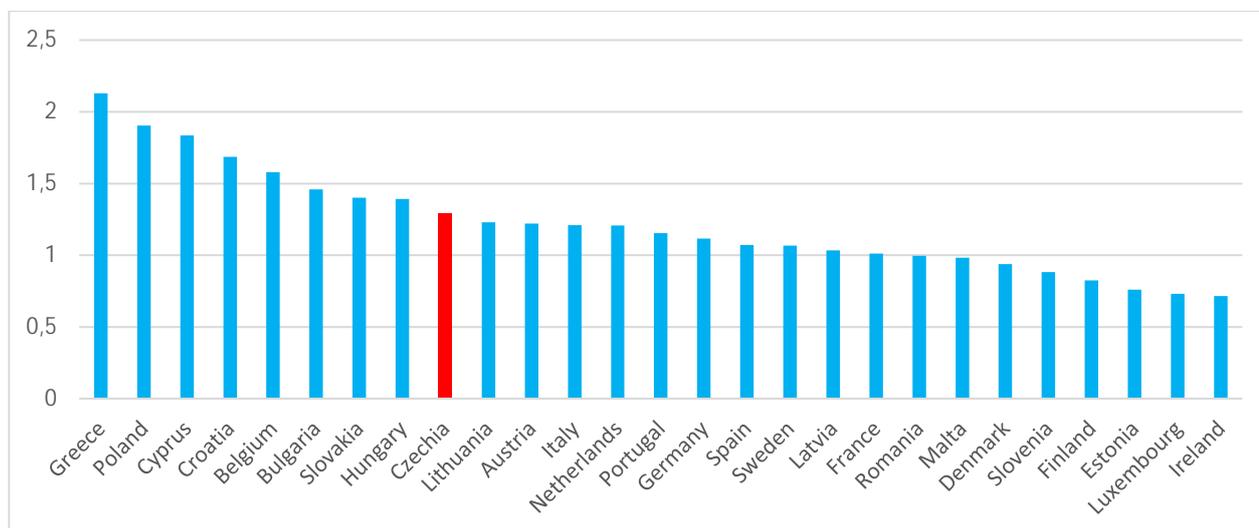
Figure 1 Share of Research and development expenditure (%)



Source: own processing, Eurostat

If we look at the change in R&D expenditure over 10 years (comparing the share of R&D expenditure in GDP in 2021 with 2011), we can see (figure 2) that the largest increase in the share of R&D expenditure is recorded in Greece (2.13 times). In the Czech Republic, there has been a 30% increase over the ten-year period, i.e. a 1.3-fold increase in the share of R&D expenditure in GDP. The R&D expenditure tends to follow the general trend of the business cycle, but is also influenced by sector- and country-specific factors. In sectors that are heavily dependent on technological innovation, the pressure to maintain R&D spending can be higher even in difficult economic times. In sectors that are heavily dependent on technological innovation, the pressure to maintain R&D spending can be higher even in difficult economic times. The different structure of the different EU economies can also be considered as an aspect.

Figure 2 Research and development expenditure – 10 change (index)

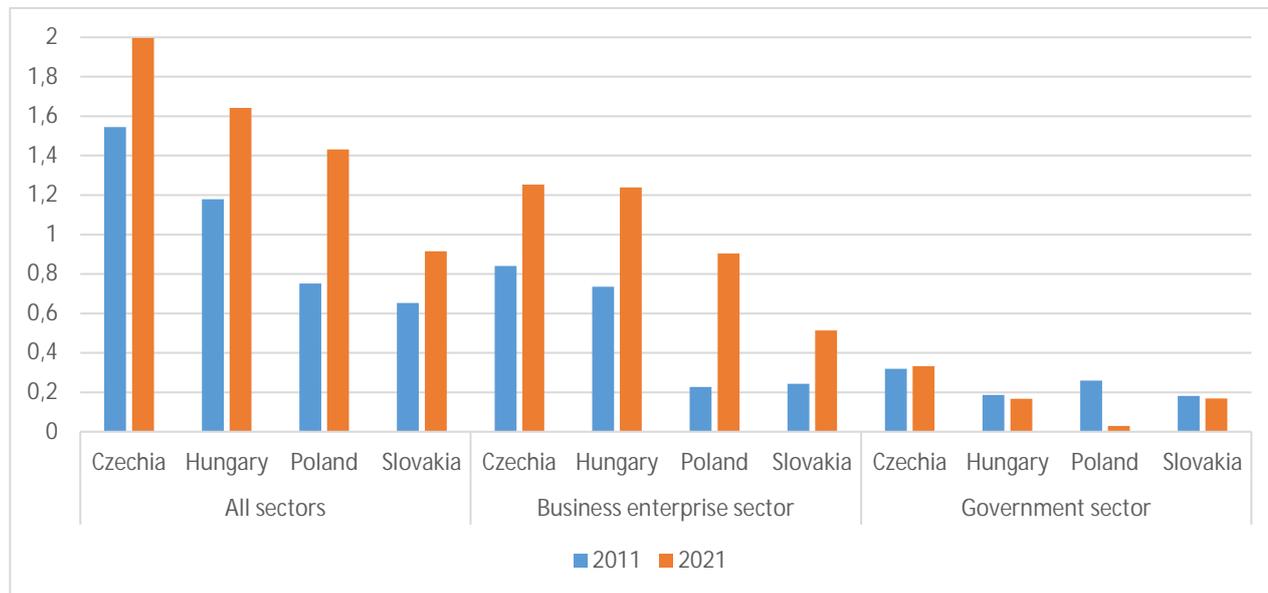


Source: own processing, Eurostat

A more detailed examination focusing only on the Visegrad group (V4) countries reveals (figure 2) that Poland has the highest 10-change in the share of R&D expenditure (0.68 percentage points), followed by Hungary (0.463 percentage points), Czechia and Slovakia. However, the highest share of R&D expenditure in GDP among the V4 countries is achieved by the Czech Republic, followed by Hungary, Poland and Slovakia (figure 3). The 10-change change in R&D expenditure was highest for Poland, which, however, had a low initial level of this indicator. The share of R&D expenditure in GDP provided by the business enterprise sector is highest in the Czech Republic and Hungary. Poland recorded the highest 10-change in this sector (an increase of 0.676 percentage points). The share of R&D expenditure

provided by the Government sector in GDP is again found to be highest in the Czech Republic (about 0.33%), and lowest in Poland (0.029% in 2021), where at the same time there has been a significant decrease in this share over the 10-year period (about 0.231 percentage points).

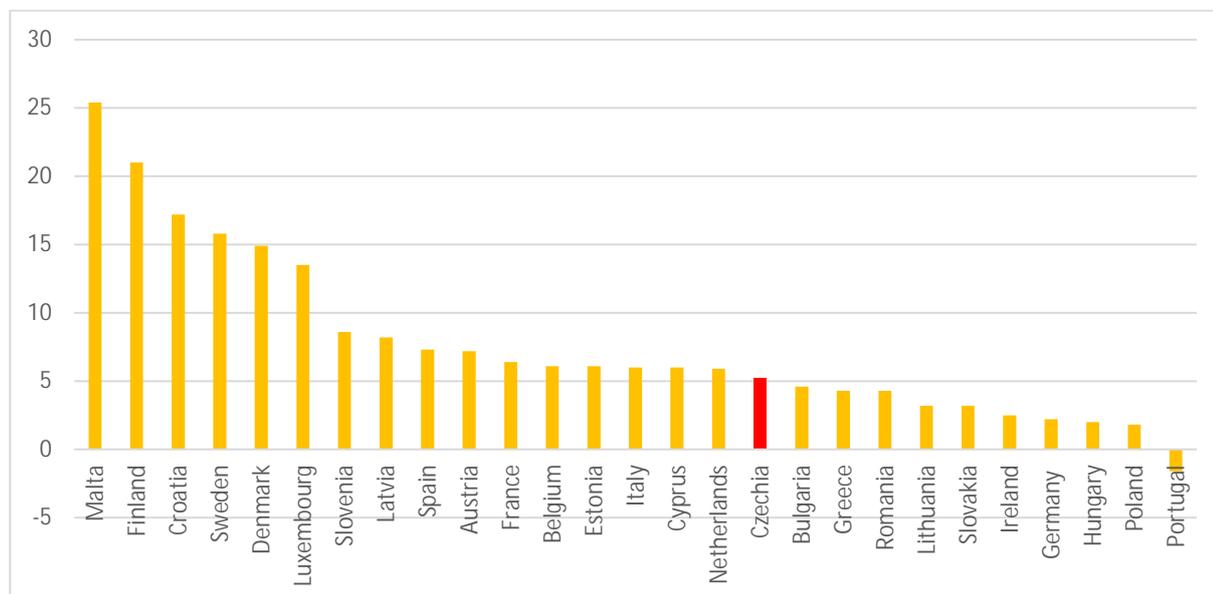
Figure 3 Share of R&D expenditure in GDP in V4 countries in 2011, 2021 (%)



Source: own processing, Eurostat

The next step was to analyse whether the increase in the share of R&D expenditure in GDP is related to the growth of EPI. The authors hypothesised that higher R&D expenditure is related to spending on research on technologies etc. contributing to environmental friendliness and thus leads to an improvement in the EPI. Figure 4 illustrates the 10-change EPI index across EU countries in descending order.

Figure 4 EPI 10 change



Source: own processing, Eurostat

The country of Malta has made the most progress in this area in 10 years, followed by Northern European countries (Finland, Sweden, Denmark) and, surprisingly, Croatia. In the Czech Republic, the EPI increased by 5.2 points. Table 1 focuses on the comparison of the countries with the most significant 10-change (most significant decrease or increase) in the two 10-changes studied. Table 2 offers only the countries with the highest 10-change R&D expenditure per GDP, which also show the lowest 10-change EPI, and conversely the countries with the lowest 10-change R&D expenditure

per GDP and the highest 10-change EPI (antagonistic relationship). The Czech Republic performed at an average level in both observed changes.

Table 1 10-change R&D expenditure to GDP and 10-change EPI (significant changes)

10-change EPI		10-change Research and development expenditure in GDP (index)		
Level change	Points	> 1,5	1,5 - 1	<1
high	>10 points			Malta, Finland, Denmark, Slovenia Estonia
medium	10 – 5 points		Czechia, other EU countries	
low	<5 points	Cyprus, Greece, Poland		

Source: own processing, Eurostat

Table 1 then shows that the countries that have seen the highest increase in R&D expenditure as a share of GDP have also shown the lowest progress in EPI. This may be because these states already had a baseline observed level of R&D expenditure to GDP ratio at an above-average level, and so the 10-change is low, but they achieve a significant change in EPI, prioritizing more progress in environmental protection. This inverse proportionality was verified through a correlation matrix (Table 2).

Table 2 10-change R&D expenditure to GDP and 10-change EPI (significant changes)

	p < ,05000 N=25			
	Share R&D on GDP all sector	Share R&D on GDP -Business enterprise sector	Share R&D on GDP -Government sector	EPI - change 10 years
Share R&D on GDP - all sector	1.000000	0.812502	0.281854	-0.208719
Share R&D on GDP - Business enterprise sector	0.812502	1.000000	-0.112435	-0.285819
Share R&D on GDP - Government sector	0.281854	-0.112435	1.000000	0.015334
EPI - change 10 years	-0.208719	-0.285819	0.015334	1.000000

Source: own processing, Eurostat

The assumption of an indirect dependence of the 10-change R&D on GDP on the 10-change EPI was confirmed, but this dependence is very low (this indirect dependence was found for both the 10-change R&D on GDP all sector and the business enterprise sector). To verify this, the number of observations would need to be increased.

4 Conclusions

The study focuses on the link between R&D investment and improving the environmental performance of EU countries. R&D contributes to a more efficient use of natural resources, which reduces negative environmental impacts. Investment in R&D often leads to innovations that can have a positive impact on sustainable development and on addressing environmental challenges, thereby improving environmental performance. The aim of this paper was to assess the correlation between R&D expenditure and improved environmental performance. The study uses changes over a ten-year period. The analysis conducted showed that the states that experienced the highest increase in R&D expenditure as a share of GDP also showed the lowest progress in EPI. This may be because these states already had a baseline observed level of R&D expenditure to GDP ratio at an above average level, and thus the 10-change is low, but they are achieving a significant change in EPI, prioritizing more progress in environmental protection. These countries include in particular Northern European countries such as Sweden (Weiss & Anisimova, 2019). Another analysis focused on the assumption of an indirect dependence of 10-change R&D on GDP on 10-change EPI was confirmed, but this dependence is very low. A study by García-Álvarez and Moreno (2018) recommends that countries with low environmental performance should implement the environmental policies of EU countries with superior environmental performance. Environmental innovation is a key focus of environmental policies in these states. Overall, R&D investments have the potential to play a key role in improving the environmental performance of countries while contributing to sustainable development in various sectors of the national economy. Investments in R&D should not be forgotten as they are investments in the future that can bring many economic, social or environmental benefits.

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Session:

Economics of Agriculture
in Theory and Practice



The development of the profitability of agricultural enterprises and its causes

Daniel Kopta¹, Jana Lososová²

Abstract: The article presents the results of the development of the profitability of agricultural enterprises in the years 2017-2022. The results are compared with the sectors: Food Production and Food Retail. The Albertina database was used. The profitability of agricultural enterprises is significantly below average (roughly half) compared to other sectors. Intercompany volatility is also lower. On the other hand, year-on-year volatility (volatility over time) is higher. The year 2022 is characterized by high inflation and a significant increase in profitability in all sectors. The causes of change in profitability (ROA) were analyzed. Logarithmic and exponential decomposition methods were used. The reasons for the difference in profitability are different. There was a sharp increase in sales in all sectors. In the Agriculture sector, material costs grew faster than sales. Higher profitability is achieved due to depreciation (which remained fixed as sales increased), especially labor costs (which grew significantly slower than sales). In the food production sector, depreciation significantly impacts profitability (they again remained the same despite growing sales). The influence of wages is weaker than in the Agriculture sector. The average salary here more closely followed inflation. In the Food Retail sector, the main reason for the increase in ROA is higher selling prices. Selling prices rose faster than the purchase costs of goods and materials.

Keywords: Profitability, risk, volatility, agricultural firm, inflation

JEL Classification: G32, G33

1 Introduction

The food chain connects the agricultural, food, and retail sectors. World food prices hit a ten-year high in 2022 (FAO, 2022). According to a study by Steininger & Smutka (2022), the countries of the Visegrad Four faced a higher increase in food prices in 2011-2021 than in the original EU countries. The highest average price inflation was recorded in Hungary and the Czech Republic. The reasons for this development are unclear. All food producers face rising energy prices and pass these costs on to consumers (Bekkerman et al., 2021).

On the other hand, all monitored sectors increased profits in the observed period. According to a study (Rudinskaya, 2019), the development of the price spread between farmers and processors has a decreasing tendency, and the result of the price spread between processors and retailers, on the contrary, is increasing over time. There is, therefore, a need to establish measures to strengthen the bargaining power of farmers effectively.

Developments in agriculture: The share of agricultural production in gross domestic product has decreased in advanced economies in recent years (Hýblová, 2014). States focused mainly on the environmental function of landscape protection and food security (MacDonald et al., 2000; Hubbard & Gorton, 2011; Papadopoulos, 2015). In the current turbulent years, efforts are resurgent to ensure a viable and competitive agricultural sector. The main reason is to provide food self-sufficiency (Brankov et al., 2021; Škamlová, 2022; Svobodová et al., 2022). However, food self-sufficiency in the Czech Republic has declined since the 1990s for all monitored commodities (CZSO, 2022).

Agriculture is one of the least profitable and, simultaneously, the most risky sectors in the Czech Republic. The number of enterprises falling into the "excellent" category is a third lower than in other NH sectors (Kašparová et al., 2019). Among the reasons for this state of affairs are investments necessary for compliance with EU standards and growing foreign competition. Since joining the EU, Czech agriculture has faced cheaper agricultural products abroad. The decrease in production is particularly pronounced in livestock, pig, and cattle production (Lososová et al., 2023). More and more Czech agricultural enterprises are thus moving towards clean crop production. At the same time, the critical determinants for increasing the resilience of farming systems are increasing diversity and modularity (Meuwissen et al., 2019; Blažková et al., 2023). However, increasing farm resilience through diversification (of activities, products, or sales channels) comes with increased costs (Bowman & Zilberman, 2013).

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Decisive for the positive profitability of the agricultural enterprise is the favourable price development of commodities (XXX). However, commodity volatility is very high. The literature that attempts to explain the determinants of agricultural product price developments (Mišečka et al., 2019) focuses on primary sectoral determinants (e.g., commodity stocks, supply shocks) (Hochman et al., 2014; Ott, 2014), macroeconomic impacts (Gohin & Chantret, 2010) and trade policies (Bellmann & Hepburn, 2017). Other authors deal with the link between policy interventions in biofuels, energy, and agricultural commodity markets (Ciaian & Kancs, 2011; Drabik et al., 2014; Ahmadi et al., 2016). Speculative trading of farm commodities also strongly impacts the level of agricultural prices and their volatility (Gutierrez, 2013; Henderson et al., 2015).

Development in Food Industry: The food industry's economic and social importance is evident in the EU and the Czech Republic. In the EU, the food industry generates 1.8% of gross added value (FoodDrink Europe, 2016); in the Czech Republic, the share of the food industry in the added value of the entire processing industry was 7.5% and in employment 9.2% in 2016 (CZSO, 2017; Dvoulitý & Blažková, 2019). Globalization and liberalization of food markets, the world financial crisis, the COVID-19 crisis, changing consumer preferences, organic food, food safety, and environmental issues have influenced the development of the European food industry in recent decades (Kapelko, 2019; Čechura & Žáková Kroupová, 2021). Given the affordability and safety of food, the connection between food processing, the national economy, and food trade is crucial. (Tong et al., 2016). The high degree of market saturation and concentration of food retail contributes to a highly competitive environment (Čechura & Žáková Kroupová, 2021).

Development in Food Retail: The market power and competition policy in retail food chains has emerged as an important economic issue and a susceptible point on the political agenda worldwide (Rudinskaya, 2019). The results of studies focused on the market power of retail in Europe reject the hypothesis of perfect competition (Gohin & Guyomard, 2008). The results suggest evidence of retail oligopoly and oligopsony power (Anders, 2008; Sckokai et al., 2009) and the existence of retail market power vis-à-vis consumers and vis-à-vis suppliers (Salhofer et al., 2012). Strong multinational and national retail chains dominate the Central European food market, and the market structure of Central European food retailers is predominantly characterized by an asymmetric oligopoly (Špička, 2016).

2 Methods

The aim of the work: The main goal of the work is to describe the development of the profitability of agricultural enterprises and its volatility in the years 2018-2022. This development is compared with the growth in the food industry and retail. The second goal of the thesis focuses on identifying the causes of the year-on-year change in profitability between 2021 and 2022

The evaluation of companies is based on indicators of classic financial analysis. Due to the specifics of the industry, the study is focused on indicators of asset profitability. The high value of inflation in 2021 was the reason for comparing profitability with the inflation index. The way of management greatly influences indebtedness, activity, and liquidity indicators in the monitored industry, and mutual comparison is difficult.

The risk was monitored using volatility. Inter-firm volatility was calculated for each industry and each observation year. A high value of inter-company volatility indicates a considerable influence of internal factors on the company's success. At the same time, the volatility of the average company in the sector for the monitored period (year-on-year volatility) was calculated. A high value of year-on-year fluctuations indicates that the industry depends on external factors. The stability of the economic result was measured using the Spearman correlation coefficient. It is a non-parametric correlation coefficient that is robust to outliers, as it only counts the ranks of the observed values.

The sharp increase in profitability in 2022 led to the necessity to decompose profitability. Due to the different indebtedness of individual sectors, ROA decomposition was performed. The profitability of assets was divided into the influence of sales profitability and turnover of assets. The logarithmic method was used for decomposition (exponential method in case of negative profitability). The profitability of sales was transposed to cost-effectiveness. This indicator was broken down into the effect of performance consumption, material consumption, service consumption, depreciation cost, personnel costs, and the residual value of fixed assets and other effects.

Processed database. Data from the Albertina database were used. The condition was the company's presence in all monitored years (2018-2022). A minimum turnover limit (1 million crowns) was also set. Unfortunately, only part of the companies' data was published by September 1, 2023. 421 agricultural enterprises, 152 food producers, and only 24 food sellers were processed.

3 Research results

3.1 Development of return on assets in 2018 – 2022

Average profitability in the agricultural sector is around 3.51% (without the last atypical year). This value is approximately half that of other industries. It is also unfavorable that such low profitability is lower than inflation in the three monitored years. This does not even allow simple reproduction of assets. In other sectors, inflation exceeds profitability only in 2022.

Table 1 Return on assets (ROA) in 2018-2022

Industry	Year	2018	2019	2020	2021	2022	Average (2018-2021)	Average (2018-2022)	Year-to-date volatility (2018-2021)	Year-to-date volatility (2018-2022)
Inflation		2.10%	2.80%	3.20%	3.80%	15.10%	2.79%	5.29%	x	X
Agriculture	ROA	2.42%	2.39%	3.05%	3.75%	5.89%	2.90%	3.50%	0.56%	1.29%
	ROA – inflation	0.32%	-0.41%	-0.15%	3.71%	-9.21%	0.11%	-1.79%	x	X
	Inter-firm volatility	5.92%	7.72%	6.18%	6.12%	7.78%	x	x	x	x
Food processing	ROA	5.27%	5.13%	4.22%	5.29%	6.35%	4.98%	5.25%	0.44%	0.67%
	ROA – inflation	3.17%	2.33%	1.02%	1.49%	-8.75%	2.19%	0.80%	x	X
	Inter-firm volatility	10.30%	9.33%	9.91%	11.29%	12.07%	x	x	x	x
Retail	ROA	5.21%	5.33%	5.41%	5.78%	9.86%	5.43%	6.32%	0.21%	1.78%
	ROA – inflation	3.11%	2.53%	2.21%	1.98%	-4.34%	2.64%	1.21%	x	x
	Inter-firm volatility	10.56	10.77	10.37	11.63	11.98	x	x	x	x

Source: Own processing

The year-to-year fluctuation of the economic result is noticeable. It fluctuates from 2.42% in 2018 to 5,89% in 2022. Such high year-on-year changes in average profitability are atypical for other sectors.

However, inter-company volatility is equally low. It fluctuates in individual years between 5.92% (in 2018) and 7.78% (in 2022). These values are considerably lower than the values usual for other industries. In the "Food processing" sector, volatility ranges from 9.33% (in 2019) to 12.07% (in 2022). In the "retail" sector, intercompany volatility ranges from 10.37% (in 2020) to 11.98% (in 2022).

The explanation may be the high share of subsidies in total income and the overall nature of the industry. Production per unit is limited by the limitation of animals and cultivated plants. Natural constraints prevent significantly above-average returns; entitlement subsidies prevent extreme losses. The majority of agricultural enterprises, therefore, hover around the average. The maximum and minimum ROA values do not differ much from the standard.

On the other hand, this does not mean that agricultural enterprises are independent of the quality of management. The Spearman coefficient is very high (0.85). Successful businesses achieve above-average results consistently, but above-average results are not very different from the standard values.

On the other hand, year-to-year volatility is relatively high. Especially compared to retail. This testifies to the increased influence of external factors on profitability. These external factors cause the year-on-year movement of profitability. For other sectors, the profitability of the average company does not change much over time (except the last year).

3.2 Decomposition of changes in ROA in 2022-2021

The total change in profitability in the "Agriculture" sector was 2.14 percentage points. The profitability of assets increased from 3.75% to 5.89%. Turn rate increased from 0.54 to 0.60. An increase in sales mainly caused this change (they increased by 31%). The stagnant value of fixed assets contributed. The influence of current assets was negative (their value increased by 15%). The overall effect of turnover rate on ROA was 0.52 percentage points.

Table 2 Decomposition of changes in ROA in 2022-2021

	Agriculture	Food production	Retail
Change in profitability (2022-2021)	2.14%	1.06%	4.08%
Effect of Turnover Rate	0.52%	0.43%	2.61%
Effect of Sales Profitability	1.62%	0.63%	1.47%
Material, goods and energy consumption	-0.37%	-0,19%	4.95%
Labor costs	1.36%	1.62%	3.89%
Depreciation	0.35%	0.82%	-1.38%
Interest	-0.27%	-0.51%	-0.63%
Other influences	0.55%	0.31%	-5.38%

Source: Own processing

The impact of sales profitability was more significant and reached 1.62 percentage points. Cost-effectiveness (costs/sales) also has the same influence. Of the individual cost items, personnel costs have the most significant impact. An increase in labor productivity (caused by income growth and a decrease in the number of workers) is associated with only moderate growth or stagnation in the average wage (increase in the average wage by 3%). Thanks to wages, the return on assets increased by 1.36 percentage points. Depreciation also has a positive effect on profitability. This item is stagnant (with increasing sales). The overall impact on ROA is 0.35 percentage points.

"Consumed materials and services" hurt profitability. They have interest that grows faster than sales. These items grew faster than sales year-over-year and caused ROA to decline by 0.37 percentage points. "Interest" has an equally damaging effect on ROA. Their increase causes a decrease in ROA by 0.27 percentage points. In the last item, mainly fixed (or partially fixed) costs are again represented. These are "Residual value of long-term assets" and "Taxes and fees". These costs increase profitability.

At first glance, the increase in the profitability of agriculture looks like a favorable situation. The problem is that profitability remains well below inflation. The real return is thus negative. The reasons for the increase in profitability are also unfavorable. Much of the growth is due to labor cost efficiencies. Average wages grew considerably slower than inflation in 2022. However, a sharp wage increase can be expected in the coming years.

Even more problematic is the increase in profit due to depreciation. Depreciation is charged at historical prices. With high inflation, depreciation does not fulfill its primary function; the resources saved from depreciation are insufficient to reproduce long-term assets.

The reasons for the change in profit in the "Food Production" sector are similar. The influence of individual factors varies. The effect of turnover speed is positive. Of the cost items, the decrease in depreciation has the most significant impact, followed by savings in wages and material consumption. There was also a significant increase in profit in the retail sector. The rise in profitability was the cost of goods (prices of sold goods grew faster than costs), followed by the speed of turnover and saving wages.

4 Conclusions

The article presents the results of the development of the profitability of agricultural enterprises in the years 2017-2022. The results are compared with the sectors of Food Production and Food Retail. The profitability of agricultural enterprises is significantly below average compared to other industries. The Food Retail sector achieves the best profitability results.

The significant differences are in volatility. The "Agriculture" sector is characterized by high year-on-year and low inter-firm volatility. This fact means an increased influence of external factors on profitability. Trend analysis also corresponds to this factor. The trend in the development of profitability moves in the same direction for the vast majority of companies.

In the "retail" sector, the situation is the opposite. Year-to-date volatility is very low. The average profitability of the entire sector changed very little in individual years. However, the differences between individual companies are very

large. The food processing sector is similar in character to the retail industry. However, average profitability and inter-company volatility are lower. Interestingly, the values of Spearman's correlation coefficient are similar for most industries.

The year 2022 is characterized by high inflation and a significant increase in profitability in all sectors. In none of the monitored sectors did the return on assets exceed the inflation index. The real return in the industries was thus negative. The causes of the change in profitability were analyzed using the logarithmic and exponential decomposition methods. Significant differences were revealed between the monitored sectors. All industries saw a sharp increase in asset turnover rates. In the agricultural sector, material costs grew faster than sales. Higher profitability is achieved due to depreciation (which remained fixed as sales increased), especially labor costs (which grew significantly slower than sales).

Similar results were obtained in the Food Production sector. The influence of individual factors was different. Unlike agriculture, the impact of material consumption (power consumption) was positive, but the contribution to profit was small. Depreciation (stagnating when sales are growing) has the principal share in increasing profitability. The impact of labor costs is weaker than in the agricultural sector. The average salary here followed inflation more. In the Food Retail sector, the main reason for the increase in profitability is higher selling prices of goods. The selling prices of goods grew faster than the acquisition costs of goods and materials.

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Regional differences in technical performance of Slovak farms

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Abstract: The assessment of regional differences in the technical performance of farms in Slovakia requires a comprehensive analysis of various factors and sources, with technical efficiency in agriculture referring to the ability of a farm to produce a given level of output with a minimum amount of inputs or resources. The aim of the contribution was to evaluate the technical efficiency of Slovak farms at the regional level using the widely used method of Data Envelopment Analysis. We used an output-oriented DEA model to calculate a technical efficiency score for each farm and identify the most efficient farms. We found statistically significant differences between efficiency scores at the regional level. The highest technical efficiency scores were achieved by farms in Western Slovakia, and the lowest efficiency scores were achieved by farms in Eastern Slovakia. Farms in Eastern Slovakia lag behind those in Western Slovakia. While all farms are catching up with the most efficient farms in the Nitra region, it's worth noting that these farms experienced the highest decline during the period from 2014 to 2019. In conclusion, it can be concluded that in most regions the overall efficiency of agriculture has not been fully realized. These farms have the potential to improve efficiency by optimizing the use of resources, specifically by reducing their scale.

Keywords: technical efficiency, regional differences, data envelopment analysis, agriculture
JEL Classification: C14, C23, R58, Q16

1 Introduction

The agricultural sector plays a key role in the economic sector of Slovakia. Ensuring the efficiency and competitiveness of farms in this sector is key to sustaining agricultural growth, food security and rural development. The Common Agricultural Policy (CAP) supports farm incomes through two main areas, with the first pillar focusing on direct income support through direct payments. As the second pillar of the CAP, the EU's rural development policy is designed to support investments in agricultural farms, payments under agrienvironmental schemes, LFA payments and economic diversification in rural areas. One of the measures proposed by the European Commission for the CAP proposal was the development of agricultural enterprises also through non-agricultural activities in rural areas (European Parliament, 2023). Agriculture in Slovakia currently does not create enough job opportunities. The constant decrease in the number of employees in agriculture ranks Slovakia among the countries with the lowest share of workers in agriculture in the total number of employees. The unemployment rate in rural areas is above the EU average (8.4%). Solving the unfavorable situation will require investments in infrastructure, diversification of the rural economy and an increase in human capital (European Commission, 2023). Diversification of economic activities is an important part of the policy of sustainable rural development and the basic means for maintaining and improving the balance between economic opportunities and social conditions of the rural population.

Slovak agriculture is characterized by a double structure of agricultural enterprises with a high proportion of small agricultural enterprises and a smaller number of large agricultural enterprises (European Commission, 2023). Institutional support for agricultural holdings in the crop and livestock sector focuses on resource efficiency and investment, as well as on the development of small family farms and non-agricultural farm activities. Important differences can be observed between the economically richer, especially more industrialized West compared to the East, which also affects job opportunities in the agricultural sector. One of the ways to increase competitiveness is to use available resources efficiently. Higher efficiency allows the farm to better perform strategic activities, which will also lead to gaining a competitive advantage. For this purpose, the analysis of the efficiency of Slovak farms performing other gainful activities through the Data Envelopment Analysis (DEA) approach is of primary importance.

To analyze of efficiency and productivity in agriculture empirical research emphasizes the application of the DEA technique. Błażejczyk-Majka et al., (2012) pointed out the connection between technical efficiency and production

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specialisation, and economic size. Toma et al. (2015) examined efficiency at the regional level using different inputs and outputs to analyze the performance of agriculture practiced in plain, hill, and mountainous regions. Similarly, Imran et al. (2019) used an input-oriented intelligent DEA to investigate technical, economic, and water efficiency to investigate the impact of climate agriculture. Alem et al. (2021) found regional differences in dairy farms in technical efficiency using a stochastic meta-frontier approach. In the study, Tenaye (2020), an analysis of the technical efficiency of smallholder agriculture was conducted at a regional level. The study's findings indicated that regional disparities in technical efficiency were primarily influenced by agroecological factors, soil fertility, and the amount of rainfall. Bagchi et al. (2019) examined shifts in both regional productivity and efficiency. To counter regional disparities and diminishing technical efficiency, they put forward recommendations for investment in research and development, agricultural expansion, and crop diversification. In intensive agriculture, a pivotal consideration is finding the right balance of inputs to achieve the desired output without causing harm to the environment. The optimal level of intensive agricultural production can be described as one that minimizes input usage while attaining a specific output level.

In summary, the use of DEA at the regional level can facilitate the identification of best practices and resource optimization strategies within intensive agriculture, helping regions strike the optimal balance between productivity and environmental preservation. In the context of intensive agriculture, DEA provides a quantitative approach to assess how efficiently agricultural regions utilize their inputs to generate outputs. When applied regionally, DEA can shed light on which areas are achieving the desired output levels with the least amount of inputs, but also those regions that may be using excessive inputs to achieve similar or lower output levels. In this contribution, we analyze regional differences in the technical capability of Slovak farms performing other profitable activities.

2 Methods

Data Envelopment Analysis (DEA) is a mathematical optimization technique and also powerful quantitative method widely used in the agricultural field to evaluate and compare the relative performance of individual entities, such as farms, with multiple inputs and outputs. In agriculture, efficiency can be examined from the point of view of the input-oriented DEA model or the output-oriented DEA model. In this paper, the technical efficiency of Slovak farms is investigated using data envelopment analysis employing an output-oriented model that considers multiple outputs and inputs. Output-oriented DEA models for efficiency analysis are suitable in case of greater control over production inputs. In the output-oriented DEA model, the goal is to maximize the production of outputs while minimizing the use of inputs. This model is particularly useful when identifying units that are inefficient in generating output and seeking ways to improve their performance.

The first DEA model proposed by Charnes et al. (1978) is a CCR model that assumes constant returns to scale. Banker et al. (1984) extended it to the BCC model for the case of variable returns to scale. We estimated the technical efficiency score for each farm, assuming constant return to scale (TE_{CRS}) and variable return to scale (TE_{VRS}). The TE_{CRS} is derived by solving the following linear programming:

$$\max_{\theta, \lambda} \theta_i \text{ s. t. } \sum_{j=1}^n \lambda_j y_j - \theta_i y_i - s = 0; \sum_{j=1}^n \lambda_j x_{kj} + e_k = x_{ki}; \lambda_j \geq 0; s \geq 0; e_k \geq 0 \quad (1)$$

where θ_i is the potential proportional increase in output achievable by the i -th farm. Meanwhile, λ_j is a vector of weights relative to the efficiency observation for all N farms, s denotes the output slack, and e_k represent the k -th input slack.

By introducing the convexity constraint $\sum \lambda = 1$, the model can be transformed into the TE_{VRS} DEA. In this modified model, a farm is considered to have achieved efficiency when both θ_i and λ_i equal 1, while λ_j equal 0. Conversely, an observation is classified as inefficient when $\theta_i > 1$, $\lambda_i = 0$, and $\lambda_j \neq 0$.

The technical efficiency of each farm was calculated using a common production frontier and then the farms were categorized into three groups based on regions. In this case, it was unreasonable to calculate three production function frontiers for each region separately, because we assume that these farms also perform other income-generating activities in different regions and work under the same technology.

Next, we employed the non-parametric Kruskal-Wallis test to determine whether the scores of technical efficiency differed significantly among individual regions. To analyze efficiency, we used output-oriented models with the assumption of both constant and variable returns to scale.

Balanced panel data from 215 agricultural enterprises engaged in other gainful activities were used, sourced from the FADN database. These enterprises continuously conducted agricultural activities from 2014 to 2019. The variables for the model were selected based on the most commonly used variables in the application of DEA models in agriculture.

A single output variable was utilized, specifically total production of the enterprise expressed in thousand euros. Inputs were categorized into five groups, including farming overheads and depreciation (FOD), total specific costs (TSC), labour and machinery costs (LMC). These three inputs were calculated according to FADN methodology and are expressed in thousands of euros. Another input was agricultural labor converted into annual work units (AWU). Finally, the last input was the hectare area expressed as the total utilized agricultural area (UAA). Descriptive statistics of these variables in 2014-2019 are presented in Table 1. In practice, technical efficiency is calculated using linear programming, where we utilized the DEAP 2.1 program, and for other analyses, we worked with Stata 18.0 software.

Table 1 Descriptive statistics on selected variables for Data Envelopment Analysis

Variables	Total sample mean (st. dev.)					
	2014	2015	2016	2017	2018	2019
Total production	3207.46 (1051.92)	2667.05 (1039.85)	3113.28 (1027.11)	2956.99 (1022.23)	3288.83 (1012.7)	3061.06 (1000.52)
Utilised agricultural area	1028.18 (968.3)	1016.1 (949.08)	1004.2 (935.92)	999.82 (932.48)	990.79 (932.21)	979.51 (895.79)
Total employed work	23.74 (26.21)	23.76 (25.84)	22.91 (24.94)	22.41 (24.05)	21.90 (24.39)	21.01 (23.38)
Farming overheads and depreciation	349.71 (414.08)	360.89 (415.62)	368.66 (415.96)	366.23 (420.48)	368.62 (410.11)	379.32 (451.18)
Labour and machinery cost	519.24 (627.78)	476.16 (549.95)	501.74 (590.65)	522.11 (616.82)	535.91 (634.35)	551.76 (655.37)
Total specific costs	663.08 (904.03)	592.93 (757.42)	569 (716.41)	565.41 (708.97)	445.08 (583.05)	718.69 (913.63)

Source: Own processing

3 Research results

Technical efficiency scores of Slovak farms divided by region into Western Slovakia, Central Slovakia and Eastern Slovakia are shown in Table 3. The highest efficiency scores in the observation period are achieved by farms in Western Slovakia, in the regions of Nitra, Bratislava, and Trnava. The most inefficient farms are in Eastern Slovakia in region Prešov and Košice. Farms in Eastern Slovakia are lagging behind the farms in Western Slovakia. Although all farms are catching up with the most efficient farms in the Nitra region, these farms achieved the highest decline in the period 2014-2019.

The average technical efficiency score under constant returns to scale for farms in western Slovakia is 0.64, with 2014 and 2015 being the years in which these farms were most efficient. The years 2014 and 2018 were the most efficient in terms of variable returns to scale, with an average technical efficiency score for WS farms of 0.77.

The average technical efficiency score of farms in central Slovakia, in terms of constant returns to scale, is 0.55, with 2014 and 2015 being the most efficient years, similarly to the western Slovakia. The same is true in the case of variable returns to scale where the average technical efficiency score is 0.65.

Under constant returns to scale, the average technical efficiency score of farms in eastern Slovakia is the lowest at 0.52 and in 2017 these farms were the best performers. In the case of variable returns to scale, the most efficient farms were in 2014 and 2015, with the average technical efficiency of western Slovakia farms being 10% higher than at constant returns to scale. The lowest early technical efficiency of eastern Slovakia farms was in 2018 with an average efficiency score below 0.5. In the case of variable returns to scale, higher values are achieved compared to constant returns to scale due to the stricter evaluation of efficiency than the VRS frontier.

Table 2 Technical efficiency scores and Kruskal-Wallis test for differences between efficiency scores

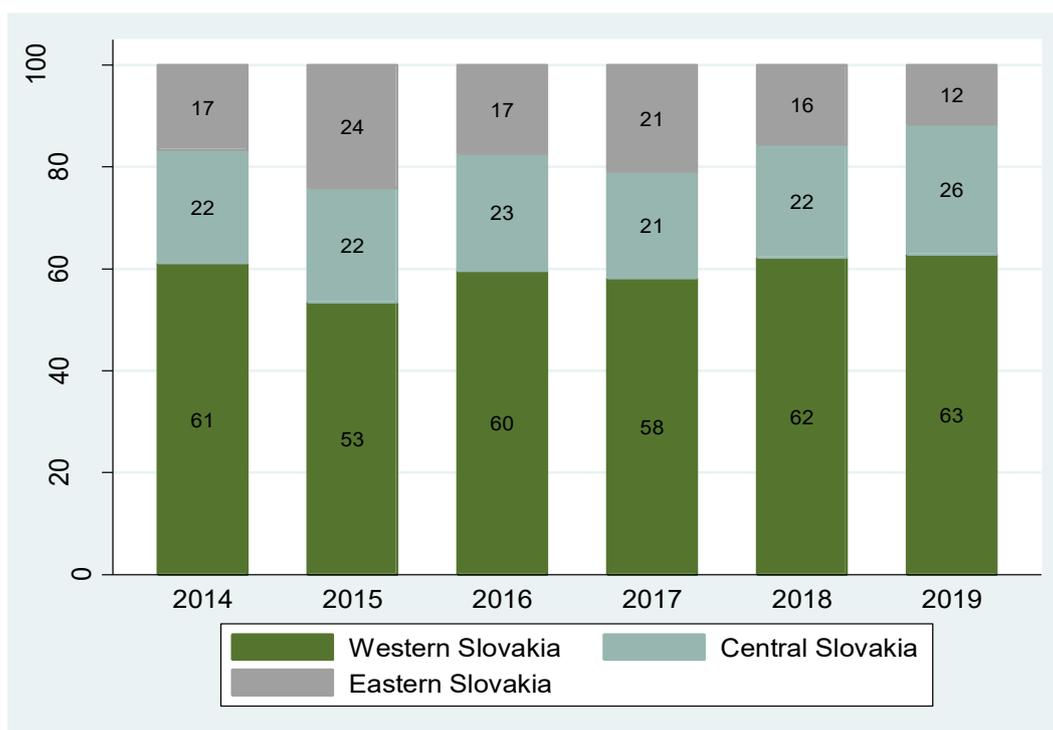
	NUTS	TE for the type of farming						Mean
		2014	2015	2016	2017	2018	2019	
TE _{CR} S	Western Slovakia	0.67	0.67	0.64	0.60	0.66	0.57	0.64
	Central Slovakia	0.58	0.60	0.52	0.53	0.57	0.52	0.55
	Eastern Slovakia	0.54	0.57	0.49	0.55	0.49	0.49	0.52
	chi square	21.869** *	11.241** *	28.384** *	4.795*	27.569** *	4.539	83.057***
TE _{VR} S	Western Slovakia	0.82	0.77	0.79	0.75	0.78	0.73	0.77
	Central Slovakia	0.70	0.67	0.63	0.61	0.64	0.62	0.65
	Eastern Slovakia	0.64	0.65	0.61	0.63	0.57	0.59	0.62
	chi square	26.261** *	13.013** *	29.726** *	13.670** *	33.150** *	18.266** *	129.127** *

Source: Own processing; Note *, **, *** the null hypotheses are rejected at the 1%, 5%, 10% level

To investigate whether there are statistically significant differences between regional efficiency scores in panel data, we apply a non-parametric Kruskal–Wallis’s test (Table 2). Technical efficiency scores across regions were statistically significantly different in all years except 2019 in the case of constant returns to scale, when the efficiency score for Slovak farms was 0.49-0.57.

Figure 1 illustrated the percentage distribution of efficient farms by region and years, whose technical efficiency score had a value of 1. More than half of the efficient farms in the total sample were located in western Slovakia. The efficiency of these farms increased towards the end of the monitoring period. Once again, farms in western Slovakia consistently outperformed those in other regions. There were relatively few efficient farms in central and eastern Slovakia. In the case of central Slovakia, there was a 4-percentage point increase in the number of efficient farms during the monitoring period. Conversely, in eastern Slovakia, there was a significant decrease of up to 5 percentage points in the number of efficient farms. Although in 2015, efficient farms in eastern Slovakia caught up with those in central Slovakia by 2 percentage points, their share declined in the subsequent years.

Figure 1 Percentage distribution of efficient farms by regions



Source: Own processing

Table 3 Optimal use of inputs achieving full efficiency (2014-2019)

Regions		UAA	AWU	FOD	LM	SC
Western Slovakia	Observed means	993	23	436461	607778	701672
	Optimal means	893	21	468175	631611	716010
	Savings (%)	-10%	-10%	7%	4%	2%
Central Slovakia	Observed means	903	23	303696	460026	539173
	Optimal means	705	21	332235	469897	693709
	Savings (%)	-22%	-11%	9%	2%	29%
Eastern Slovakia	Observed means	1083	21	316793	442016	488818
	Optimal means	738	14	265427	298283	431210
	Savings (%)	-32%	-33%	-16%	-33%	-12%

Source: Own processing; Note *, **, *** the null hypotheses are rejected at the 1%, 5%, 10% level

Table 3 displays the role of individual inputs in the efficiency calculation. Farms in eastern Slovakia have a larger average area 1083 ha compared to farms in western Slovakia (903 ha) and farms in central Slovakia (993 ha). Optimal means variables indicate the variable values that individual farms should achieve in order to attain full efficiency (TE=1), compared to the observed means of variables in the sample. These results highlight which input variables have the most significant impact on efficiency. The difference between the observed and optimal means, expressed as a percentage, represents the potential savings achievable in terms of input use if the inputs were used efficiently. In all regions, achieving efficiency requires change in scale, especially by reducing the hectare-square area of land. The least effective utilization of input resources, namely AWU, UAA, and LM, is observed among farms located in eastern Slovakia. To enhance their performance and align with other farms, Slovakian farms should prioritize the reduction of these specific input variables.

4 Conclusions

With the gradual shift towards sustainable rural development in the European Union (EU), farm diversification has gained increasing significance in EU policy. Understanding the trends and efficiency of diversified farms is crucial for enhancing the effectiveness of policies aimed at supporting farm diversification. The surveyed farms were found to be technically inefficient, exhibiting either constant or variable returns to scale, highlighting their potential to improve technical

efficiency levels. This inefficiency suggests that farms have been using an excessive amount of inputs to produce their current output levels. Farm diversification often arises from multifunctional farming practices but, in some cases, can come at the expense of lower overall farm efficiency.

The results showed significant regional differences in achieving efficiency. Farms in western Slovakia achieved the highest efficiency on average, followed by farms in central Slovakia, and finally, farms in eastern Slovakia catch up the most with these more efficient farms. The input total utilized agricultural area was identified as the main source of inefficiency. In conclusion, it can be concluded that in most areas the overall efficiency of agriculture is not achieved, the farms have to decrease the level of inputs, especially the hectare area.

However, regional differences can be attributed to different access to resources, rates of technology adoption, agricultural policies, and market conditions, among other factors. Understanding these differences is essential for policymakers, farmers, and stakeholders to make informed decisions and allocate resources effectively. This information can guide targeted interventions and policies to support sustainable intensification in agriculture, ensuring that regional agricultural practices are not just efficient, but also environmentally responsible.

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Towards a strategic vulnerability and resilience analysis framework for sustainable small farmer involvement in short food supply chains (SFSCs).

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Abstract: The economic and social disruption caused by the COVID-19 pandemic again focused the attention on the importance of strategies and practices to secure the sustainability of small farms involved in short food supply chains (SFSCs) following such disruptive activities. The aim of the paper is to examine the role and importance of the vulnerability and resilience predisposition of SFSCs and show the importance of their adaptive capacities in the face of such catastrophes and disruptions. Some theoretical analysis is offered in analyzing the adaptive capacity of such undertakings. The article interrogates the potential collective protective mechanisms offered by SFSCs to participants in mitigating these risks with the objective to offer perspective on strategies and policies aimed at the management of the sustainability of small farms in SFSCs. Selected methodological approaches suitable not only for identifying the levels of sustainability, resilience, and vulnerability of small farms, but also the importance of their individual determinants, are discussed. This paper identifies this matrix of contributing factors and offers insight into the development of a strategic vulnerability and resilience analysis framework to research and promote sustainable small farmer involvement in SFSCs. Discussions confirm the importance of careful policy considerations and mechanisms when developing vulnerability and resilience analysis frameworks to enhance the adaptive capacities of small farms in navigating toward resilient small farms in inclusive SFSCs.

Keywords: small farms, short food supply chains, sustainability, resilience, vulnerability

JEL Classification: QOI, Q12, Q13

1 Introduction

When the World Health Organisation (WHO) declared the Novel Coronavirus (Covid 19) a global pandemic on March 11, 2020, the scale of disruption caused by this pandemic, was compared by historians to that of the aftermath of the second world war (Kiwanuka, 2021). Not only did the challenges caused by this event leave institutions increasingly vulnerable, but the capability of Government institutions globally to adapt innovatively to new mechanisms with the potential to foster societal resilience were severely tested. Blažková, et.al. (2023) confirms this concern in their findings on the impact of the COVID-19 pandemic on family farms, emphasizing that family farms as businesses are generally characterised as vulnerable because of their autonomous, family-oriented standing and their constrained financial capital and resources. The uncertainty that naturally characterises agricultural systems, was just aggravated, increasing concerns about the ability of agricultural and food systems worldwide to overcome these disruptions and shocks. This created important concerns for governments and policymakers (Blažková, et.al., 2023).

To worsen matters for farming systems, a broad range of environmental, economic, social and institutional challenges were created (Meuwissen, et.al., 2019), not excluding the economic and social challenges resulting from very complex market conditions like volatile prices in liberalized markets and sudden changes in access to markets. Blažková, et.al. (2023) eludes to this problematic dynamic in their discussion on the complexities of family agriculture in the Visegrad countries. The increased emergence of short food supply chains (SFSCs) during this time of restrictions, given their limited exposure to the effect of international restrictions, and being closer to the consumer, strengthened research activities to provide technical solutions aimed to improve short food supply chains and local production (Nemes, et.al., 2021).

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The propagation of shocks through food supply chains and their subsequent effect on consumption and the resulting impact on the sustainable small farmer involvement in SFSCs are not regular topics of research. As global food systems become more integrated, understanding the dynamics of propagation across supply chains through empirical research is critical to inform adequate interventions (Marsden, Zander, Lassa, 2023). This paper aims to offer an analytical perspective on the possibilities and most suitable processes to follow in developing a strategic vulnerability and resilience framework for analysing sustainable small farmer involvement in SFSCs in Poland and the Czech Republic.

2 Methods

An important influence on the eventual selection of the theoretical rationale for this study followed, is reflected in the IPCC (2001) definition of vulnerability: *Vulnerability is a function of the character, magnitude, and rate of environmental variation to which a system is exposed, its sensitivity, and its adaptive capacity*. This definition refers to and highlights the unique, contextual and sensitivity aspects associated with the framework of analysis that will be created. In this light, a significant and innovative (but challenging) aspect of the process is the systematic measurement and evaluation of the vulnerability, sustainability and resilience strategies and adaptive capabilities of small farms in SFSCs. This broad perspective of vulnerability offered by Joseph (2013) in Figure 1 and resilience clearly suggests a complex combination of risks together with the intrinsic ability to handle the negative consequences of disruptive events (adaptive capacity) (see Figure 2). The structure and potential relationships suggested by Jami. Dixon, Stringer, & Challinor, (2014), Béné, *et. al.* (2012) and Engle (2011) were carefully integrated to create this integrated perspective. Štreimikienė, Baležentis, *et. al.* (2021) goes further to show how vulnerability analysis is measured at four different levels:

- Physical vulnerability relates to physical assets and covers the possible losses and waste of food as well as other agriculture infrastructures necessary to livelihood of rural communities.
- Social vulnerability relates to the most vulnerable groups of society in rural areas.
- Economic vulnerability relates to the losses in economic assets and processes of agricultural systems.
- Environmental vulnerability analysis should examine the risk of destruction of soil, losses of fauna and flora.

The integrated rationale reflected in Figure 2 was used as the guide to the conceptualization of this process.

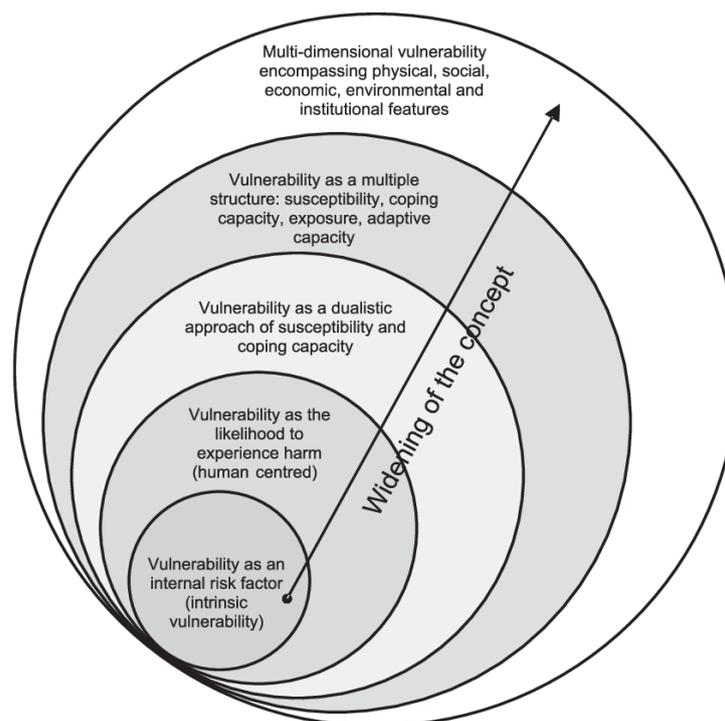
3 Research results

Farming systems are typical examples of agro-ecosystems, and consist of complex, social and ecological systems (SES). Vulnerability is thus an inherently dynamic feature of food systems, with farming systems becoming increasingly risky because of market liberalization and globalization, severely reducing predictability. It is a default position that may and will change over time as the interactions between the potential disruptions (risks, stressors) and the affected socio-economic system change. This is emphasized by Dixon, Stringer and Challinor (2014) in their assertion that “*every natural system is subject to regular disturbance; those that have survived, indeed must have built up some degree of resilience*” – referring to the ability to successfully negotiate and overcome such disruptive events in future.

3.1 Why is vulnerability a factor?

Vulnerability describes the fundamental preposition and susceptibility of any system prior to shocks or disruptive events. This perspective of the vulnerability of food systems is supported by the definition of vulnerability as the degree to which a food system, or its constituent, responds harmfully in the face of a shock or disruptive event is supported by Štreimikienė, Baležentis, *et. al.* (2021, citing Handmer & Dovers, 2009) and Dixon, Stringer and Challinor (2014). Food systems, like farming systems, are complex systems, and are not only economically productive systems; they also have important political, social and cultural dimensions, acting risk sensitive (Dury, Bendjebbar, Hainzelin, Giordano, & Bricas, 2019). These multi-dimensional features of vulnerability as predisposition in a food system are illustrated in Figure 1 (Joseph, 2013) and supported by the findings of Adger (2006). This means that current vulnerability to stressors does not define equal future vulnerability to such risks being realized.

Figure 1 Widening the concept and understanding of the nature of vulnerability (Joseph, 2013)



This understanding clearly reflects in the Inter-Governmental Panel on Climate Change (IPCC 2001) definition of vulnerability: *The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of environmental variation to which a system is exposed, its sensitivity, and its adaptive capacity.*

3.2 The fundamental importance of resilience

Many perspectives exist on what resilience is (Folke, et.al., 2013; Harris and Spiegel, 2019), but it is generally considered to be the ability to deal with disruptive shocks and stresses, including the unknown and previously unimaginable, such as the Covid-19 crisis (Meuwissen, et.al. 2019). Resilience describes the degree to which a response reaction to a specific hazardous event succeeds in completely overcoming the impact of such an event. It is not linked to vulnerability but is determined by the ability of an undertaking to overcome, survive, and even grow post-catastrophic events or shocks. This perspective is valuable to facilitate an understanding of how a system or unit responds to negative change, whether it 'does' return to this preexisting state, or whether it is 'transformed' to another state, be it advantageous or disadvantageous (Martin et al., 2016). Resilience is determined by the adaptive capacity of a food system (or SFSC) and is characterized by it possessing and applying the necessary strategies, policies, processes, and practices deemed essential to allow for such a food system to overcome the disruptions caused by shocks and catastrophes (Dixon, Stringer and Challinor, 2014). From a social-ecological perspective resilience has been defined as the capacity of socio-economic systems (e.g., households) to withstand shocks through actions of absorption, adaptation, and transformation (Ansah, Gardebroek, & Ihle, 2019) and is reflected in the success with which societies sustainably adapt to externally imposed change. The authors integrate the thinking discussed to define resilience of a farming system as *its ability to ensure the provision of the system functions in the face of increasingly complex and accumulating economic, social, environmental and institutional shocks and stresses, through capacities of robustness, adaptability and transformability*. This is in line with Adger (2006) who defines resilience as, "the magnitude of shock that can be absorbed before a system changes to a radically different state, as well as the capacity to self-organize and the capacity for adaptation to emerging circumstances".

3.3 Growing the understanding of adaptive capacity.

The adaptive capacity of social systems depends on the nature of their institutions and the ability to absorb disruptive events and shocks which potentially can actually play a constructive role in resource management, forcing a new consideration of issues of learning, adapting and renewal (Rodriguez, et.al., 2018). It is therefore important to understand that the ability to recover from shocks and disruptions depends largely on the capacity of food systems to implement adaptive strategies to overcome such catastrophes or disruptions. Where this capacity fails, a mismatch between demand and supply arises, while there is an escalation in consumer demand for SFSC products. Figure 1 offers some perspective

of the various levels of adaptive capacity demands from food systems to overcome and to remain sustainable and overcome the possible implications for SFSCs. Participation by small farmers in short value chains contributes largely to managing their vulnerability and improve their resilience capacity and policy considerations and frameworks are important to support and sustain the participation of small farms in navigating toward resilient and inclusive short value chains.

Figure 2 Linking vulnerability and resilience frameworks through the concept of adaptive capacity. (Own structuring after: Jami L. Dixon, J.L., Stringer, L.C., & Challinor, A.J. 2014; After: Béné, et. al., 2012; Engle, 2011)

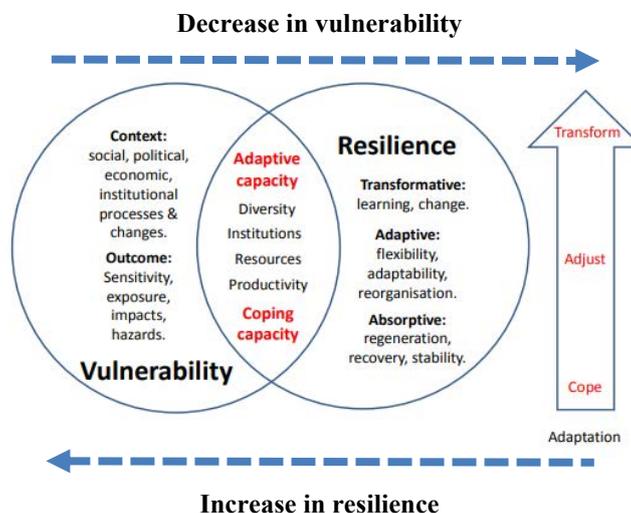


Figure 2 offers an integrated perspective linking vulnerability and resilience frameworks through the concept of adaptive capacity presenting resilience as an inherent capacity of systems. It suggests three key attributes which characterize the set of necessary actions that systems exposed to shocks need to undertake (adaptive capacity):

- *Absorptive capacity* defines the ability of the system to minimize its exposure to shocks, but also having the mechanisms to recover quickly when disruptive events occur, ensuring the persistence of system functions, and mostly constitute coping strategies such as harvesting crops early to avoid floods, taking children out of school or even delaying debt repayments (OECD 2014).
- *Adaptive capacity* measures “the ability to make informed choices about alternative livelihood strategies based on changing conditions” (Béné *et al.* 2012; Heltberg & Lund, 2009).
- An important expansion in resilience thinking is the consideration of *transformative capacity*, which refers to the system level conditions that are necessary for changing the basic configuration of the system to create long-term resilience. Researchers argue that adaptive and transformative capacities are necessary for dealing with the primary sources of vulnerability (Carpenter *et al.* 2005; Folke *et al.* 2010; Béné *et al.* 2012).

Dixon, Stringer and Challinor (2014) comment that, in the language of vulnerability, adaptive capacity can correct sensitivity towards a disruptive situation. In resilience terms it can enhance the robustness of a system. System robustness is defined as a system’s ability to remain functioning under disturbances. This implies that information is needed on how the system responds to different degrees of disturbance (Mens, Klijn, De Bruijn & Van Beek, 2011). Practical evidence suggests that adaptive capacity relatively easily translates into practical actions and policy recommendations (see Figure 2).

3.4 The important role of Short Food Supply Chains (SFSCs)

In their discussion on the growing importance of SFSCs during the COVID-19 pandemic, Uliano, Stanco & Nazzaro (2023) stresses how restrictions imposed by health authorities and experts had significant impact on the isolation and food purchasing and consumption behaviour of consumers. This provided evidence of the fragility of food systems and the ease and speed with which they can be disrupted. SFSCs are considered business forms including a limited number of intermediaries, sometimes none in the case of direct sales to the consumer.

Smallholder farmers have become especially vulnerable and are now explicitly recognized by the EU as an area that should be supported within the EU rural development policy. SFSCs are covered by a definition in Article 2 of Regulation (EU) No 1305/2013 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD), which entered into force with the reformed Common Agricultural Policy for 2014-2020. In these policy documents an SFSC is defined as “a supply chain involving a limited number of economic operators, committed to cooperation, local economic development, and close geographical and social relations between producers, processors

and consumers". In a separate comprehensive study on SFSCs in the EU, Kneafsey, *et.al.* (2013) adopts a similar definition of SFSCs but emphasizes the "identification and traceability of food to the source at a farmer."

SFSCs therefore provide such contextual survival mechanisms for small farmers from where adaptive strategies can be applied, and small farms can be supported and successfully recover from disruptive and catastrophic events. Joseph (2013) offers some insight in Figure 1 into the differential abilities of farmers in SFSCs to react differently to shocks and disruptive events – offering farmers differential capacities to respond differently and express different adaptive capacities. In a study conducted in Slovakia on the development of SFSCs, Floriš, Schwarcz, Schwarczová, & Munk (2022) quotes important observations by Van der Ploeg (2000) around the developments of SFSCs as a "commonly recurring phenomenon in several fields of rural development centred around distinctive product qualities including organic farming, high quality production and region-specific products". They continue to summarize several important characteristics of such SFSCs:

- SFSCs are based on their capacity to re-socialize or re-spatialize food, allowing the consumer to make value-judgements about the relative desirability of foods.
- The short supply chain has a positive effect on public goods, with overt environmental benefits, when compared to the long supply chain.
- There is a significant emphasis put on minimizing the distance between the food and the consumer's table, saving both time and cost.
- The factor of minimizing the distance allows the consumer to buy higher quality, healthy, and seasonal products, promoting the territory with the marketing of local food products.
- The number of intermediaries benefits the profitability for the producer and the trader, improving the economic benefits from the perspective of the farmer/producer/processor and improving their long-term economic survival.

Data that will be collected with face-to-face surveys among farmers who experienced the crisis caused by COVID-19 pandemic, will be analysed to describe, and explain how shocks impact on the successful functioning of small farms in short value chains. This is particularly important to reflect on their absorptive, adaptive, and restorative capacities. In the current will be conducted. The following set of relevant variables will also be included (amongst others), for individual components:

- Economic – income gap indicator (difference between average income in the national economy and total income of the agricultural holding), the level of agricultural investment and governance, estimated market value of the holding, debt ratio of the respondent.
- Social – household equipment, workload ratio, quality of health, participation in social and cultural life, participation in a lifelong learning system, membership of organizations, clubs, associations, etc.
- Environmental – crop biodiversity, livestock units, share of permanent grassland and forest in the farm area, fertilizer and pesticide use, soil quality.

Information will be analysed to determine the latent ability and preparation of small farms in short value chains to successfully deal with and recover from future shocks after changes in their absorptive capacities, following experiences of previous shocks and the resulting changes in the resilience capacities and attributes of such farms. This pattern of analysis is in line with the research methodologies advanced by Dixon, Stringer and Challinor (2014) and Ansah, Gardebroek & Ihle (2019).

4 Conclusions

Any attempt to design a strategic vulnerability and resilience analysis framework for small farmer involvement in short food supply chains (SFSCs) needs to acknowledge the dynamic and expansive multi-dimensional nature of vulnerability and resilience in food systems, showing the following dimensions: 1) Intrinsic vulnerability or risk; 2) Human centered possibility for harm; 3) Susceptibility and capacity to cope; 4) The interrelated structural nature of vulnerability; and 5) the complexity of vulnerability. This paper is an important reflection on the theoretical and conceptual approach followed in the development of data collection instruments to ensure the vulnerability, sustainability and resilience strategies and adaptive capacities of small farms in short food supply chains are sufficiently represented in the analysis.

The objective is to integrate and, where necessary, augment the approaches identified in the literature in order to perform vulnerability analysis at four different levels (following the methodology suggested and implemented by Štreimikienė, Baležentis, *et al.*, 2021), namely: 1) Physical vulnerability relating to physical assets coverings the possible losses and waste of food as well as other agriculture infrastructures necessary for the livelihood of rural communities; 2) Social vulnerability relating to the most vulnerable groups of society in rural areas; 3) Economic vulnerability relating to

the losses in economic assets and processes of agricultural systems; 4) Environmental vulnerability relating to the risk of soil destruction and the loss of fauna and flora.

Based on the foregoing explanations, the ability of SFSCs to recover and continue functioning following reversible and irreversible disruptive events (adaptive cycle), three system capacities will be analyzed to understand the resilience of farming systems, namely, robustness, adaptability, and transformability. To complete the analysis it will be necessary to: 1) Assess the absorptive capacity of small farms in SFSCs to deal with disruptive shocks; 2) Assess the impact of disruptive shocks on the productive functioning of small farms in SFSCs; 3) Assess the ability of small farms in SFSCs to implement their adaptive restorative strategies against future shocks to ensure the recovery of small farms in SFSCs, and; 4) Actions by small farmers to improve / strengthen the absorptive capacity of their farms in SFSCs remain less vulnerable – e.g., through creating new outlets, changing business models, expanding on markets, diversifying of products, using smart technology or smart agricultural production principles, repositioning, or innovative restructuring of the farm to improve its environmental, economic / technological and social position, increased vertical and horizontal integration.

In line with this strategy proposed, the following aspects will be addressed in the analyses (aligned with Meuwissen, et.al. 2019): 1) Characterizing the farming system; 2) Identifying key challenges; 3) Identifying the desired functions of the farming system; 4) Assessing the resilience capacities of the farm; 5) Assessing the resilience-enhancing attributes of the farm. To accomplish this, the following research methodology and analysis process will be followed:

- Develop an initial conceptual framework for the research process based on desktop literature reviews.
- Complete a household analysis, farming system analysis (characteristics, challenges, functions and performance indicators), short value chain structuring and economic performance, risk analysis of farming and short value chain relationships and structures.
- Assess the resilience capacities (robustness, adaptability, and transformability) and resilience attributes (enhancing and constraining attributes) of the farm and map the resilience profiles of small farms in SFSCs.
- Use the Delphi technique to subject the data collection instruments to expert consultations in both Poland and the Czech Republic to identify the critical factors and their weightings for inclusion in the analysis.
- The next important step will be to follow an approach suggested by Volkov, Žičkienė, et.al. (2021) to quantify the resilience profile through the development of a resilience index for small farms in short value chains (following analyses of the dynamic changes in resilience capacities and attributes). This will be an innovative approach implemented to the mapping process to give a better indication of the resilience profiles of farms and regions. It will also provide a powerful basis from where comparative studies of the vulnerability and resilience profiles of small farms in short value chains in the two countries can be undertaken.

Explanatory / clarifying comments and information will be provided to describe and explain how shocks impact on the successful functioning of SFSCs, specifically reflecting on their absorptive, adaptive, and restorative capacities. The latent ability and preparation of SFSCs to successfully overcome current and future disruptive events, following changes in their absorptive capacities and resilience capacities and attributes. The dynamic interaction between vulnerability and resilience, with the definitive intermediate impact of adaptive capacity holds very important significance for researchers with the perspective of serving the agricultural industry. The „triple helix“ structure of the interaction identify three important areas of functional importance in the ongoing consistent development and growth of SFSCs that demand knowledge and understanding of:

- The strategic predisposition of SFSCs and small farmers to the possibility of disruptive events.
- The ability of SFSCs and small farmers to negotiate, cope with and design strategies and practices to counter the disruptive impact of such events
- The successful implementation of such strategies and practices to comprehensively adapt to externally imposed change.

To efficiently and effectively address this need for remaining abreast in understanding these important areas of functional importance, it is recommended that ongoing research address the following important questions:

- What support is necessary to optimize the predisposition of farmers and SFSCs to the possibility of disruptive events and shocks?
- What support is necessary farmers and SFSCs to optimize their adaptive capacity to successfully react to and exceedingly overcome disruptive shocks and events?

Participation by small farmers in short value chains contributes largely to managing their vulnerability and improve their adaptive capacity for resilience. Indications are that careful policy considerations and frameworks are essential to support

and sustain the participation of small farms in navigating toward resilient and inclusive short value chains. This study pledges to make a contribution to this process.

Acknowledgement

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Current market situation of urea for agricultural use and other nitrogen fertilisers

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Abstract: Urea is an organic compound of carbon, nitrogen, oxygen and hydrogen, which is used in the production of plastics, adhesives, but also in cosmetics. More than 90% of the world's urea production is for agricultural use as fertiliser. Urea has the highest nitrogen content of the commonly used solid nitrogen fertilisers. Unfortunately, the current price trend is very unfavourable not only for urea but for all nitrogen fertilisers. Although agricultural commodity prices have risen proportionately, they are not always sufficient to cover the costs incurred in producing the commodity. What is certain, however, is that any price anomalies in the morning will ultimately be paid for by all of us in food prices, even in staple food prices. How far are our farmers willing to pay, and what effect will this price anomaly have on agricultural technology, farm composition and farming?

Keywords: urea, price, commodities

JEL Classification: G10 ; G11 ; G12 ; G14

1 Introduction

A growing world population inevitably creates a higher demand for food. While the Western world is concerned with the quality of food, the poorest countries in the world are concerned with its availability, not only in terms of price, but especially availability in a given location. This raises the question of whether the current capacity of agricultural land is sufficient to cover nutritional needs not only in terms of today's needs, but above all in terms of the long-term and, above all, sustainable development of the needs of the world population. By 2050, the world's population is projected to reach up to 9.1 billion. The largest population growth is projected in developing countries, almost as much as 70 %. The urbanization of the world's population is also expected to accelerate. While around 49 % of the population lives in cities today, up to 70 % of the population is expected to live in cities by 2050. The significantly higher number of urban populations necessitates an increase in food production. Unfortunately, agricultural land is limited in its area and cannot be increased without environmental consequences (Skorupka & Nosalewicz, 2021).

Therefore, one of the main ways to partially compensate for the consequences of the increasing population and thus the increasing need for food is proper and appropriate fertilization, the use of quality fertilizers and also the application of appropriate technology for the crop and location. Gathering data on global fertiliser use by country and crop is very challenging to process data and verify. Nevertheless, every two to four years since 1992, expert surveys have been carried out and fertilizer consumption data in the major fertilizer-consuming countries have been published. These surveys are conducted jointly by the Food and Agriculture Organization of the United Nations (FAO), the International Centre for Fertilizer Development (IFDC) and the International Fertilizer Association (IFA). The globally available dataset is the Fertilizer Use by Crops (FUBC) file, which contains CSV data from a survey conducted by IFA in 2017-2018. The following table shows us which fertilizers are primarily monitored (Ludemann & CI, Gruere, A., Heffer, P. a kol., 2022).

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Figure 1

Measurement	Use of fertilizers in crops and soils for nitrogen, phosphorus and potassium.
Technology type(s)	Survey
Factor type(s)	Crop and land
Sample characteristics - Organism	Plantae
Sample characteristics - Environment	World
Sample characteristics - Location	World

Source: (Ludemann & CI, Gruere, A., Heffer, P. a kol., 2022)

From the table above, we can see that the main fertilizers monitored are nitrogen, phosphorus and potassium. Nitrogen and phosphorus inputs are particularly important for high crop yields. (Johnes, Steel, Coffey, & a kol, 2007).

Urea is one of the world's most popular and widely used nitrogen fertilizers. Urea contains 46 % nitrogen and has a very high bioavailability. (Skorupka & Nosalewicz, 2021).

Urea is formed by the reaction of ammonia with carbon dioxide (CO₂) at high pressure and is used as a direct fertilizer, but also for the production of complex fertilizers NPK (nitrogen, phosphorus, potassium) and others. (IFA, 2023). In 2019, the global urea production capacity was approximately 209 million tons. By 2021, global production capacity had increased to 225 million tonnes, an increase of 8%. In 2024, the production of 203 million tonnes of urea is envisaged. And a further increase in demand for urea is expected globally (Skorupka & Nosalewicz, 2021).

Urea is one of the most important fertilizers of the present time, and the development of its price is very important not only in terms of the cost of food production, but also plays a large role in the field of fertilization technology (AGRA, 2023).

2 Developmnet of prices

Prior to 2020, fertilizer prices on the global market showed stability. The increase started at the beginning of 2021, when gas supply and price problems were the main contributor to the price increases. The situation was exacerbated by the war in Ukraine, and prices began to rise rapidly in the second quarter of 2022. Europe is dependent on imports of nitrogen fertilisers, almost 30 % of which have to be imported into Europe. Most of the EU's imports come from Russia and Belarus. Following EU sanctions against these countries, nitrogen fertiliser prices soared in 2022. Natural gas is 80 to 90 % of the dominant cost item in the production of mineral fertilisers, on which Europe is 40 % dependent on imports from Russia. At the end of July 2022, the exchange price in the EU was six times higher than in the first half of 2021 (FiNTAG.cz, 2022).

The following chart shows the evolution of urea prices from December 2013 to September 2023 in USD per tonne. While in 2020 prices were slightly above USD 100 per tonne of urea, the price began to increase at the end of the year and rose steadily throughout 2021 until it ended at USD 550 per tonne of urea at the end of the year. Over the course of 2022, it initially started to fall slightly, but after the Russian invasion of Ukraine, the price began to rise again, stabilizing at a whopping \$620 per tonne (kurzy.cz, 2023).

Figure 2



Source: (IFA, 2023)

In the autumn of 2022, urea for agricultural businesses was traded for up to CZK 22,000 per ton of urea. These prices were maintained until the end of 2022. At the beginning of 2023, the price fell sharply, but unfortunately, most farms had already purchased nitrogen fertilizers in Europe under the promise of a shortage of nitrogen fertilizers. At the moment, a ton of urea is traded on the Czech market at around CZK 14,000 per ton of urea (iDNES.cz, 2023).

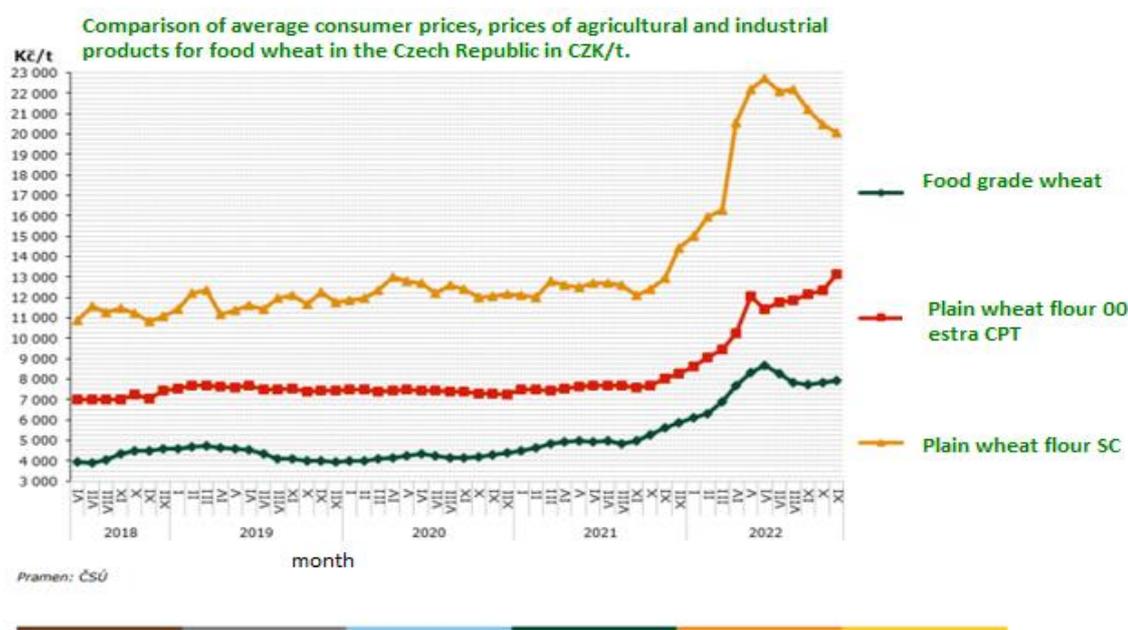
Farmers buy most, if not 100%, of their fertilizers in the fall. Therefore, in the spring of 2023, they had to fertilize with very expensive fertilizers. At the same time, the purchase prices of agricultural commodities began to rise, which could partially compensate for the increased costs of purchased fertilizers. Some farmers already knew at that point that they would not make a profit in 2023, the question was how high their loss would be (asz.cz, 2022)

Not only in an effort to reduce losses, but also losses from the unavailability of fertilizers, farmers had to start thinking about changing the crop plan. Each crop consumes nutrients differently, also depending on the turbidity of the soil. It is not possible to choose a one-size-fits-all procedure for all crops and soil types. Another decisive aspect was also the current purchase prices of agricultural commodities and the long-term experience of farmers. Fertilization has become a very expensive affair, while in previous years the farm paid 8 million crowns for fertilizers, in 2022 they paid up to 32 million crowns for hunting. In the past, if farmers used to fertilize excessively, supplementing basic nutritional parameters, it is possible to reduce fertilizer doses, but this trend will only last for one or two years, depending on the quality of the soil (Český rozhlas, 2022).

This year, 2023, farmers have been relieved a little, fertilizer prices have fallen, fuel prices have also fallen, and government tracking is in effect on energy. Thus, prices could have fallen, but so far this has not happened and forecasts show the opposite trend. If farmers decided to reduce fertiliser dosing last year due to high prices in autumn 2022, this may have a negative impact on agricultural crop yields. This may not be reflected in this year's yields, but only in the yields of the following year, if farmers do not have enough fertilizers, but above all will not make up for the financial deficit of this spring (iDNES.cz, 2023).

As can be seen in the following graph, the purchase prices of some agricultural commodities copied the increase in fertilizer prices and therefore it can be assumed that they could help farmers reduce their losses from the increase in fertilizer prices not only but also other costs such as energy, fuel and labor costs (SZIF, 2022).

Figure 3



Source: (SZIF, 2022)

3 Summary

The ever-growing population is increasing the demand for food and with it the increasing need for fertilizers. Europe is not self-sufficient in fertiliser production. A large part of the fertilizers is imported from high-risk areas.

A large percentage of the necessity to import from risk areas disproportionately and without the possibility of prediction increases the price of fertilisers and thus large cost inputs into primary food production for the EU population. Dependence not only on economic but also on political aspects and EU measures.

Short-term options to reduce the impact of unforeseen fluctuations in fertilizer prices by adjusting the technology and doses of fertilizer used. It can only be used for one to two years, taking into account the replenishment of basic nutritional parameters in previous years and the quality of the soil.

Sustainability of the profitability of agricultural business in relation to high fertilizer prices and corresponding purchase prices of agricultural fertilizers.

Shopping habits and panic due to fertilizer shortages lead to wrong decisions. Which can have incalculable consequences for the profit and further functioning of the entire agricultural sector of the investigated site.

If the prices of fertilizers increase in proportion to the purchase prices of agricultural commodities and at the same time if other inputs such as diesel, labor costs, rents and others remain at the same level or with a slight increase, it is possible to maintain fertilization technologies and thus maintain the quality of the soil in the medium term. With the increase in other inputs, it is unsustainable to maintain healing technologies in such a way as to maintain soil quality in the medium term. From an economic point of view, this soil quality can only be maintained for one or two years, depending on the quality of the soil and also on the quality of previous fertilization practices, as all the necessary basic nutritional parameters of nitrogen, phosphorus and potassium have or have not been supplemented. Fertilization is only one of the initial impacts on the disproportionate increase in the price of agricultural inputs. Of course, other impacts are also expensive food and other economic impacts.

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Session:

Mathematical-Statistical Modelling
and Optimization in Practice



Evaluation of food security among European Union countries using multivariate statistical analysis

Mária Májek¹, Michaela Soóki², Eva Matejková³

Abstract: The purpose of this paper is to determine the level of food security in European Union member countries using selected socioeconomic indicators. The data for the research are gathered from FAOSTAT's and EUROSTAT's public databases for year 2020. We examine four socioeconomic indicators from the access pillar based on FAOSTAT, and two agricultural indicators. Following indicators are considered as stimulants, namely gross domestic product in purchasing power standard, median equivalised net income, government expenditures for agricultural R&D and agricultural factor income. On the contrary, indicators like the proportion of total household expenditures spent on food and the prevalence of moderate or severe food insecurity are considered as inhibitors. The data has been normalised using the min-max transformation. To achieve the set goal, we use a multivariate statistical method - factor analysis. We have used principal component analysis without rotation to estimate the factor analysis model. The 73,8% of total variability of original data has been explained by one common factor, that was used to catch the phenomenon of food security among analysed countries. From the above results, we conclude that the most food secure countries are Ireland, Denmark, the Netherlands and Germany, which achieve the highest values of common factor. On the contrary, Bulgaria and Romania rank among the most food insecure countries with the lowest values of common factor.

Keywords: access, agriculture, European union, factor analysis, food security, principal component analysis

JEL Classification: C38, C43

1 Introduction

The process of ensuring food security poses a significant challenge for both developing nations and economically advanced countries, such as the member states of the European Union. Furthermore, one of the main objectives of the United Nations' Agenda 2030 is ending of global hunger and malnutrition by the year 2030 (UN General Assembly, 2015). Undernutrition is a significant global public health concern with consequences for both the quality of life and the level of productivity of future generations (Trenouth et al., 2018).

The agri-food system is impacted by a number of external factors, including infrastructure development, political influences, technological advancements, weather patterns, water availability, energy resources, and climate conditions. Socioeconomic factors also include factors like population dynamics, urbanization, economic growth, and technological advancements (Béné et al., 2019; Brouwer et al., 2020; Ruben et al., 2021; van Berkum & Ruben, 2021).

In last decades the demand for measurements of food security has been growing. In order to ensure that policies are grounded in reliable evidence and that the monitoring and evaluation of food security is based on robust empirical foundations, there are still significant areas that require attention. These areas include enhancing the quality and scope of data, as well as developing improved methods, standards, and tools for assessment (Cafiero, 2013). Nowadays, there exist numerous indicators and metrics for assessing the phenomenon of food insecurity. The Food and Agriculture Organization (FAO) has developed the Food Insecurity Experience Scale (FIES) to assess individuals' experiences regarding the quantity and quality of food. When examining macro-based indicators, the FIES demonstrates a comparative advantage due to its ability to provide insights into the attributes of individuals experiencing food insecurity. Additionally, it enables the examination of food insecurity within prosperous and developed nations (Cafiero et al., 2016). Since the FIES has a high level of accuracy and internal coherence, it can be used to assess individual food insecurity (Grimaccia & Naccarato, 2020). The common determinants of food insecurity in 134 countries were analysed using FIES. The results suggested that the largest increase in the probability of experiencing food insecurity was linked with five characteristics, namely

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low educational attainment, weak social networks, low social capital, low household income and unemployment (Smith et al., 2017). Current approaches to evaluating food security, specifically the FAO approach, food consumption surveys, and anthropometric indicators require greater transparency in methods and data, as well as country-level comparisons of approaches (de Haen, 2011).

2 Methods

The main purpose of this study is determination of food security situation in European Union member countries using multivariate statistical analysis. The main goal contains of the following research questions.

- RQ₁: There is a statistically significant correlation between the selected food security variables.
- RQ₂: The selected indicators are proper for performing factor analysis model.
- RQ₃: The selected common factors, explain more than 70% of the variability of original variables.
- RQ₄: Western and northern countries of European Union are more food secure than Eastern and Southern European Union countries.

The data for the research were gathered from FAOSTAT's and EUROSTAT's public databases for year 2020. We examine four socioeconomic indicators from the access pillar based on FAO and two indicators related to agriculture monitoring Goal 2 of Agenda 2030 for EU-26 countries. Following indicators are considered as stimulants, namely gross domestic product (purchasing power standard per capita), median equivalised net income (euro), government support to agricultural R&D (euro per inhabitant) and agricultural factor income per annual work unit (euro per annual work unit, chain linked volumes 2010). On the contrary, indicators like the proportion of total household expenditures spent on food (percent of total households' expenditures) and the prevalence of moderate or severe food insecurity (percent) are considered as inhibitors. Most of the strategies that have been presented to determine the number of principal components the model should keep require non-standardised data. However, standardisation is often necessary in agricultural, biological and environmental applications (Forkman, 2019). Before performing factor analysis on selected determinants of food security, the variables have been normalised and transformed to the 0-1 scale using min-max transformation. For those indicators considered to be positive the following equation was used:

$$z_i = \frac{x_i - x_i(\min)}{x_i(\max) - x_i(\min)} \quad (1)$$

On the contrary, negative indicators were transformed using following equation:

$$z_i = \frac{x_i(\max) - x_i}{x_i(\max) - x_i(\min)} \quad (2)$$

where:

- z_i is the normalised value of i^{th} indicator
- x_i is the actual value of i^{th} indicator
- $x_i(\min)$ is the lowest value of i^{th} indicator
- $x_i(\max)$ is the highest value of i^{th} indicator

We have used principal component analysis to estimate the factor analysis model. Before performing factor analysis, the correlations between indicators were examined using Pearson's correlation coefficients based on following equation:

$$r = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}} \quad (3)$$

where:

- r is coefficient of correlation
- \bar{x} is mean of x variable
- \bar{y} is mean of y variable
- x_i is sample of variable x
- y_i is sample of variable y

Using factor analysis, the i^{th} indicator could be explained by following equation:

$$X_i = \mu_i + a_{i1}F_1 + a_{i2}F_2 + \dots + a_{iq}F_q + \varepsilon_i \quad (4)$$

where:

- μ_i for $i=1,2,\dots,p$ is a mean of i^{th} indicator
- F_k for $k=1,2,\dots,q$ is a common factor
- ε_i for $i=1,2,\dots,p$ is a specific factor
- a_{ik} for $k=1,2,\dots,q$ is factor weight (saturation) estimating influence of q^{th} common factor on i^{th} indicator

3 Research results

In this section. The results of our research are presented. Table 1 shows Pearson correlation coefficients of individual pairs of indicators.

Table 1 Pearson's correlation coefficients of original variables in 2020

Pearson's Correlation Coefficients, N=26 Prob > r under H0: Rho=0						
	Food Consumption Expenditures (% of total)	Gross Domestic Product (PPS per capita)	Prevalence of Moderate or Severe food insecurity (%)	Median equivalised net income (euro)	Government Support to Agricultural R&D (euro per capita)	Agricultural Factor Income (euro per annual work unit)
Food Consumption Expenditures (% of total)	1.000 (-)	-0.814 (***)	0.728 (***)	-0.898 (***)	-0.68216 (***)	-0.612 (***)
Gross Domestic Product (PPS per capita)	-0.814 (***)	1.000 (-)	-0.606 (***)	0.840 (***)	0.763 (***)	0.511 (***)
Prevalence of Moderate or Severe food insecurity (%)	0.728 (***)	-0.606 (***)	1.000 (-)	-0.745 (***)	-0.392 (**)	-0.626 (***)
Median equivalised net income (euro)	-0.898 (***)	0.840 (***)	-0.745 (***)	1.000 (-)	0.682 (***)	0.744 (***)
Government Support to Agricultural R&D (euro per capita)	-0.682 (***)	0.763 (***)	-0.392 (**)	0.682 (***)	1.000 (-)	0.550 (***)
Agricultural Factor Income (euro per annual work unit)	-0.612 (***)	0.511 (***)	-0.626 (***)	0.744 (***)	0.550 (***)	1.000 (-)

Source: Own processing using SAS Enterprise Guide Software

A statistically significant correlation has been observed between all pairs of variables, providing confirmation for RQ1 (Table 1). There is a positive correlation between the factors that are stimulants (maximizing). The previous correlation may also be seen between variables that are considered inhibitors (minimizing). Still, there exists a negative interaction between pairs of stimulants and inhibitors. Based on the correlation matrix provided in Table 1, it may be assumed that the chosen dataset is appropriate for conducting factor analysis (RQ2). This assumption is further verified by the use of Kaiser's measure of sampling adequacy.

Table 2 Kaiser's measure of sampling adequacy

Kaiser's Measure of Sampling Adequacy: Overall MSA = 0.789					
Food Consumption Expenditures (% of total)	Gross Domestic Product (PPS per capita)	Prevalence of Moderate or Severe food insecurity (%)	Median equivalised net income (euro)	Government Support to Agricultural R&D (euro per capita)	Agricultural Factor Income (euro per annual work unit)
0.844	0.786	0.856	0.775	0.761	0.711

Source: Own processing using SAS Enterprise Guide Software

Based on the above results (Table 2), we can conclude that the overall selection of data for factor analysis is average (Overall KMO = 0.789). At the same time, the suitability of the variables food consumption expenditures and prevalence of moderate or severe food insecurity is meritorious ($0.8 \leq KMO \leq 0.9$). The selection of other indicators is average ($0.7 \leq KMO \leq 0.8$). Based on the given results, we performed factor analysis using the principal component analysis method through all the indicators.

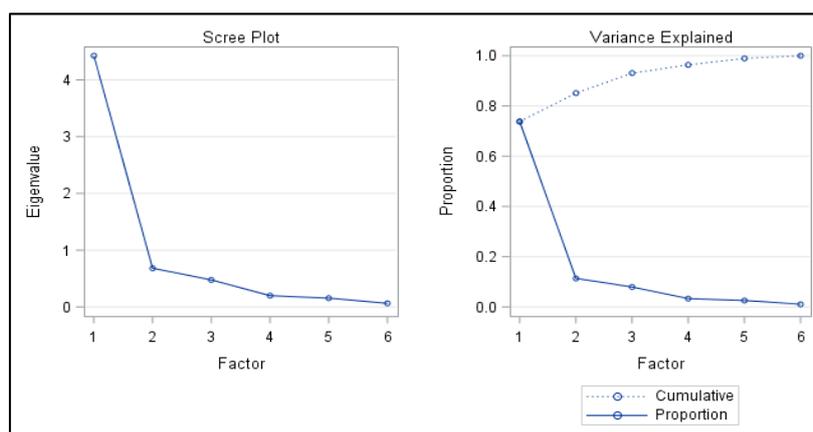
Table 3 Eigenvalues of the correlation matrix

Eigenvalue of the Correlation Matrix: Total = 6 Average = 1				
	Eigenvalue	Difference	Proportion	Cumulative
1	4.426	3.745	0.738	0.738
2	0.681	0.206	0.114	0.851
3	0.476	0.278	0.078	0.931
4	0.199	0.044	0.033	0.964
5	0.155	0.091	0.026	0.990
6	0.063		0.011	1.000

Source: Own processing using SAS Enterprise Guide Software

Table 3 shows the eigenvalues of the correlation matrix. Factor 1 appears to be sufficient (Eigenvalue = 4.413), with 73.8% of the proportion of the original data variability explained (Table 3, Figure 1). This conclusion confirms RQ₃.

Figure 1 Scree plot of the eigenvalues



Source: Own processing using SAS Enterprise Guide Software

Based on the values of the factor weights (Table 4), it is clear that Factor 1 is strongly positively correlated with the normalised indicators used in the analysis. The resulting score of Factor 1, which simultaneously captures all assessed variables, is used in Figure 2 for the evaluation of the ranking of European Union member countries in terms of food security.

Table 4 Factor pattern

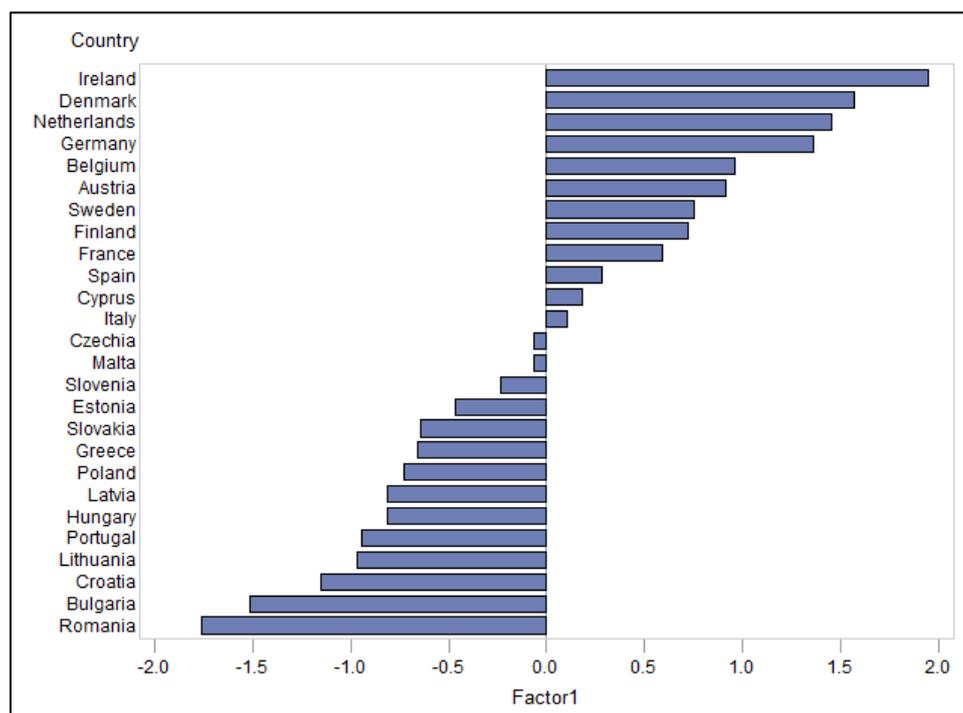
Factor Pattern					
Food Consumption Expenditures (% of total)	Gross Domestic Product (PPS per capita)	Prevalence of Moderate or Severe food insecurity (%)	Median equivalised net income (euro)	Government Support to Agricultural R&D (euro per capita)	Agricultural Factor Income (euro per annual work unit)
0.927	0.888	0.795	0.959	0.789	0.778

Source: Own processing using SAS Enterprise Guide Software

Figure 2 shows ranking of European Union countries based on common factor of food security in 2020. From the results we can conclude that western European countries – Ireland, Denmark and Netherlands are most food secure countries among Europe. On the contrary, the results suggest that eastern countries like Croatia, Bulgaria and Romania are least food secure among analysed group. The Factor 1 takes values within the interval (-2;2). Positive outcomes have been achieved by a total of twelve nations situated in the western and northern regions of Europe. On the contrary, 14 nations in Eastern and Southern Europe achieve negative outcomes, which supports RQ₄. Simultaneously, the findings

suggest that among the member states of the European Union, nations such as Cyprus, Italy, Czechia, and Malta exhibit an average level of food security.

Figure 2 Bar chart of European countries based on common factor of food security



Source: Own processing using SAS Enterprise Guide Software

Conclusions

The task of maintaining food security is a significant challenge for both developing nations and economically advanced ones, including the member states of the European Union. The main purpose of this study is determination of food security situation in European Union member countries using multivariate statistical analysis. The analysis was performed for EU-26 countries for year 2020. To estimate the factor analysis model, we have chosen six indicators capturing access pillar of food security and agricultural indicators of Ending hunger goal of Agenda 2030. Namely, gross domestic product (purchasing power standard per capita), median equivalised net income (euro), government support to agricultural R&D (euro per inhabitant) and agricultural factor income per annual work unit (euro per annual work unit, chain linked volumes 2010). These indicators were considered to have positive effects on food security. On the contrary, indicators like the proportion of total household expenditures spent on food (percent of total households' expenditures) and the prevalence of moderate or severe food insecurity (percent) were considered to have negative effects on food security among European union countries. Correlation matrix of examined variables confirmed existence of strong linear correlation between them. To conduct the factor analysis, the original values of indicators were normalised to <0;1> scale using min-max transformation. The results of factor analysis based on PCA showed that dimension of these indicators could be reduced by one common factor that explained 73,8% of variability of original dataset. After that, this Factor was used to assess food security situation among EU-26 countries in 2020. Based on the selected indicators of food security we concluded that Ireland, Denmark and Netherlands are among Europe most food secure countries. On the other side, countries like Croatia, Bulgaria and Romania seemed to be least food secure countries in European union. Overall, western and northern European countries performed better than eastern and southern countries. It should be also noted, that this study is only preliminary and in further researches more indicators could be added to compare obtained results. Moreover, it is also important to examine of households accounts to capture food security.

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Josephus problem as a multidisciplinary exercise source

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Abstract: Josephus problem is an ancient mathematical problem based on the historical events lived and described by Flavius Josephus. As the problem description is rather vague, there is a traditional interpretation and some alternative versions. Our purpose is to show several different mathematical fields that can be applied to the solution with emphasis on usage in education and teaching, as the formulation of the problem is an ideal tool to introduce new methods and fields to students.

Keywords: Josephus problem, modular arithmetic, star polygons, algorithms

JEL Classification: C60, C88

1 Introduction

The main focus of our paper is to demonstrate the Josephus problem as an exciting topic for exercises solved by directly using different mathematical fields. We emphasize these points as exercises.

1.1 History introduction

Josephus Flavius (c. 37 to c. 95 AD) was a Jewish soldier and historian who lived an exciting and stormy life and inspired an interesting set of mathematical problems. His real name was Joseph ben Matthias. He was born in Jerusalem, studied Hebrew and Greek literature as a child, and then spent three years (between the ages of 16 and 19) as an ascetic with a hermit in the desert. After further study as a member of the Pharisaic sect, he served as a delegate to Emperor Nero, was elected governor of Galilee, and was promoted to the rank of general during the Jewish revolt against Rome in 66. A year later, he was a member of the resistance during the siege of Jodfat, which lasted 47 days. According to Josephus Flavius (1970), doomed soldiers chose to take their own lives rather than be captured by the Romans and suffer an uncertain future. Josephus exclaimed: "Let us entrust our mutual deaths to the decision of lots. Whoever gets the first lot, let the second lot kill him, and so luck will proceed through us all." By chance, fate, or providence," [Josephus] with another was left to endure, to be condemned to the lot, nor, if left to the last to fill his right hand with the blood of his countryman, [Josephus] persuaded him to trust the Roman assurances and he lived as well as he did." Josephus surrendered to Vespasian, who later became the emperor. He travelled extensively with him, and served him and later he served the next emperor, Titus, son of Vespasian, and adopted his family name of Flavius as his own. Josephus was in Jerusalem (as a Roman citizen) during the bloodiest battles of 70 AD, travelled to Rome for the opening of the Colosseum, survived a tragic shipwreck, was married at least three times, and lived a life of excitement and intrigue. More importantly, he wrote several books, including History of the Jewish War, Jewish Antiquities, and Autobiography. His books are valuable and exceptional for witnessing the years of the early Roman empire from the point of view of a person of another culture.

1.2 Formulation of the problem

The problem is named after Flavius Josephus (also Iosephus). According to Josephus' account of the siege of Jodfat, he and the other 40 soldiers were trapped by Roman soldiers in a cave. They preferred serial suicide by drawing lots over capture. Josephus states that by luck, or perhaps the hand of God, he and one other man stayed to the end, surrendering to the Romans rather than killing themselves. This story is told in Book 3, Chapter 8, Part 7 of Joseph's Jewish War (Flavius, 1970). Although the exact wording of Josephus problem varies slightly in different sources (Schumer, 2002), primarily in the starting number of soldiers standing in the circle, from which men will be gradually selected (for example, every third or seventh, etc.) to be killed. The goal is to find the position where the person in question remains the last one. In other words, which position will ensure the person's survival? According to one version of the Josephus problem, 15 Turks and 15 Christians are on board the ship. The ship will surely sink unless half the passengers are thrown overboard. All 30 stand in a circle and decide that every ninth person will be thrown into the sea. The task is to determine where the Christians should line up to ensure that all the Turks are thrown overboard first.

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In addition to being an interesting historical story, the Josephus problem can be used to solve contemporary and modern tasks. For example, image encryption utilizes the principles of the Josephus problem (Hua, Xu, Jin, & Huang, 2019).

2 Classical formulation and solution

Suppose k people (denoted from 1 to k) stand around the circle. Gradually, every second person is eliminated by their neighbour. In the first step, person number 2 is eliminated. In the second step, number 4, etc. The circle is circled several times until all soldiers are eliminated except for the last survivor. (See figure Nr. 1.) Previously eliminated individuals are no longer counted in the further course of the round. The most classical variant is $k = 41$ (Josephus and 40 other soldiers).

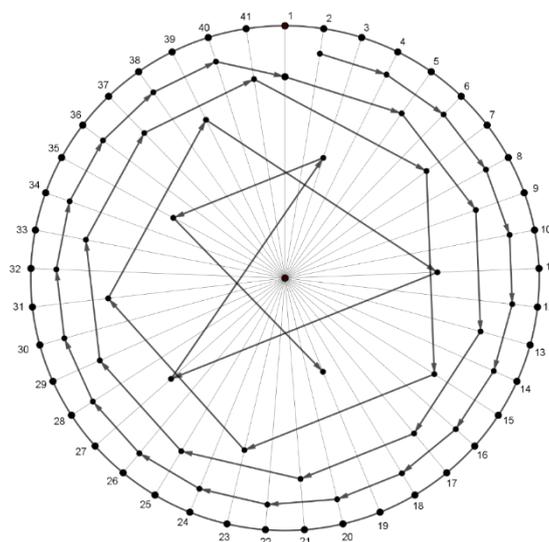


Figure 1 Josephus problem for $k = 41$ and $s = 2$

The solution of the classical formulation is well known; for k soldiers and step $s = 2$, we decompose $k = 2^m + n$ for maximal m so that n is non-negative, and the last soldier standing would be on position $p(k, 2) = 2n + 1$. There are several ways to let students find the solution.

Exercise 1 (Easy, algorithm): Solve the classical Josephus problem with step $s = 2$ and a given number of soldiers k .

By hand, a student can find the solution for a given number of soldiers, but to prove the general formula is somewhat tricky, as shown in the next section. The first attempt would be collecting data. For small k by hand, for higher numbers by an algorithm simulating the process. A detailed algorithm analysis can be found in (Graham, Knuth, & Patashnik, 1989); the authors apply a recurrent algorithm to solve the problem. The following much simpler algorithm is designed with general s and k .

First, initiate variables; all soldiers are alive, and the position of the *Victim* is one step before the first soldier. Then, by *Determining the next victim*, we go forward until we pass s living soldiers. Then, we change the status of the *Victim* to *Not Alive* and write the number of the *Victim*. After repeating k times, the last written number is the survivor.

Initiate:: Let $Number:=k$; $Step:=s$; $Victim:=0$; $Status(i)=Alive$ for $i=1 \dots k$.

Determining the next victim: $Count:=0$. $Looked=Victim$

Repeat until $Count:=s$: If $Status(Looked+1)=Alive$ then ($Count:=Count+1$ and $Looked:=Looked+1$) else ($Looked:=Looked+1$). If $Looked:=k+1$, then $Looked:=1$.

$Victim:=Looked$; $Status(Victim)=Not Alive$; write *Victim*

Program: *Initiate*; for $i=1 \dots k$ *Determining the next victim*.

Such an algorithm is a good exercise for the first semester of coding and produces the following results.

Table 1 Solution of classical formulation for general k and $s = 2$

Number of soldiers k	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Last soldier alive $p(k, 2)$	1	1	3	1	3	5	7	1	3	5	7	9	11	13	15	1	3	5	7	9

Exercise 2 (Normal, coding): Code the program to solve the classical Josephus problem with a general step s and a number of soldiers k .

Exercise 3 (Easy, observation): Suggest a formula for general $p(k, 2)$ based on Table 1 for $s = 2$ and k general. Table 1 or further results can be given as data.

Once we obtain the set of results, we can observe sequences of the odd numbers restarted when reaching a power of two, which is precisely the solution described at the beginning of this section. From the engineering point of view, the problem is solved, but mathematicians should demand proof of correctness. The first idea of the proof is that if there are $k = 2^m$ soldiers alive, then clearly the first soldier is a survivor, as in the first round, all the even numbers are eliminated, then there are 2^{m-1} soldiers, number one is starting, and the new position of soldiers can be calculated by the addition of 1 and division by 2. By this process, we eliminate all numbers, but number one would stay untouched. If there is $k = 2^m + n$ soldiers for $0 \leq n < 2^m$, then we eliminate the first n soldiers, and we can use the previous solution. Which soldier would start after the elimination of n ? Clearly, the $2n + 1$ -st soldier is the one, as after n steps from the first, we have not finished the first round. This one is in the situation we described before and would be the last one.

Exercise 4 (Normal, theory of numbers): Solve and explain the solution for the classical Josephus problem with step $s = 2$ and number of soldiers $k = 2^m$.

Exercise 5 (Normal, theory of numbers): Based on Exercise 4, solve the classical Josephus problem with step $s = 2$ and number of soldiers $k = 2^m + n$, n non-negative, and $n < 2^m$.

An alternative way to prove the correctness of the solution is by mathematical induction, but the solution is rather tricky; the cases should be separated for k odd and k even, and so-called strong induction should be used. This information can be used to lower the difficulty of following exercise.

Exercise 6 (Hard, mathematical induction): Prove the correctness of the classical Josephus problem with step $s = 2$ and the general number of soldiers k by mathematical induction.

3 Alternative versions

The first natural alternation can be done by alternating the steps ($s = 3, s = 4$, etc.). This idea is interesting because it shows the algorithmic and mathematical solutions gap. By algorithm, we can use pseudocode as before to determine the result without any issues, but the result is hard to formulate and prove. It was covered in the step of size 2 (Halbeisen & Hungerbühler, 1997). The general case is described in (Park & Teixeira, 2018).

According to (Schumer, 2002), there exists a general formula. For a given number of soldiers k and given step s , the recurrent formula has the form

$$p(k, s) \equiv (p(k - 1, s) + s) \bmod (k).$$

3.1 Fixed step alternative

As these are covered, we may look at the alternative, where the step determines the killed person, but the step will include both living and killed. It means the distance between the killed persons in the original numbering of soldiers is constant. We still denote the number of soldiers k , but the step denoted by s would be the constant distance, which means $s = 2$ would mean every second soldier is killed regardless of living and dead soldiers.

First of all, there is a possibility that some soldiers would be killed multiple times, and some would stay alive. For example, $s = 2, k = 2$ means that the second soldier would be killed repeatedly, and the first would remain alive. This leads to the paradox, so let us consider the possible outcomes: The finite number of turns would eliminate all soldiers (as in the case of the non-fixed step), or any number of turns does not eliminate all, and some soldiers survive. Clearly, there is no other option.

Exercise 7 (Normal, theory of numbers): Determine the rule for numbers s and k such that in the fixed step alternative Josephus problem, all or just some soldiers would be killed.

The solution is obvious: after several steps, some of the already killed soldiers would be picked to be killed again, and it starts a cycle. If the cycle is started before all soldiers are killed, then some of them are destined not to be killed. So, the question can be formulated in the language of number theory. If we add s modulo k , do we get 0 earlier than after k steps? This is equivalent to: Is there a common multiple of s and k smaller than sk ? This is a trivial question solved by

the Euclidean algorithm as if there is any common divider of s and k bigger than 1, then the answer is positive; it means that for s, k not coprime, we eliminate all soldiers, if k and s are coprime than some of the soldier survive the infinite number of steps. Star polygons can be successfully used to model the solution of fixed step alternative Josephus problem. A star polygon is a non-convex polygon formed by connecting each vertex of a given regular k -gon with such non-adjacent vertices whose location from the selected vertex is constant, marked s . For example, we connect the selected vertex with every second (third, fourth, etc.) vertex in the positive or negative sense of rotation. Figure Nr. 2 shows an example of a star pentagon created in a regular pentagon by successively connecting every second vertex, i.e., the sequence 241352. When describing a star polygon, we use the Schläfli symbol $\{k, s\}$ for the number of vertices k and step s .

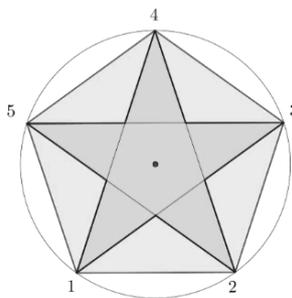


Figure 2 Star polygon of the type $\{5,2\}$

Some star polygons are so-called single lines. If in the Schläfli symbol $\{k, s\}$ of some k -gon there are natural numbers k and s such that k and s are coprime, it will not be possible to sketch the star polygon in one stroke, and it will not be a so-called single line (except for the k -gon with the symbol $\{k, 1\}$, which is always the original non-star k -gon). For example, one cannot create a star decagon $\{10,2\}$ as a single line in a regular decagon because the numbers 10 and 2 are coprime. We will now use the knowledge of single-line star polygons to solve the Josephus problem. For k, s non-coprime, if k soldiers are placed in a circle, and every s -th soldier is killed, the one from the circle standing in the position with the highest mark will remain alive.

Exercise 8 (Easy, polygons, theory of numbers): Find out which star polygons $\{8, s\}$ are single-lines.

We note the possibilities for different steps s . In this version, there are only k possible sizes of s , as $s = k + n$ is similar to the case $s = n$. This is different from the classical case, where the step is similar in the first turn, but after x elimination, the similarity is between $s = k - x + n$ and $s = n$. So the class of similar steps has to have a difference coprime to $k - x$ for all x from 0 to $k - 1$, which leads to the only possible difference being a multiple of $k!$. So, in the classical case, there are $k!$ possible steps, in fixed step alternative, there are only k of them.

3.2 Multiple survivals or multiple victims question

Another question is the position of multiple survivors, both in classical and in the fixed step alternative. The original story includes two survivors. In the medieval tale of the ship with Turks and Christians, one-half of the population survives, and a similar question is given in the story version concerning heritage and children from different marriages (Schumer, 2002). These questions are very rich and can be used as additional exercises for algorithm training or coding and can be expanded further, exceeding the topic of this article. Similarly, a situation where several people are eliminated in one step can be considered. Suppose $k = 2t$, the enemies are near, and there is no time for elimination step by step. Therefore, two eliminations with the same step are realized in parallel. The first elimination starts from soldier number 1; the second starts from soldier number $t + 1$. In the same way, there can be $k = 3t$ soldiers, and triple elimination starts from numbers 1, $t + 1$, and $2t + 1$. The general situation is described in (Yamauchi, Inoue, & Tatsumi, 2009).

3.3 Inverse Josephus problem

As the classical question is for given step s and number of soldiers k , what is the final survivor position $p(k, s)$, we can formulate an inverse question in a way: for the position p of the intended survivor and k the number of soldiers, what should be the step s ? Analogously, given a survivor position p and step s , is there a number of soldiers k such that the position p would be the last? As we mentioned, if we have a fixed position and a number of soldiers, there are more values of the step that end in the same position. We have $k!$ classes of possible steps, so we can answer the first question for given k by brute force testing all possibilities with the algorithm. Analogously, but without limitation allowing for covering all cases, we can use the previous algorithm to attempt to find the answer to the second question. Nevertheless, since there is no bound to k , the negative answer would not be complete from the mathematical point of view.

Exercise 9 (Easy, coding): Based on Exercise 2, for given position p and the number of soldiers k , determine if there is a step so p would be the position of the last survivor.

Exercise 10 (Easy, coding): Based on Exercise 2, for given position p and step s , determine if there is a number of soldiers up to 1000, so p would be the position of the last survivor.

Similar questions were asked and partially answered in (Stack Exchange, "Josephus problem"). In general, both questions are still open from the mathematical point of view, and both numerical and analytical solution is of interest.

3.4 Josephus permutations

Let us reformulate the Josephus problem from the point of view of permutations. According to (Schumer, 2002), the Josephus permutation $P(k, s)$ is the permutation created by the Josephus elimination with step s . For example

$$P(5,2) = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 2 & 4 & 1 & 5 & 3 \end{pmatrix},$$

since for 5 soldiers and step 2, the first eliminated is number 2, the second eliminated is number 4, the third eliminated is number 1, the fourth eliminated is number 5, and the last is number 3. Naturally, there arises a question of whether all permutations are feasible as Josephus for convenient number s . We have the criteria for the number of all permutations: $k!$ and the number of Josephus permutations: least common multiplier $lcm(1, \dots, k)$. For $k = 3$, $k! = lcm(1, \dots, k)$ holds. It means that for 3 soldiers, every permutation is Josephus. But for $k > 3$ we have $k! > lcm(1, \dots, k)$. Thus, for more than 3 soldiers, some permutations are not Josephus permutations.

Exercise 11 (Easy, permutations): Construct the Josephus permutation for $k = 7$ soldiers and step $s = 3$.

Exercise 12 (Normal, permutations): For 3 soldiers ($k = 3$), consider all 6 permutations. Find appropriate s to construct such Josephus permutations (remember that s has not to be smaller than k).

Note that the number of unique permutations is $k!$, equivalent to the upper bound of possible steps. Nevertheless, as not all permutations are Josephus permutations, we may exclude some classes of possible steps as the merge in order to produce less than $k!$ permutations. This can be used as an efficiency improvement in some previous algorithms, as we do not need to test all $k!$ steps if we can identify the steps generating the same class.

Exercise 13 (Normal, theory of numbers, permutations): For a given number of soldiers, identify steps that generate the same permutation, which means the two different steps determine the same order of victims.

3.5 Stochastic Josephus problem

Exercise 14 (Hard, probability): Number of soldiers k are standing in the circle. Starting with number 1, which is killed, one soldier neighbouring to the last victim randomly (with probability $\frac{1}{2}$ left and $\frac{1}{2}$ right) would be killed until only one soldier would remain. Where to stand in relation to the first victim, so the probability of being the survivor is the highest?

The solution of the previous exercise depends on the precise formulation: If the probability refers to moving one step to the first living soldier in that direction, then after k steps, all soldiers are killed. In this way, we can easily calculate the probability of survival by counting the number of permutations that avoid the position before the last step. For example, the position neighbouring to the starting kill has to be avoided by $k - 1$ repeated steps in the other direction. Positioning one step away allows sequences with one step to this direction and $k - 2$ ones to the opposite direction. The question is transferred to a similar question: What is the probability to toss a coin and get a head $k - 1$ times in the row for the neighbour or to toss $k - 2$ heads and one tail for the position one step away, and so on? This is the well-known situation as for $k - 1 - n$ heads and n tails, the probability is $\binom{k}{k-1-n} 2^{-k+1}$. Up to the multiple 2^{-k+1} , we get the row in the Pascal triangle or binomial coefficients $\binom{k}{k-1-n}$. Galton's desk would reveal that the safest position is opposite in the starting one, or $k/2$ positions to any direction.

Exercise 15 (Hard, probability): k soldiers are standing in a circle. Starting with number 1, which is killed, randomly (with probability $\frac{1}{2}$ left and $\frac{1}{2}$ right), one neighbouring position of the soldier is the next victim (it means the soldier on the position is killed, if alive, and the position is regarded as the last victim) until only one soldier would remain. Where to stand in relation to the first victim, so the probability of being the last one is the highest?

The situation is very different, and there is no finite number of turns, as we can repeat the left-right switch for unlimited time. However, we can determine the situation based on symmetries with a surprising outcome: the probability of any position (except for the starting one) to be the last survivor is $(k - 1)^{-1}$. An interesting analogy exists with exercise from

the book (Anděl, 2007) about the wolf and sheep. We have 4 positions in the circle. Position 1 (figure Nr. 3 left) represents the wolf (dark dot); the others are sheep (bright dots). The wolf moves to the adjacent space and picks the direction randomly with a probability of $\frac{1}{2}$. If a sheep is in that position, the wolf will eat it; otherwise, he just moves. The movement of the wolf continues according to the same rules. Which of the positions 2, 3, and 4 should the wise sheep occupy so that the wolf comes to it last? Let p_i , $i = 2,3,4$ denote the probability that the wolf is the last to visit position i . We have the equalities $p_2 + p_3 + p_4 = 1$ and according to the symmetry $p_2 = p_4$. Further, let us imagine the situation where, after the first move, the wolf is in position 2 (figure Nr. 3 right). Then, the probability the wolf standing at position 2 visits position 3 the last is the same as the wolf starting from position 1 visits position 2 the last. It follows $p_3 = \frac{1}{2} \cdot p_2 + \frac{1}{2} \cdot p_4$. From previous equalities, we have a surprising solution $p_2 = p_3 = p_4 = \frac{1}{3}$.

Other variants can be added, either by randomization of the step or by randomisation of the direction in different ways. Such a question would lead us out of the topic and deserve deep and separate analysis.

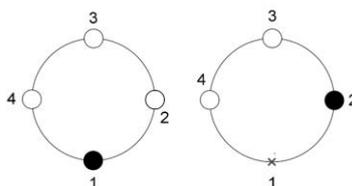


Figure 3 Exercise about the wolf and sheep for $k = 4$. Left: default situation, right: the first step of the wolf in the circle.

4 Conclusions

We intend to reveal how a simple historical mention can lead to developing a series of questions and inspire examinations and application of several methods. Note that our study does not exhaust the topic and techniques, but we would need both to use more advanced methods and does not lead to the goal of a lecturer/student-friendly paper. Several other exciting inspirations arise from a non-mathematical situation; examples include the Monty-Hall problem from a TV show, airplane plating optimisation by Abraham Wald, or permutation algebra needed to break the Enigma ciphering.

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Trade unions and automation: A theoretical approach

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Abstract: Automation has had a profound impact on the economy, which has led to it being a widely discussed topic not only in economics over the past few years. However, the pertinent literature on the possible interplay between trade unions and automation is still relatively meager. Therefore, this article strives to contribute to the body of literature by analyzing theoretical effects of automation on the decision-making of trade unions. For this purpose, a model of the firm and a trade union akin to van der Ploeg (1987) is constructed. The firm employs capital, labor, and automatable capital, which is assumed to be a perfect substitute for labor. The trade union maximizes its utility by choosing an optimal amount of labor employed by the firm with the wage being determined by the demand for labor. By means of optimal control, we show that the employment of automatable capital can have an adverse effect on the optimal amount of labor.

Keywords: trade unions, automation, optimal control

JEL Classification: C61, J51, O33

1 Introduction

The impact of technological changes on the economy has long been a pertinent area of economic research. In particular, the implications of automation for the labor market have been extensively studied in papers such as Acemoglu (2002), Acemoglu and Restrepo (2018, 2019, 2020, 2021, 2022), Autor and Dorn (2013), Frey and Osborne (2017), Prettnner and Strulik (2020). The articles study topics such as the impact of automation on the labor share and wage inequality, substitutability of various tasks by automatable capital and robots, the interaction between education, automation and labor market, all of which are of paramount importance. However, the body of literature on the possible interplay between trade unions and automation is relatively meager. A line of the research tries to explain the how technological change may cause a drop in the unionization rate. For instance, Acemoglu et al. (2001) argue that skill-biased technological change may account for the declining unionization rates. This result is supported by Acikgoz and Kaymak (2004) and Dinlersoz and Greenwood (2016).

It is essential to study the impact of automation on the trade union decision making as it can have a profound effect on the wages as well as the unemployment. Therefore, this article strives to contribute to the body of literature by analyzing theoretical effects of automation on the decision-making of trade unions in the framework of a growth model. For this purpose, a model of the firm and a trade union akin to van der Ploeg (1987) is constructed. Although the model analyzes a single firm only, it could be extended to the whole economy (albeit with more complex analysis) as it already contains the main features of a whole-economy model. The model is introduced in the next section. The results thereof are discussed, conclusions are drawn and prospects for future research are provided in the last section of the article.

2 The Model

In this section, we build the model for our analysis. We begin by considering the firm first and then move on to the decision-making of the trade union.

2.1 The Firm

Let us begin our analysis by first considering the firm. Its production function is of the following form:

$$Y = f(x, y) = f(K, L + mP) \quad (1)$$

where:

Y product
 K capital
 L labor
 P automated capital
 m parameter; either 0 or 1¹

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¹ Should the parameter attain real values between 0 and 1, a certain level of imperfect substitutability would be introduced in the model. We do not pursue it here, however, since a much standard form of imperfect substitutability would be by raising the automatable capital

Function f is assumed to be as smooth as necessary with the following restrictions on its derivatives:

$$\frac{\partial f}{\partial x} > 0, \frac{\partial f}{\partial y} > 0, \frac{\partial^2 f}{\partial x^2} < 0, \frac{\partial^2 f}{\partial y^2} < 0, \frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x} > 0 \quad (2)$$

Economically, these conditions imply that the marginal products are positive, but decreasing. The last inequality signifies that an increase in either labor or automated capital increases the marginal product of capital and, because of the assumed smoothness of the function, the order of the cross derivatives can be changed so that an increase in capital increases the marginal product of labor or automated capital. We also adhere to the convention of omitting the function arguments in derivatives.

Automated capital P is assumed to be a perfect substitute for labor L . The parameter m denotes the possibility of substituting labor with automated capital. If it attains the value 0, no such substitution is possible. If its value is 1, then labor can be substituted with automated capital. Both capital and automated capital are assumed to change in time according to the following ordinary differential equations (henceforth ODEs):

$$\frac{dK}{dt} = i_K - \delta K \quad (3)$$

$$\frac{dP}{dt} = i_P - \delta P \quad (4)$$

where:

t	time
δ	depreciation rate; a real number between 0 and 1
i_K	capital investment
i_P	automated capital investment

For the sake of clarity, the depreciation rate is assumed the same for both capital and automated capital. The firm chooses the investment goods as well as labor so as to maximize its discounted profit functional²:

$$\max_{L, i_K, i_P} \int_0^{\infty} e^{-\rho t} (f(K, L + mP) - wL - p_K i_K - p_P i_P - i_K^2 - i_P^2) dt \quad (5)$$

where:

ρ	discount rate; a positive real number
w	wage; a positive real number
p_K	capital investment price; a positive real number
p_P	automated capital investment price; a positive real number

The last quadratic terms in the functional denote installation costs of investment goods and, for the sake of simplicity, are chosen to be quadratic with no parameters. Furthermore, the product is a numéraire and, hence, its price is set to 1. Optimal amount of labor can be found to be:

$$\frac{\partial f}{\partial y} = w \quad (6)$$

Equation (6) plays a vital role in our analysis as it links wages and labor. This enables us to conduct the analysis of trade union optimization the way it is done later in the text. Determining an optimal level of investment goods is a bit more complex and needs to be done by means of optimal control. The corresponding current value Hamiltonian of the problem is:

$$\mathcal{H} = f(K, L + mP) - wL - p_K i_K - p_P i_P - i_K^2 - i_P^2 + \lambda_K (i_K - \delta K) + \lambda_P (i_P - \delta P) \quad (7)$$

The parameters λ (and later μ) have a similar interpretation to the Lagrange multiplier with the difference that they are not mere constants but functions of time. The reader is referred to the relevant literature on dynamic optimization (see Footnote 2) for further information. The first-order conditions (henceforth FOCs) yield:

$$i_K = \frac{\lambda_K - p_K}{2} \quad (8)$$

to a power. Another possibility for further research would be to assume that the parameter either changes in time or is dependent on the relative amount of automatable capital employed with respect to the amount of labor employed.

² Dynamic optimization in economics can be found in Dixit (1990), Kamien and Schwartz (1991), Chiang (1992) or Acemoglu (2009).

$$i_p = \frac{\lambda_p - p_p}{2} \quad (9)$$

$$\frac{d\lambda_K}{dt} = (\rho + \delta)\lambda_K - \frac{\partial f}{\partial x} \quad (10)$$

$$\frac{d\lambda_P}{dt} = (\rho + \delta)\lambda_P - m \frac{\partial f}{\partial y} \quad (11)$$

2.2 The Trade Union

Let us now turn our attention to the trade union. It is assumed to maximize the discounted wage bill functional:

$$\max_L \int_0^{\infty} e^{-\rho t} wL dt \quad (12)$$

The trade union chooses the optimal amount of labor while the firm consequently determines the optimal wage corresponding to that amount of labor given by Equation (6). However, the trade union needs to take into consideration the optimal levels of investment goods chosen by the firm. Therefore, the current value Hamiltonian is of the form:

$$\mathcal{H} = L \frac{\partial f}{\partial y} + \mu_1 \left(\frac{\lambda_K - p_K}{2} - \delta K \right) + \mu_2 \left(\frac{\lambda_P - p_P}{2} - \delta P \right) + \mu_3 \left((\rho + \delta)\lambda_K - \frac{\partial f}{\partial x} \right) + \mu_4 \left((\rho + \delta)\lambda_P - m \frac{\partial f}{\partial y} \right) \quad (13)$$

The FOCs yield:

$$L = -\frac{\frac{\partial f}{\partial y}}{\frac{\partial^2 f}{\partial y^2}} + \mu_3 \frac{\frac{\partial^2 f}{\partial x \partial y}}{\frac{\partial^2 f}{\partial y^2}} + \mu_4 m \quad (14)$$

$$\frac{d\mu_1}{dt} = (\rho + \delta)\mu_1 - L \frac{\partial^2 f}{\partial x \partial y} + \mu_3 \frac{\partial^2 f}{\partial x^2} + \mu_4 m \frac{\partial^2 f}{\partial x \partial y} \quad (15)$$

$$\frac{d\mu_2}{dt} = (\rho + \delta)\mu_2 - mL \frac{\partial^2 f}{\partial y^2} + \mu_3 m \frac{\partial^2 f}{\partial x \partial y} + \mu_4 m^2 \frac{\partial^2 f}{\partial y^2} \quad (16)$$

$$\frac{d\mu_3}{dt} = -\delta\mu_3 - \frac{\mu_1}{2} \quad (17)$$

$$\frac{d\mu_4}{dt} = -\delta\mu_4 - \frac{\mu_2}{2} \quad (18)$$

We are interested in the impact of automatable capital P on the optimal amount of labor L . Therefore, we need to analyze the sign of the derivative:

$$\frac{\partial L}{\partial P} = -m \frac{\left(\frac{\partial^2 f}{\partial y^2} \right)^2 - \frac{\partial f}{\partial y} \frac{\partial^3 f}{\partial y^3}}{\left(\frac{\partial^2 f}{\partial y^2} \right)^2} + \mu_3 m \frac{\frac{\partial^3 f}{\partial x \partial y^2} \frac{\partial^2 f}{\partial y^2} - \frac{\partial^2 f}{\partial x \partial y} \frac{\partial^3 f}{\partial y^3}}{\left(\frac{\partial^2 f}{\partial y^2} \right)^2} \quad (19)$$

It is evident that if $m = 0$, automatable capital has no effect whatsoever on labor since it cannot substitute labor. Therefore, we set $m = 1$. Should an increase in P cause a decrease in L , the following inequality must hold:

$$\frac{\partial^2 f}{\partial y^2} \left(\mu_3 \frac{\partial^3 f}{\partial x \partial y^2} - \frac{\partial^2 f}{\partial y^2} \right) - \frac{\partial^3 f}{\partial y^3} \left(\mu_3 \frac{\partial^2 f}{\partial x \partial y} - \frac{\partial f}{\partial y} \right) < 0 \quad (20)$$

Let us make the following assumptions (keeping in mind the assumptions from Equation (2)):

$$\frac{\partial^3 f}{\partial y^3} > 0, \frac{\partial^3 f}{\partial x \partial y^2} < 0 \quad (21)$$

These assumptions are in accordance with the most commonly used production function – the Cobb-Douglas production function – of the form:

$$f(x, y) = x^\alpha y^{1-\alpha}, \alpha \in (0, 1) \quad (22)$$

For this production function, we obtain:

$$\frac{\partial^3 f}{\partial y^3} = (1 - \alpha^2)\alpha x^\alpha y^{-\alpha-2} > 0, \frac{\partial^3 f}{\partial x \partial y^2} = -\alpha^2(1 - \alpha)x^{\alpha-1}y^{-\alpha-1} < 0 \quad (23)$$

Let us now analyze Equation (20) with respect to the sign of μ_3 . If $\mu_3 = 0$, then automatable capital has a negative effect of the optimal amount of labor if the following inequality holds:

$$\left(\frac{\partial^2 f}{\partial y^2}\right)^2 > \frac{\partial^3 f}{\partial y^3} \frac{\partial f}{\partial y} \quad (24)$$

It can be verified that this inequality holds true in the Cobb-Douglas case when $\alpha > \frac{1}{2}$. If $\mu_3 > 0$, then it is sufficient that require that the following be true:

$$\mu_3 \frac{\partial^2 f}{\partial x \partial y} > \frac{\partial f}{\partial y} \quad (25)$$

In the Cobb-Douglas case, that holds true if $x < \mu_3 \alpha$. If $\mu_3 < 0$, then we obtain:

$$\frac{\partial^2 f}{\partial y^2} > \mu_3 \frac{\partial^3 f}{\partial x \partial y^2} \wedge \frac{\partial^3 f}{\partial y^3} \left(\mu_3 \frac{\partial^2 f}{\partial x \partial y} - \frac{\partial f}{\partial y} \right) > \frac{\partial^2 f}{\partial y^2} \left(\mu_3 \frac{\partial^3 f}{\partial x \partial y^2} - \frac{\partial^2 f}{\partial y^2} \right) \quad (26)$$

We have thus provided sufficient conditions under which an increase in automatable capital decreases the optimal amount of labor. As is evident, the result depends on the sign of the parameter μ_3 . The parameter denotes the shadow value the trade union attaches to the shadow value of capital investment. Let us now analyze its equilibrium value. From Equations (14) – (18) we obtain the following result:

$$\mu_3^* = \frac{\frac{\partial f}{\partial y} \frac{\partial^2 f}{\partial x \partial y}}{\frac{\partial^2 f}{\partial y^2} 2\delta K} \quad (27)$$

where $K := \rho + \delta + \frac{\left(\frac{\partial^2 f}{\partial x \partial y}\right)^2}{2\delta \frac{\partial^2 f}{\partial y^2}} - \frac{\partial^2 f}{2\delta}$. Strictly speaking, the derivatives are equilibrium values as well as they are determined by the equilibrium values of capital, labor and automatable capital. Since we have placed assumptions on their signs, we do not need to consider their exact value in the equilibrium. Depending on the sign of K , the equilibrium value for μ_3^* is either positive or negative. If $K < 0$, then $\mu_3^* > 0$ and it can be checked that the condition given by Equation (25) is satisfied. The other case is not so straightforward to analyze and its meticulous analysis is left as a prospect for further research.

3 Conclusions

In this article, we have analyzed the impact of automation on the decision-making of trade unions. We have constructed a model of the firm and the trade union, which builds on the work by van der Ploeg (1987). We have derived the FOCs for the optimal amount of labor chosen by the trade union. We show that under certain assumptions, automatable capital can have an adverse effect of the optimal amount of labor.

The effect of automatable capital on labor comes down to the sign of μ_3 . While the resulting dynamical system could be analyzed numerically, it suffices to calculate the steady-state value of μ_3 numerically, once the magnitudes of the derivatives have been determined. In certain cases, its steady-state value is positive while in other cases the steady-state value is negative.

The work presented here is still in progress. In the future, one could analyze in more economic detail the assumptions under which automatable capital decreases the optimal amount of labor. Furthermore, the assumption of perfect substitutability could be relaxed to see how the conclusions change. One could also analyze the effect of automatable capital on optimal wages as well. Last but not least, a similar analysis could be performed in a growth model of the national economy. The equations of motions for capital and automatable capital would be different and one would also have to take into account the overall labor force, not just the employed as well as unemployment benefits.

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Analyzing consumer behavior in bakery product markets: A journey through correspondence analysis and regression modeling

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Abstract: Analyzing consumer behavior in bakery product markets involves understanding the factors that influence consumers' choices and preferences when it comes to baked goods. One crucial aspect of this analysis is examining how different diseases impact the consumption of bakery products, such as celiac disease, Crohn's disease, or a low histamine diet. By incorporating these factors into consumer behavior analysis in bakery product markets, researchers can gain valuable insights into how these diseases impact individuals' choices and preferences. This knowledge can help bakeries and food manufacturers develop products that cater to specific dietary needs and expand their customer base. This study aims to investigate the consumer behavior and preferences of bakery products in Slovakia. Using a survey of 528 respondents we applied regression models and correspondence analysis to analyze the data and identify the factors influencing consumer choices and satisfaction. The results show correlations between different qualitative variables such as the consumption of bakery products the feelings arising from the consumption of bakery products and the average physical activity of the respondent. The research is supported by the VEGA project: Challenges for food security in 21st century Europe – key factors, socio-economic and environmental contexts, no. VEGA 1/0755/21.

Keywords: correspondence analysis, consumer behavior, bakery products, regression modeling

JEL Classification: D12, L66, M31, P2

1 Introduction

In the world of consumer behavior research, the allure of bakery products, with their enticing aromas and delectable flavors, has long been a subject of fascination. These products, ranging from crusty artisan bread to indulgent pastries, hold a unique place in our culinary landscape, transcending mere sustenance to become an integral part of our daily lives. However, what lies beneath the act of selecting a croissant over a muffin, or a whole-grain loaf over a baguette, is a complex web of human choices, emotions, and influences. Consumer behavior, as eloquently defined by Solomon (2019), serves as the compass guiding individuals through the labyrinth of decisions surrounding their purchases—what to buy, when to buy, where to buy, and at what cost. This intricate interplay of choices holds profound implications for marketers, managers, and policymakers alike. It is the cornerstone upon which effective strategies are designed to satisfy customer needs and desires, bolster sales and profits, and foster social welfare. Researchers have made substantial contributions to our understanding of bakery product consumption and its underlying drivers, ranging from psychology and emotions to marketing and portion control. Their work provides a rich foundation for studying the complex dynamics of consumer behavior in bakery product markets. Authors such as Brian Wansink have significantly contributed to our understanding of consumer behavior, particularly in the context of food consumption. Wansink and Sobal (2007) conducted a study on the daily food decisions people overlook. In their research, Wansink, Painter, and North (2005) explored how visual cues of portion size influence food intake. Wansink's work has practical implications for understanding how individuals make decisions regarding bakery product consumption and their dietary habits. Dan Ariely's research focuses on the irrational aspects of consumer decision-making, including food choices. He has conducted experiments and studies that reveal how emotions, cognitive biases, and social factors influence our food preferences and consumption patterns. Ariely and Kreisler (2007) examined the persistence of habits despite conflicts with motives. According to Loewenstein and Ariely (2006), curiosity plays a significant role in decision-making. Ariely's work provides valuable insights into the emotional and psychological dimensions of bakery product consumption.

Barbara J. Rolls' research centres on satiety, portion control, and the factors that affect food intake. Rolls (2010) investigated the relationship between dietary energy density and energy intake. The study by Rolls and Roe (2002) focused on the effect of intragastrically infused liquid food on satiety. Rolls' findings are relevant for understanding why

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individuals may opt for certain bakery products and how these choices relate to feelings of satisfaction and fullness. David Kessler's book "The End of Overeating" (2009) discusses taking control of the insatiable American appetite. In his work, Kessler (2018) explores the concept of fast carbs and their impact on health. Investigates the factors driving overconsumption of highly palatable foods, including bakery products. He delves into the neurological and behavioral aspects of cravings and how they influence consumer behavior. Kessler's research offers insights into the motivations behind bakery product consumption, particularly in the context of indulgence and overeating. Paul Rozin's research explores food preferences, cultural influences, and the psychology of eating. His work helps unravel why individuals develop preferences for specific bakery products and how these choices relate to cultural and emotional factors. Rozin's studies shed light on the diverse range of emotions associated with bakery product consumption, from pleasure to nostalgia. Rozin and Fallon (1987) provided a perspective on disgust. Rozin (1999) discussed preadaptation and its role in pleasure. Marion Nestle's work focuses on food policy, marketing, and the influence of the food industry on consumer choices. Nestle's book "Food Politics" (2013) examines how the food industry influences nutrition and health. In her article, Nestle (2002) discusses the relationship between food marketing and childhood obesity. Chandon and Wansink (2007) proposed a psychophysical model of meal size estimation. The reduction of context effects in choice experiments was explored by Chandon and Hutchinson (2007).

In this paper, we aim to analyze the consumer behavior in the bakery products market using data from a large-scale survey conducted in Slovakia in 2023. The survey collected information on various aspects of consumer behavior, such as product attributes (e.g., taste, freshness, quality, price, etc.), consumer demographics (e.g., age, gender, income, education, etc.), purchase frequency (e.g., how often consumers buy bakery products), and purchase occasion (e.g., breakfast, lunch, snack, etc.). We use two statistical methods: correspondence analysis and regression modeling. Correspondence analysis is a technique that allows us to visualize the associations between categorical variables in a two-dimensional map (Greenacre, 2017). Regression modeling is a technique that allows us to estimate the effects of explanatory variables on a dependent variable (Wooldridge, 2016). By combining these two methods, we are able to identify the main consumer segments in the bakery products market, explore the relationships between product attributes and consumer demographics. In this study, we embark on a captivating journey through the interplay of bakery product consumption, health diagnoses, emotional states, and physical activity levels among respondents. Our research seeks to unravel the intricate web of connections that link the choices individuals make at the bakery aisle to their well-being and daily lives. The findings presented herein shed light on the nuanced dynamics that underpin these relationships, presenting valuable insights into the intricate tapestry of human behavior and its health consequences. One of the central revelations of our study lies in the profound interdependence between diagnoses related to the consumption of bakery products and the frequency of such consumption. By scrutinizing the health profiles of respondents, we uncovered patterns that illuminate how certain diagnoses may significantly influence bakery product consumption. Our exploration doesn't stop at the confines of health diagnoses; it extends into the realm of emotions. We have unearthed a fascinating connection between emotions, often rooted in bakery product consumption, and the respondents' levels of physical activity. The emotional states that individuals experience in response to their dietary preferences appear to play a pivotal role in shaping their engagement in physical activities. This intriguing finding hints at the profound psychological implications of bakery product consumption, transcending mere dietary satisfaction to influence broader aspects of daily life.

As we navigate through the intricacies of these relationships, it becomes evident that bakery products are not just items of sustenance; they are, in many ways, agents that bridge the domains of health, emotions, and physical well-being. Our study offers a holistic perspective on how choices made at the bakery aisle reverberate through the corridors of health diagnoses, emotional experiences, and daily activities.

2 Methods

When evaluating the relationship between two attributes, the investigation delves into whether the occurrence of one attribute is linked to the occurrence of another. This exploration involves the assessment of hypotheses:

- Null hypothesis: The attributes are independent.
- Alternative hypothesis: The attributes are dependent.

The assessment employs the chi-square test of independence, denoted by the formula:

$$\chi^2 = \sum_{(i=1)}^m \sum_{(j=1)}^r (E-T)^2/T \quad (1)$$

Where:

- 'm' signifies the number of rows,
- 'r' the number of columns,

- 'n' the total respondents,
- 'E' the observed frequency,
- 'T' the expected frequency,
- ' χ^2 ' the calculated test statistic.

To gauge the dependency strength, two coefficients are utilized:

Pearson's coefficient (C), computed as:

$$C = \sqrt{\chi^2 / (n + \chi^2)} \quad (2)$$

Where:

- ' χ^2 ' represents the test statistic,
- 'n' denotes the total respondents.

Cramer's V coefficient (V), calculated as:

$$V = \sqrt{\chi^2 / (n(\min((m,r)-1)))} \quad (3)$$

Where:

- ' χ^2 ' represents the test statistic,
- 'n' denotes the total respondents.
- 'm' signifies the number of rows,
- 'r' the number of columns,

Cramer's V factors in the number of rows and columns, overcoming Pearson's coefficient limitation influenced by the number of groups. Both coefficients usually range from <0.1 (weak dependence) to >0.1 (stronger dependence), with values closer to 1 indicating a stronger attribute relationship.

Notably, a commonly chosen significance level (alpha) for hypothesis testing is 0.05.

Regression models serve to elucidate the link between a dependent variable and one or more independent variables. The general linear regression model follows the format:

$$y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \dots + \beta_nx_n + \epsilon \quad (4)$$

Where:

- 'y' represents the dependent variable.
- 'x1, x2, ..., xn' denote the independent variables.
- ' $\beta_0, \beta_1, \dots, \beta_n$ ' signify the regression coefficients.
- 'e' denotes the error term.

Correspondence Analysis (CA) emerges as a valuable method for exploring connections between categorical variables. It finds applications in diverse domains like market research and ecology, organizing data in contingency tables. CA provides a visual representation, revealing patterns, groups, and interdependencies among variables.

The method transforms the contingency table into a lower-dimensional space. Each category from the rows and columns becomes individual points, with distances between them signifying association strength. This graphical method yields insights into categorical data relationships.

The general formula for correspondence analysis is:

$$X = UDV^T \quad (5)$$

This formula represents the contingency table's decomposition into its elements:

- 'X': The observed frequencies in the contingency table.
- 'U': A matrix of row scores indicating relationships between rows.
- 'V': A matrix of column scores indicating relationships between columns.

- 'D': A diagonal matrix of singular values reflecting relationship strength.
- 'T': Denotes the transpose of a matrix.

By employing SVD on the standardized residuals of the contingency table and decomposing it into 'U', 'D', and 'V' matrices, one gains insights into category relationships. Visualizing these relationships through biplots using row and column scores helps depict connections graphically.

Description of Available Data:

The survey responses encompass a blend of categorical and numerical variables crucial for our analyses. Categorical variables include information on the frequency of bakery product consumption ('regularly', 'sometimes', 'non'), specific diagnosed conditions that might influence this consumption ('celiac', 'milk allergy', 'low histamine', 'other'), as well as emotions experienced during consumption ('satisfaction', 'nostalgia', 'guilt', 'joy', etc.).

Moreover, we possess numerical data such as stress levels on a scale from 1 to 10 and monthly expenditures on bakery products in euros, ranging from 0 to 149 €.

Objective of Analyses:

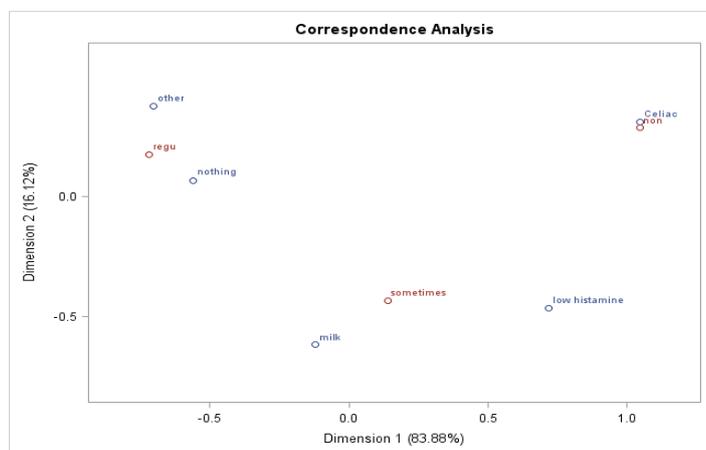
The analyses aim to identify relationships among multiple variables. We seek to elucidate connections between diagnosed conditions and consumption frequency, as well as emotions experienced during consumption. Furthermore, we explore how these diagnosed conditions influence respondents' emotional experiences during bakery product consumption. There's a specific focus on understanding the relationship between stress levels and monthly expenditures on bakery products among individuals with celiac disease.

For these analyses, we plan to employ tools such as the chi-square test of independence for categorical variables and regression analysis to understand relationships between numerical variables.

3 Research results

"In the initial segment of this research effort, centered around the survey questions on the frequency of bakery product consumption (mark in the Figure 1 'regu' for regularly, 'sometimes' for sometimes, 'non' for no consumption) and the presence of specific diagnoses that might affect such consumption ('nothing' for I don't have any, 'other' for other than mentioned, 'milk' for any milk allergy or lactose intolerance, 'low histamine' for histamine sensitivity, 'celiac' for celiac disease), our primary focus was to explore the intricate relationship, or potential lack thereof, between these aspects. Following rigorous chi-square analysis, our calculations uncovered a statistically significant association between these variables, supported by a test statistic (311.25) surpassing the critical value (18.307). Hence, it is reasonable to posit that the existence or absence of specific diagnoses correlates distinctly and significantly with the frequency of bakery product consumption. Indeed, the examination of this correlation has yielded noteworthy outcomes. Our findings indicate a level of dependence between these variables that ranges from moderate to robust, as substantiated by both the Pearson coefficient, registering at an impressive 0.6086, and the Cramer-V coefficient, standing at a substantial 0.5424. These coefficients collectively underscore the strength of the relationship between the variables under scrutiny, underscoring the significance of the observed dependencies.

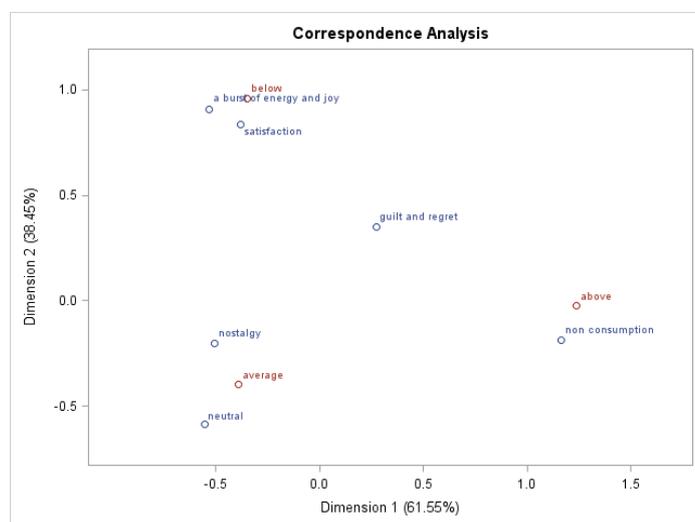
Figure 1 Relation between frequency of consumption and diagnosis



Source: Own processing

As depicted in Figure 1, our analysis of Slovak respondents afflicted with celiac disease reveals a conspicuous pattern: they conscientiously abstain from the consumption of bakery products. This notable trend may be attributed to several compelling factors. Firstly, it is plausible that newly diagnosed individuals lack comprehensive guidance regarding dietary restrictions and allowances, potentially resulting in cautious avoidance of bakery items to avert any inadvertent consumption of gluten. Additionally, the propensity to eschew bakery products may be influenced by the higher costs and limited availability of gluten-free alternatives vis-à-vis their conventional counterparts. Conversely, our survey findings indicate a contrasting consumption behavior among respondents devoid of diagnoses impacting bakery product consumption, as well as those possessing diagnoses not explicitly accounted for within the survey options. Evidently, these individuals exhibit a proclivity for regular bakery product consumption. Intriguingly, within the category of "occasional" consumption, two distinct diagnoses emerge—namely, milk allergy (inclusive of lactose intolerance) and hypersensitivity to histamine. This dichotomy warrants closer examination, as it implies that not all individuals adhering to a low-histamine diet necessarily exhibit hypersensitivity to components found in bakery products. Furthermore, it underscores the intricate interplay between dietary restrictions and the presence or absence of specific ingredients, such as milk or lactose, within bakery items. In our comprehensive investigation of the Slovak respondents within the bakery products market, we also delved into additional variables encompassing average physical activity levels and the emotional states of respondents during bakery product consumption. These variables enrich our understanding of the multifaceted dynamics at play and their influence on consumer behavior within this market segment.

Figure 2 Relation between condition of respondent and their emotions



Source: Own processing

In the subsequent section of our research, we directed our focus toward the discernment of intricate relationships between the variables physical condition and an emotion accompanied by the consumption of bakery products. Employing chi-square analysis, our calculations unveiled a statistically significant association among these variables, substantiated by the test statistic (403.241) surpassing the critical value (21.026). Consequently, we posit that the emotions elicited by the consumption of bakery products are indeed correlated with the physical activity levels and overall well-being of the respondents.

Within this web of interdependence, we observe a robust connection, ranging from moderate to strong, substantiated by both the Pearson coefficient, which attains a notable value of 0.658, and the Cramer-V coefficient, standing at a substantial 0.618. Figure 2 encapsulates these associations, revealing intriguing nuances within the emotional spectrum experienced by respondents.

Notably, for respondents reporting below-average physical condition (as denoted by mark "below" in the Figure 2), the consumption of bakery products engenders a distinct sense of satisfaction. Respondents articulated this sentiment as "Eating bakery products gives me a feeling of satisfaction both physically and emotionally. It is a soothing experience." Simultaneously, they conveyed sensations of "a burst of energy and joy" after partaking in bakery products, depicted in the image as "a burst of energy and joy."

Conversely, respondents in average physical condition expressed more neutral or nostalgic emotions, describing bakery product consumption as evocative of cherished memories. For these individuals, bakery products constituted a trip down memory lane. Additionally, some respondents in average condition reported that bakery products did not elicit significant emotional reactions and were considered a routine part of their diet.

However, it is noteworthy that negative emotions, including feelings of guilt and regret tied to the fear of weight gain, transcended physical condition and activity levels. Both respondents with below-average and above-average physical activity levels harbored these concerns, underscoring the complex interplay of emotions intertwined with bakery product consumption.

In our regression analysis, we examined the relationship between the variable "stress level," which ranged from 1 to 10, and the variable "monthly household expenditures on bakery products," with expenditure amounts ranging from 0 to 149 €. Our findings indicated a positive correlation between monthly expenditures on bakery products and stress levels.

The analysis showcases an incredibly robust relationship (Multiple R = 0.9769) between the variables under study. This means that a significant proportion (around 95.44%) of the variability in stress levels among individuals with celiac disease can be accounted for by variations in their monthly expenditures on bakery products (R Square = 0.9544). The statistical significance of our regression model is highlighted by the ANOVA results. The obtained F-statistic (F = 209.23) coupled with an extremely low p-value (4.95E-08) indicates that the overall regression model is notably superior in explaining the variance in stress levels compared to a model devoid of independent variables. When the monthly household expenditure on bakery products is zero, the predicted stress level is estimated to be approximately -1.1872. While this may not hold practical significance, it forms the baseline prediction within the model. The coefficient of 0.05696 for the monthly household expenditures on bakery products signifies that for every one-unit increase in spending on bakery items, stress levels among individuals with celiac disease tend to rise by approximately 0.05696 units. The regression equation obtained was:

$$\text{Stress Level} = -1.1872 + 0.05696 \times \text{Monthly Expenditures on Bakery Products.}$$

Surprisingly, the analysis revealed a positive correlation between increased monthly expenditures on bakery products and heightened stress levels within households affected by celiac disease. This suggests that as spending on bakery items escalates among individuals with dietary restrictions, reported stress levels also demonstrate an upward trend.

4 Conclusions

Our exploration through the complex web of bakery product consumption and its associated factors has been an illuminating journey, unraveling the intricate dynamics that govern our dietary choices and their broader implications. Beginning with the investigation into the link between bakery product consumption frequency and health diagnoses, our statistical analyses revealed a substantial and meaningful connection. This connection underscores the significant impact that health conditions have on shaping the consumption patterns of bakery products, emphasizing the critical role of informed dietary decisions, especially in the face of health challenges. Venturing deeper into the emotional realm, our exploration unearthed a fascinating correlation between the emotional responses evoked by bakery product consumption and respondents' physical activity levels and overall well-being. The diverse spectrum of emotions - from satisfaction to nostalgia and even guilt - highlights the complex interplay between dietary choices and human psychology. This exploration broadens our comprehension of bakery products, transforming them from mere sustenance to conduits of emotional experiences.

Moreover, our regression analysis introduced a compelling layer to our narrative, revealing an unexpected positive correlation between monthly expenditures on bakery products and stress levels among individuals with celiac disease. This intriguing finding beckons further inquiry into the psychological and emotional intricacies related to dietary restrictions and household spending behaviors. Understanding these correlations sheds light not only on the complex interplay between consumer behaviors and stress factors but also emphasizes the significance of considering individual dietary needs in shaping psychological well-being within household expenditure dynamics. Our comprehensive investigation has brought to light the multifaceted nature of bakery product consumption, transcending mere dietary preferences. These choices influence health outcomes, trigger emotional responses, impact physical activity, and wield influence over household budgets.

Reflecting on these insights, it becomes evident that bakery products aren't mere commodities but storytellers of human experiences, intricately woven with health, emotions, and financial implications. Our journey signifies a crucial step towards a deeper understanding of the nuanced world of bakery products and their profound impact on our lives. As we conclude this chapter of exploration, we acknowledge that our findings serve as a foundation for a more comprehensive comprehension of the captivating realm of bakery products, inviting continued inquiry into the intricate relationships they weave within the fabric of our lives.

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Decoding risk assessment: Exploring the efficacy of credit scoring vs. profit scoring in P2P lending

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Abstract: The conventional practice in the financial industry involves the assessment of creditworthiness through default scoring models, primarily focused on predicting the likelihood of default. However, this research paper challenges the status quo by introducing benefits of the concept of profit scoring – a novel approach that shifts the focus from mere default prediction to forecasting potential returns on a debtor when extending credit to clients. Using publicly available peer-to-peer (P2P) lending data, this study meticulously examines the efficacy of profit scoring compared to traditional default scoring methods. Through the implementation of machine learning (ML) algorithms, our analysis demonstrates that profit scoring outperforms default scoring in average return on portfolio of out-of-sample credit applications. In order to achieve comparable results, the paper uses the same family of algorithms for both tasks: profit scoring (predicting return on a loan) and default scoring (classifying defaults and non-defaults). Furthermore, the paper reveals that the factors influencing loan profitability exhibit disparities when compared to those driving default probabilities. The results underscore the transformative potential of profit scoring, offering lenders a more holistic perspective on risk assessment. By focusing on potential internal rate of return rather than default probability alone, financial institutions can make more informed decisions, leading to enhanced portfolio performance and profitability.

Keywords: P2P lending, loans, credit scoring, profit scoring

JEL Classification: G21, G32, C55

1 Introduction

In the fast-evolving landscape of financial services, the process of risk assessment plays an integral role in the extension of credit to customers. This assessment ensures that lending institutions strike a delicate balance between providing financial opportunities to creditworthy individuals and safeguarding their own interests. Traditionally, default scoring has been the linchpin of this assessment process, leveraging historical credit data and borrower profiles to predict credit risk. Default scoring methods primarily aim to predict the probability of default. Such models are trained on a sample of loans with a binary target variable – Default or Full repayment of all liabilities (Bluhm et al, 2016). This methodology has seen widespread use and has been well-documented in research, highlighting its significance in mitigating default risk (e. g. Bussmann et al, 2021).

However, the modern financial environment has brought in a surge of innovation that has led to the introduction of novel risk assessment methods. Traditionally, credit risk assessment relied on rule-based systems and statistical models. Then, in order to improve this process' accuracy, efficiency, and flexibility, machine learning (ML) techniques have been employed (Khandani et al, 2010). Among other innovations, profit scoring has recently garnered increasing attention (see Verbraeken et al, 2014). This approach adopts a holistic perspective, extending beyond the binary notion of default risk to consider the potential profitability of loans (Crook et al, 2007). It seeks to balance risk and reward more effectively in lending decisions and optimize the allocation of capital. The implicit risk management strategy used by the profit scoring models aims to maximize loan portfolio profitability. With the help of the loan application's parameters, this method can forecast the annualized return on a loan in the future (e. g. Serrano-Cinca et al, 2016; Paula et al, 2019). Lenders can either focus on non-negative predictions of the profit scoring model, or work with minimal profit threshold they accept.

Peer-to-Peer (P2P) lending is a burgeoning financial phenomenon that has gained substantial attention in recent years (Wei et al, 2007). In the realm of financial intermediation, P2P lending represents a departure from traditional banking institutions. It facilitates direct lending interactions between individuals or entities seeking to borrow funds (borrowers) and those willing to lend capital (investors or lenders), often through online platforms. This disintermediated approach leverages technology to match borrowers and lenders efficiently, allowing individuals and small businesses to access financing while providing investors with opportunities for diversified lending portfolios (Bachmann et al, 2011).

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In light of these developments, this research paper embarks on an exploration of risk assessment in the world of P2P lending, aiming to compare the relative efficacy of default scoring and profit scoring methodologies. By scrutinizing real-life lending data and building upon prior research, we endeavour to provide a deeper understanding of which approach, credit scoring or profit scoring, yields superior results. In doing so, we hope to offer valuable insights that will empower decision-makers in navigating the multifaceted landscape of contemporary lending practices.

2 Methods

In the subsequent sections of this research paper, we delve deeper into the methodology employed for credit risk assessment, which midpoints on the application of machine learning techniques, particularly regularized linear regression models. We will provide a comprehensive exploration of the methodology's intricacies, including feature selection, model training, and evaluation metrics. Furthermore, we will elaborate on the dataset used, which comprises real-world lending data publicly disclosed by Lending Club, a prominent P2P lending platform in the United States. This rich dataset offers a valuable glimpse into the lending decisions and borrower profiles on the platform, enabling us to conduct a thorough empirical analysis of credit risk assessment practices in the context of P2P lending.

2.1 Statistical models

ML has significantly reshaped the landscape of credit risk prediction (e. g. Baesens et al, 2003; Gambacorta et al, 2019). Recently, it has been transitioning from the research desk to the application stack for credit scoring and a variety of other applications in credit risk after decades of resistance from supervision (Breedon, 2021). This paper explores the application of ML techniques, specifically focusing on two fundamental categories: linear and logistic regression. These methods, extensively studied and refined in the field, play a pivotal role in credit risk modelling. Linear regression is a versatile approach that strives to establish a linear relationship between a set of predictor variables and a continuous target variable, making it feasible to project possible returns on credit application (Khandani et al, 2010). On the other hand, logistic regression is tailored for binary classification tasks intrinsic to credit risk assessment (Dumitrescu et al, 2022).

Distinguishing these two regression variants is essential. While both employ a linear combination of input features, linear regression seeks to predict a continuous outcome, often used for tasks, such as expected internal rate of return on credit provided to a borrower (Khandani et al, 2010). In contrast, logistic regression, designed for binary classification, employs the logistic – sigmoid – function to transform the linear combination into probabilities, making it suitable for tasks like classifying borrowers as high or low credit risks (Dumitrescu et al, 2022).

To enhance the robustness and generalization of regression models, regularization techniques are crucial. One such technique is L1 regularization, often referred to as Lasso regularization. Lasso regularization plays a vital role in mitigating multicollinearity and overfitting. It achieves this by adding a penalty term to the linear regression or logistic regression objective function, forcing some coefficients to be exactly zero. This results in feature selection, where only the most informative variables are retained in the model, enhancing interpretability and potentially improving predictive performance (Friedman et al, 2010). It is believed L1 regularization within the context of credit risk modelling, provides additional value in managing high-dimensional financial data and bolstering predictive accuracy. As well, it is used to identify the most informative parameters in decision making processes, which is of concern to this research paper.

2.2 Data

The dataset employed in the paper provides an anonymized list of accepted credit application (both defaulted and fully repaid) with detailed flow of cash from every loan. It was publicly disclosed by Lending Club for its potential investors. Lending Club is well-known peer-to-peer (P2P) lending platform with headquarters in the US. It functions as an online marketplace that connects investors and borrowers, providing a simple substitute for conventional banking methods. Lending Club data is widely used for these purposes (e. g. Serrano-Cinca et al, 2015; Ye et al, 2018).

The data spans the years 2007 to 2018, during which time the platform issued 2.2 million loans. The dataset contains more than 150 characteristics about applicant at the time of application. The initial collection of records was reduced to 1.2 million loans with more than 530 columns to which we arrived via data transformation procedure.

Table 1 Descriptive statistics of annualized rate of return in the full data sample

	Default rate	Count of loans (in #)	Annualized rate of return (in %)			
			Median	STD	10th percentile	90th percentile
Full data	19.53%					
Non-Default		1,010,349	12.27	4.86	8.33	19.45
Default		245,252	-40.85	35.83	-97.97	1.27

Source: Own processing

2.3 Data sampling

In the pursuit of advancing credit risk modelling, this research endeavours to harness the power of data-driven methodologies. We initiated our investigation by selecting a substantial dataset comprising 1.2 million loan records. To ensure the robustness of our analysis, we employed a systematic random sampling with replacement strategy, generating six distinct samples of 100,000 loans each. Random sampling with replacement is a method where individual loans are randomly selected from a dataset, and after each selection, the loan is placed back into the dataset, allowing it to potentially be chosen again in subsequent selections (i. e. new random sample of loans). Within this framework, 20,000 loans were reserved for out-of-sample testing, serving as an independent litmus test for our models, while the remaining 80,000 loans were allocated for the rigorous training of our ML models.

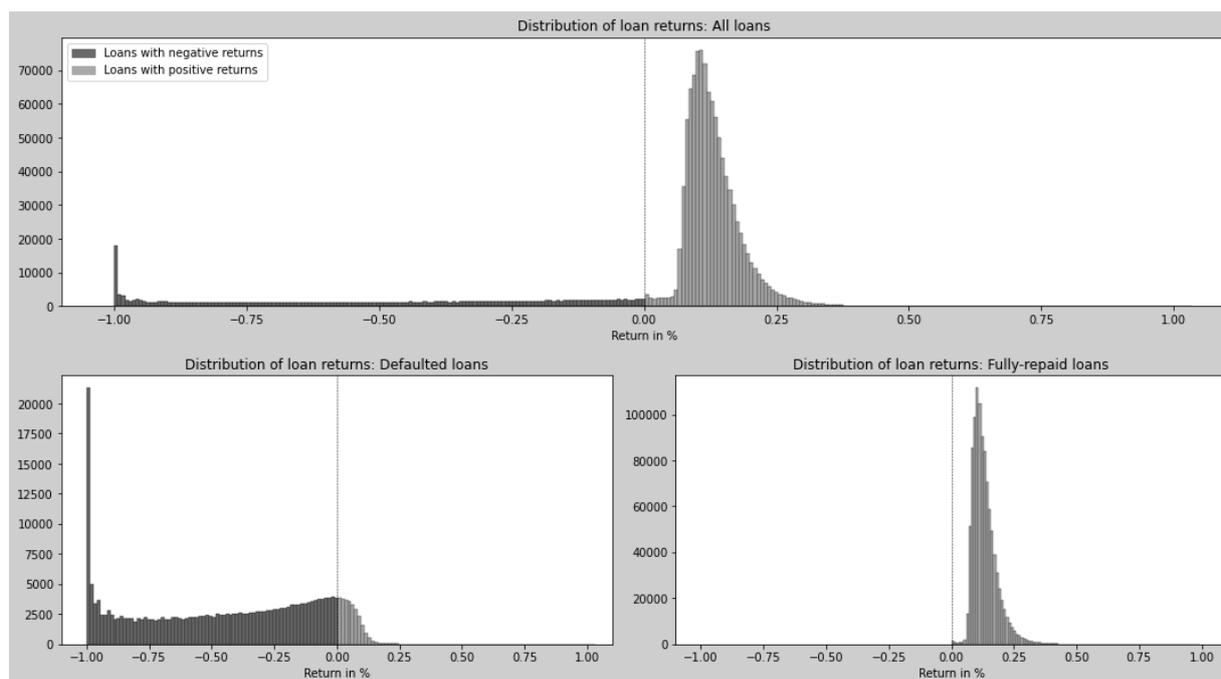
In the domain of default scoring, we employed logistic regression as the predictive model of choice. This statistical method has been widely acknowledged for its effectiveness in discerning the likelihood of loan defaults, aligning with established research in the field. In contrast, our exploration into profit scoring took a different route, focusing on a more holistic approach to lending assessment. Here, we trained our model to predict the Modified Internal Rate of Return (MIRR) which is recommended in the strand of the literature, e. g. Xie (2021). In MIRR calculation, we assume the initial release of funds from lending platform to a loan applicant to be a single payment transferred at the time of approval. Then, we estimate that the debtor (Lending Club) would be able to reinvest cash flow generated from repayments of loan at the median IRR of their loan portfolio realised in the previous 12 months, hence arriving to MIRR. With this method, we can calculate an annualized rate of return (i. e. MIRR) and compare loans with various maturities.

To evaluate the performance of our models, we conducted a multifaceted analysis. We gauged our models' efficacy by scrutinizing the mean and median values of profit derived from the out-of-sample portfolio. Furthermore, we scrutinized the overall financial performance of our models, considering the total earnings achieved relative to the credit extended within our sampled universe. These assessments culminate in a comprehensive view of model performance, shedding light on their effectiveness in minimizing default risk and maximizing the financial returns for lending institutions in real-world scenarios.

3 Research results

The paradigm of profit scoring stands out as a strong rival in the field of credit risk assessment because it provides a nuanced viewpoint that goes beyond traditional default scoring's binary framework. The motivation behind this paradigm change is definitely strong, as shown by empirical data that contradicts accepted thinking. The discovery of a subset of "defaulted" loans that, intriguingly, show a positive annualized return on investment is a key finding of our investigation. It emphasizes that credit institutions' main goal is to maximize the performance of their portfolio by utilizing the potential profitability present in some loans, rather than merely categorically identifying default.

Figure 1 Profit distribution of P2P lending loan portfolio of Lending Club



Source: Own processing

Figure 1 delves deeply into the loan portfolio's annualized rate of return distribution. Dark grey is used to indicate loans that have negative internal rates of return. The lower panel offers a split perspective on the segment of defaulted (left side) and fully repaid loan (right side) while the upper panel shows distribution of the entire portfolio of accepted credit applications. The drill-down on non-performing loans shown in the left bottom panel may tempt some investors to target even defaulted loans because some of them are profitable (light grey).

As a result, profit scoring plays a crucial part in empowering institutions to make well-informed lending decisions that not only reduce risk but also tap into hidden opportunities for profit. In order to maximize profits in the dynamic and competitive world of modern lending, this holistic perspective puts standard credit assessment procedures to the test and forces a re-evaluation of how creditworthiness is determined.

3.1 Profit scoring vs. Default scoring

Figure 1 reveals a crucial insight that disrupts the accepted norms of credit risk assessment: there is a subset of defaulted loans that not only generates profitability but also attractive returns for lending institutions. Our research builds on this intriguing finding by using a machine learning architecture that includes logistic regression (LogReg) for default scoring and linear regression (LinearReg) for profit scoring, both supported by L1 lasso regularization to effectively zero out unnecessary parameters. This methodological uniformity allows for a thorough and directly comparative investigation of default and profit scoring. To ensure robustness, we apply these models consistently to six randomly drawn samples, each with replacement, from our extensive dataset of 1.2 million loans.

Table 2 Descriptive statistics of annualized rate of return in the full data sample

	(in %)	MIRR (in %) for entire portfolio			(in mil. \$)
	Invested loans	Median	Mean	STD	Total profit
Credit scoring - LogReg					
Sample 1	61.63	7.80	2.88	17.27	8.84
Sample 2	61.56	7.70	2.79	17.12	8.64
Sample 3	61.48	7.75	2.87	17.30	8.77
Sample 4	61.57	7.79	2.89	17.08	8.54
Sample 5	61.60	7.70	2.90	17.00	8.93
Sample 6	62.10	7.84	2.84	17.24	8.87
Profit scoring - LinearReg					
Sample 1	71.43	8.97	3.26	19.40	10.84
Sample 2	69.71	8.61	3.06	19.04	10.36
Sample 3	71.75	8.94	3.17	19.62	10.81
Sample 4	71.10	8.87	3.06	19.65	10.13
Sample 5	69.49	8.67	3.25	18.84	10.67
Sample 6	69.92	8.72	3.11	19.04	10.16

Source: Own processing

A convincing conclusion emerges from the analysis: profit scoring regularly produces greater median and mean returns on loan portfolios, frequently outperforming default scoring by about 10%. Those findings are presented in Table 2 numerically. Higher standard deviations, which are a sign of higher risk, are present along with this improved profitability, however. Notably, this increase in profits appears to be largely attributable to the approval of more loan applications, highlighting the critical role that profit scoring plays in streamlining lending decisions and boosting financial returns in the complex and dynamic environment of modern credit risk assessment.

3.2 Importance of parameters in credit applications

Furthermore, in our comprehensive analysis, we delved into the inner workings of our credit risk models for both profit and default scoring. Our exploration sought to identify the key parameters driving lending decisions, shedding light on the factors that contribute to loan approval or denial. Notably, our findings revealed intriguing disparities between these two models in terms of the composition of the most influential parameters derived from loan applications. It is crucial to emphasize that all parameters underwent a rigorous normalization process to ensure comparability, with their coefficient values reflecting relative importance. However, it is important to acknowledge that direct comparisons of coefficient amplitudes across the models are not feasible due to their distinct target variables – default vs. annualized return – each operating on different scales.

Table 3 Importance of 7 most important parameters in Default scoring and Profit scoring models

Descending order	Default scoring (Logistic regression)		Profit scoring (Linear regression)	
	Parameter	Value of coefficient	Parameter	Value of coefficient
1	Interest rate on loan	0.48	Interest rate on loan	-0.03
2	Term length	0.17	Home (mortgage)	0.02
3	FICO score	-0.15	Listed for whole amount founding	-0.02
4	Home (mortgage)	-0.09	Term length	-0.01
5	Debt-to-Income	0.09	Home (rent)	-0.01
6	Loan amount to annual income	0.03	Debt-to-Income	-0.01
7	Home (rent)	0.001	Employment length over 10 years	0.01

Source: Own processing

The analysis presented in Table 3 highlights notable differences in parameter importance between default scoring and profit scoring models. While the disparities between these two approaches are not substantial, there are some small yet intriguing nuances that shed light on their distinct objectives and priorities.

In the context of default scoring, the FICO score emerges as a one of the most significant determinants, with a negative coefficient, indicating its pivotal role in assessing credit risk. The lower the FICO score, the higher the risk of the default of the applicant for a credit (target variable default is classified as 1, hence, an inversely proportional relationship between them). FICO score is popular in US and is based on an individual's credit history and provides lenders with a numerical representation of their credit risk, aiding in the decision-making process for extending credit. Meanwhile, interest rate on loans and term length hold considerable importance, aligning with conventional credit assessment factors. Interest rate assigned to the credit application according to internal risk categories of Lending Club is the most important distinctive factor.

In contrast, the profit scoring model, focused on maximizing financial returns, exhibits slightly different parameter priorities. Interest rate on loans, still the most impactful, carries a negative coefficient, suggesting that a lower interest rate is preferred for achieving higher returns, at least on average. Home-related variables, such as mortgage and rent, play a pivotal role in profit scoring (although they appear also in default scoring model, here in profit scoring, they are more dominant), underscoring the significance of property ownership in influencing lending decisions. Profit scoring comparing to credit scoring weights on length of employment of credit applicant. Length of employment provides insights into a borrower's financial stability, reliability, and commitment to meeting financial obligations, making it an essential factor in credit decision-making. A surprising variable to stand out in profit scoring model was a parameter about funding. When a loan is "Listed for whole amount founding" it means that the loan was initially listed in the so-called whole market. In this context, the term "whole" signifies that the loan was proposed to investors with the intention of being fully funded all at once. This has a negative influence on overall profitability. To comprehensively understand how this variable influences profitability, further investigation into its inner mechanics and its impact on loan performance will require additional time and analysis.

4 Conclusions

In conclusion, the paradigm of profit scoring emerges as a formidable contender in the realm of credit risk assessment, offering a nuanced viewpoint that transcends the standard binary framework of default scoring. The motivation behind this paradigm shift is undeniably strong, backed by empirical data that challenges accepted norms. Notably, the discovery of a subset of "defaulted" loans that yield positive annualized returns is a key finding of our investigation (see Figure 1), emphasizing that credit institutions' primary goal is to maximize portfolio performance, not merely categorically identify default.

The results are compelling, as the profit scoring consistently outperforms default scoring, often yielding higher median and mean returns on out-of-sample loan portfolios by approximately 10%. However, it is important to note that this enhanced profitability comes with higher standard deviations, indicative of increased risk. Significantly, this profit boost appears to be largely driven by the approval of more loan applications, underscoring the pivotal role that profit scoring plays in streamlining lending decisions and enhancing financial returns in the dynamic world of credit risk assessment.

In our detailed analysis, we also delved into the inner mechanics of both credit risk models, uncovering disparities in parameter importance between default and profit scoring. While the differences are not substantial, they illuminate the distinct objectives and priorities of these models. Factors such as the FICO score, interest rates, and term length play essential roles in default scoring, while profit scoring places greater emphasis on interest rates, home-related variables, and the length of employment. Additionally, the variable "Listed for whole amount founding" emerged as a noteworthy factor in profit scoring, indicating its influence on overall profitability.

In summary, our research challenges conventional credit assessment procedures and underscores the critical importance of profit scoring in enabling institutions to make well-informed lending decisions that maximize returns. The nuanced insights gained from this study have the potential to reshape credit risk assessment practices and drive more profitable lending strategies in the modern financial landscape.

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Session:
Artificial Intelligence and Education



Artificial Intelligence in CRM Education

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Abstract: Artificial intelligence (AI) is an applied information technology with the potential to transform processes in various fields and sectors. The highest expectations are associated with administrative support, engineering, management and marketing, computers, healthcare, and education institutions and libraries, which also find their place in this transformation. AI-driven automation will affect public tasks such as data entry, meetings and presentations, or document management. Good examples may be observed in CRM systems, where AI generates content and personalized emails, creates predictive analytics to gain insights into customer behavior, and provides support for natural language processing. In the context of education, AI technologies open up opportunities for critical thinking rather than repetition in navigating applications like CRM systems. There is more room for real-time feedback to engage students effectively, leading to a better learning experience. This article presents experiences from courses that focus on analytic thinking about customer relationship management. ChatGPT is used to illustrate the variability in the description of necessary terms and processes. Active work involves not just passively receiving content but it is about thinking for the right expression, exploring innovative possibilities, and subsequently testing in selected CRM systems. For example, this evaluation is in the form of a classic SWOT analysis, or it is more flexible, involving the identification of both positive and less positive experiences and the knowledge required to solve the assigned tasks.

Keywords: artificial intelligence, education, customer relationship management (CRM)

JEL Classification: C80, D70, D80

1 Introduction

Artificial intelligence (AI) brings many benefits to education. One of the main advantages is the personalization of the learning content. Students have the opportunity to learn at their own pace and according to their individual needs. AI provides research and students learn to be more objective, to perceive concepts in wider contexts, which increases the quality of teaching and more precisely identifies areas in which students need help. Additional benefits are visible in exploring and interpreting selected terms and concepts in class with students. One of the main ways AI can help is by analyzing text and available resources. For example, it can be used to automatically search for key terms in education materials and provide definitions and explanations that help students better understand the topic being covered. It is also possible to identify connections between different interpretations and present students with relevant examples and applications, which increases the depth of their understanding.

Applications such as DeepL and ChatGPT are well-known AI-powered tools that have found valuable use in various fields, including education. DeepL (DeepL, 2023) is a machine translation service that uses advanced neural models to provide high accuracy and natural sounding translations. DeepL helps understand and translate texts from different languages, making foreign language learning more accessible and effective. The machine translation capabilities in DeepL expand the global dimension of education and facilitate cross-cultural communication and collaboration. ChatGPT (ChatGPT, 2023), like the AI model, is a versatile language model that can be used in various areas of education. It can act as a virtual tutor or assistant, answering students' questions on a wide range of topics, providing explanations and helping with homework. ChatGPT can also generate educational content such as essays, reports or summaries to help with writing assignments and research projects. In addition, it can adapt to the level and pace of learning, offering personalized learning experiences. In this way, ChatGPT contributes to the development of AI-based education that supports both students and educators in their academic endeavors.

Other solution brings AI language models that are integrated into many applications. Popular are applications like Google Assistant, or IBM Watson. Other application are like Siri (Apple), or Alexa (Amazon); they focus on voice-controlled assistant solution. AI also has an important place in applications such as CRM systems. Good example is Salesforce Einstein (Salesforce), Microsoft Dynamics 365, HubSpot CRM, or Zoho CRM. Google Assistant (Google Assistant, 2023) uses AI and natural language processing to provide voice-activated assistance and answer questions. IBM Watson (IBM Watson, 2023) is an AI platform by IBM that offers chatbot capabilities, language understanding, and

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data analysis for businesses and industries. Siri (Siri, 2023) is Apple's virtual assistant uses AI to understand and respond to voice commands, providing assistance with various tasks. Alexa (Amazon - Alexa, 2023) is voice-controlled assistant, used in Echo devices, relies on AI for natural language processing and smart home control. Salesforce Einstein (Salesforce Artificial Intelligence, 2023) is an AI platform that integrates into customer relationship management (CRM) to improve sales and service. Microsoft Dynamics 365 (Lamanna, 2023) uses artificial intelligence to analyze data, predict customer behavior, and automate business processes. HubSpot CRM (What's New in HubSpot AI, 2023) offers artificial intelligence features for content personalization, marketing automation, and campaign management. Zoho CRM (Work Smarter with Zia, 2023) uses artificial intelligence to analyze customer data, predict sales and automate marketing campaigns. These applications and services highlight the broad range of AI technologies applied in everyday products and across different solutions (AI marketing tools software, 2023; AI sales assistant software, 2023; AI writing assistant software, 2023; Artificial intelligence software, 2023).

At a public level, CRM systems serve as a valuable source of inspiration for the utilization of AI (Dilmegani, 2023; Basu, 2022; Blokdyk, 2022; Buyak, 2022; Castagna et al., 2020). These systems and their impact on customer relations are the point of interest of two courses, the CRM systems within the Management Informatics program and Customer Relationship Management as part of the International Trade program. CRM systems predominantly involve information technology to explain CRM modules, communication channels, knowledge management, or the application of various intelligences such as business intelligence. On the other hand, the Customer Relationship Management course supports international contacts, use of multilingual functions, analytical and creative thinking, effective methods of negotiation and providing a meaningful message, or automation processes. In the realm of education, ChatGPT outputs are utilized for reflecting on the presented content of the messages and understanding the discussed material. It is not about simply receiving information, but it involves analyzing the accuracy and depth of information on specific topic. Additionally, there are opportunities associated with the use of selected CRM systems in teaching, which enable agile management solutions, the creation of mind maps and knowledge databases. In term of communications, these are questionnaires to evaluate assigned tasks and know more about opinion and understanding. The question addresses in this paper is about usefulness of AI in education and its impact on analytical thinking, as well as its role in promoting diverse solutions influenced by different perspectives and conditions.

2 Methods

The courses' structure is given according to the syllabus. Practical examples utilizing CRM systems, often available in free versions with minimal restrictions. To support optimal solution, guide questions and example solutions are provided. ChatGPT elements and questionnaires are integrated into the teaching process to gather feedback and insight on the discussed topic. The attractiveness of the teaching is enhanced by analyses, including traditional SWOT assessment and more flexible evaluation of benefits and shortcomings with clarification of essential knowledge. A typical question is about the recommended procedure for solving a given task. The answer is not always clear because usually more than one path can be used, and the advantages or disadvantages depend on the individual knowledge and the specific focus of the task being addressed. From the teacher's point of view, it is important to encourage students to explore different solutions, express themselves effectively, organize their thoughts and propose the most advantageous procedure.

Teaching methods include lectures, discussions, group work in seminars and practical activities aimed at solving predetermined tasks. The preparation of learning materials includes the creation of study texts, presentations, case studies, links to interesting articles or other resources related to the topic. Direct interaction with students is sometimes challenge, discussions is usually started in connection with questionnaire results and the presentation of findings. This interaction serves as a valuable feedback mechanism to show how well discussed topic is perceived. Each group of students is unique, which requires greater flexibility. However, the teaching pace can be easily adapted to current requirements and focused on a more difficult topic or more complex tasks for inquisitive and active students. Questions and inaccuracies in the solution are a source for repetition and more detailed clarification for subsequent teaching sessions.

3 Research results

The first questionnaires were created in the survio.com application. At the start of the lectures, they were about general awareness of CRM systems and customer relation management such as:

- What do you think customer relations means to businesses? Why are customer relations resolved?
- Is the importance of customer relations growing nowadays? Why?
- What, in your opinion, can businesses improve in customer relations?
- What topic would you like to tackle in the subject CRM systems?
- What topic would you like to tackle in the Customer Relationship Management course?

- Are CRM systems complicated in your opinion?
- What does the imaginary wind in the sails bring to the further development of customer relationship management?
- What skills are needed to solve the above questions? Which ones did you use?

The answers varied. In some cases, there were only a few responses, while in other cases, there were different answers reflecting individual priorities. The following table presents a selection of these responses. See Table 1.

Table 1 Selected answers on questions from questionnaires

Questions	Answers
Is the importance of customer relations growing nowadays? Why?	definitely yes - customers are more and more demanding and therefore we can also observe the great importance of relationship marketing; due to the fact that customers are more demanding and their options for shopping, for example, are huge (related to globalization), companies must try to have good relations with customers and be attractive to customers
What topic would you like to tackle in the Customer Relationship Management course?	artificial intelligence, trends and innovations in customer relationship management, customer data analysis, cross-cultural CRM, customer loyalty and retention
What topic would you like to tackle in the subject CRM systems?	customers and building a relationship with customers, CRM selection and implementation, software and trends, introduction of different CRM systems - business intelligence and maybe a little touch on artificial intelligence, how to build a good relationship with a customer
Are CRM systems complicated in your opinion?	I can't answer yet - I didn't have experience, it depends on the point of view, for sure - it will be difficult to come up with something like this, the correct implementation of the system and its management can be a challenge for an inexperienced admin, for smaller companies the implementation and use of a CRM system can be relatively simple - especially if one is an online system, in my opinion, if a person gets to know the selected system then not, it depends on the specific CRM system - some can be simpler, with better graphic elements and interface and some can be complex
What does the imaginary wind in the sails bring to the further development of customer relationship management?	customers, the development of artificial intelligence, expanded automation, the prospect of higher sales, the effort to gain a competitive advantage, the entry of new innovative companies into the market, or the increasing number of customers with different demands, tastes, needs
What skills are needed to solve the above questions? Which ones did you use?	knowledge of the given system and the art of searching

Source: Own processing

Another innovation in student lectures involves integrating statements generated by ChatGPT. This integration includes small tasks, such as:

- Specify what is CRM from various authors with links on source of citation in a table.
- Specify different architecture CRM systems in a table.
- Specify metrics and KPI for CRM in a table.
- Specify CRM category from history to present, please specify answer in a table.

Every such output from ChatGPT is cited, for example such this: ChatGPT. (2023). Specify what is CRM from various authors with links on source of citation in a table. [Response to user question]. Available from chat.openai.com/chat. Default mentioned definitions are paraphrased and simplified. It is needed to search more detailed information in available sources such as literature, articles from journals, or other recommendations from the Internet. This situation is a good starting point for subsequent analyzes and critical thinking.

Practical work to support contact with customers uses information technology. CRM systems have integrated artificial intelligence and advantage automation into implemented processes (Homer, 2023; Jagadeesh, 2023; Jaspreet, 2023; Samit, 2023; Zhang. and Dai, 2020). Now, it is start of lectures but in focus of interest will be also in well-known AI benefits for CRM. Please, see Table 2.

Table 2 Advantages AI for CRM systems

AI benefits for CRM	CRM processes
Personalized communication	an individual approach to each customer, which allows a better understanding of their needs and preferences; personalized messages are processed for each customer so that each customer feels that the company cares about him and is ready to meet individual requirements
Predictive analytics	analytical techniques and algorithms are used to predict customer behavior, needs and preferences; better ability to personalize offers and communication with the customer leads to higher satisfaction and loyalty; predictive analysis also serves to identify potential risks and opportunities in relation to customers
Task automation	routine tasks are processed, such as updating contact information, tracking customer interactions, and generating reminders for follow-up communications; tasks are automatically assigned to team members in accordance with defined priorities; creative customer care is supported
Social media monitoring	monitoring and analyzing customer messages and comments on various social media; again, the aim is to better understand the views and needs of customers; this feedback makes it possible to respond flexibly to positive and negative client experiences and to resolve any complaints or questions
Pattern recognition	pattern recognition is the process of identifying and analyzing customer behavior patterns to optimize interactions and improve the overall customer experience; the process uses advanced technologies such as machine learning algorithms and data analysis; the results of the analysis are used to personalize marketing campaigns, increase customer loyalty and improve the efficiency of the sales process
Customer classification	the process of solving customer segmentation into different groups based on different characteristics such as demographics, behavior, purchase history and preferences; the appropriate classification helps to better understand individual customer segments and subsequently adapt marketing and business strategies
Revenue forecasting	provides estimates for future revenue based on historical data on sales, customers and market trends; the process uses analytical tools and techniques, such as predictive analytics and modeling, to make forecasts regarding future sales and market developments; accurate forecasts serve to better plan inventory, marketing campaigns and business strategy

Source: Own processing

4 Conclusions

AI plays an irreplaceable place in various software applications, with CRM systems serving as a good example. Naturally, the AI integration into student lectures has interest of teachers. In the context of CRM, it extends beyond the capabilities of CRM systems. There is room for innovation thought interactions with AI, such as ChatGPT. Benefit is more space for analytical thinking and a deeper understanding of customers. Based on realized questionnaires, it is good that students understand importance of customer relationship management. Their curiosity about trends and innovations is expected. In accordance with their expectations, the topics discussed also include different CRM systems, business intelligence, and

artificial intelligence. From point of view of teacher, there is responsibility to demonstrate the diversity within CRM and show that it is not a difficult topic.

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Navigating the future of soft skills: Integrating Artificial Intelligence for employee training success

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Abstract: Nowadays business landscape, characterized by the pervasive integration of innovation across all facets of organizations, the realm of employee development stands as no exception. Contemporary trends, such as Artificial Intelligence (AI), Virtual Reality (VR), and blended learning, have intricately woven current businesses into the fabric of market dynamics and employee expectations. This research paper is primarily devoted to the examination of how one of these contemporary trends, namely AI, exerts its influence on the domain of employee development and training. This paper will centre its attention on the soft skills, aiming to provide a thorough analysis and comprehension of how AI technologies may serve as indispensable tools in enhancing the training of soft skills within organizations. Additionally, this study will endeavour to ascertain the preferences of employees regarding their soft skills development. Through an exploration of AI's impact on soft skills training and an examination of employee preferences, this research contributes to a deeper understanding of the evolving landscape of employee development in a rapidly changing business environment.

Keywords: training, development, soft skills, trends

JEL Classification: M12, M16, M53

1 Introduction

The contemporary business landscape is undergoing rapid and profound changes. Numerous factors, including technological advancements, global crises, and shifts in customer demand, exert a significant influence on business processes (Aquino and Garcia 2023; Hašková and Zatkálík 2018; Jayathilake et al. 2021). Furthermore, since the onset of the COVID-19 pandemic, there has been a notable shift within organizations, with a heightened emphasis on soft skills rather than hard skills. As noted by Capranos and Magda (2023), the daily work processes of employees have undergone a significant transformation. In today's evolving business landscape, thriving organizations must actively engage and nurture the competitive soft skills of their employees to maintain success in the market. The authors have observed that since the onset of the pandemic and up to the present day, there has been a notable shift in demand dynamics. Specifically, there has been a significant 48% increase in the demand for soft skills, juxtaposed with a 33% decrease in demand for hard skills. These statistics underscore the swift realignment of organizational priorities towards the cultivation and enhancement of human potential within the workforce (Capranos & Magda, 2023; Jayathilake et al., 2021). A similar trend has been affirmed by Deloitte Australia in their report titled 'Soft Skills for Future Success.' This report traces the integration of soft skills into businesses over the course of several decades. According to Deloitte, there has been a dramatic increase in occupations that place a significant emphasis on soft skills when comparing the years 2000 and 2015. Additionally, the consulting company has made a prediction that by the year 2030, soft skills-intensive occupations will constitute 63% of the workforce (Deloitte, 2017).

All the information presented above serves as confirmation that the development and integration of soft skills into employee learning processes are actively evolving (Changkajonsakdi & Kaewkuekool, 2019; Holt, 2018). Consequently, this trend can be interpreted as a shared demand expressed by both employees and organizations. As mentioned earlier, the process of employee development is an ongoing and ever-evolving endeavour. In light of this reality, it becomes imperative to incorporate contemporary trends such as Virtual Reality, Artificial Intelligence, and Blended Learning to enhance the effectiveness and productivity of employee training (Harwardt et al., 2020; Hašková & Zatkálík, 2018; Sihi, 2018). Nevertheless, for the scope of this research paper, the primary focus of the author will be on the integration of soft skills into the business landscape, particularly through the utilization of supportive technology in the form of Artificial Intelligence for effective training.

2 Methods

This research paper has been meticulously crafted through an extensive literature review and the analysis of secondary data obtained from various sources. To provide an in-depth examination of the prevailing conditions within the business

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environment, the author has drawn upon secondary data sourced from the Continuing Vocational Training Survey (CVTS) conducted by Eurostat. These data were collected from a broad spectrum of European enterprises, with the primary objective of scrutinizing investments made by organizations in vocational training initiatives. The findings presented in this research paper are rooted in data collected from companies spanning the reference years of 2015 and 2020. These data have been sourced from a total of 31 European countries, offering a comprehensive view of the evolving landscape across diverse markets. The data set was primarily focused on main skills targeted by Continuing Vocational Training (CVT) courses based on involved markets. For the purpose of this research paper, the author focused on four primary selections – Problem Solving, Management Skills, Communication Skills and Teamworking. Furthermore, in the process of assessing the available secondary data, the author drew upon a variety of surveys and reports that conducted comprehensive analyses of skills and learning development pathways within contemporary society.

3 Research results

The primary objective of this research paper is to assess the contemporary understanding of employees' soft skills within the corporate landscape. Through an extensive literature review and the analysis of secondary data, the author aims to distill the core soft skills that constitute essential skills set for employees. Furthermore, the paper seeks to propose the direction for modern organizations to harness the power of Artificial Intelligence (AI) in optimizing their soft skills training programs. By leveraging existing research and secondary data, this study endeavours to provide insights into the fundamental soft skills expected of employees in nowadays business environment. Additionally, it explores the ways in which AI technologies can be effectively employed to enhance the effectiveness of soft skills training initiatives.

3.1 Pivotal employees' soft skills for nowadays business landscape

In the present business landscape, a multitude of definitions and compositions for various soft skills can be identified (Holt, 2018). Nevertheless, in order to gain a deeper understanding of their significant implications, the author has drawn upon several secondary sources of data and information. This approach has been employed to formulate a comprehensive framework for the most widely recognized soft skills training programs that have the potential to positively impact business processes. Through this methodological approach, this research endeavours to provide a clearer understanding of the multifaceted landscape of soft skills and their strategic implications for modern businesses.

The research report titled "2022 Workplace Learning and Development Trends" offers a valuable comparison between the perceptions of employees and the demands of organizations concerning the development of soft skills within the contemporary business landscape. The findings of this report shed light on several disparities in understanding and objectives. This research report plays a pivotal role in illuminating the contrast between employees' perspectives and organizational requirements in the context of soft skills development. According to the findings of the report, a substantial 75% of all employees express satisfaction with the continuous training programs provided, while an even more noteworthy 81% indicate that they are inclined to remain with a company that offers Continuous Vocational Training (CVT) courses. These results underscore the critical importance of employee development within organizational contexts and emphasize the need for proactive attention to this internal pillar. The high level of employee satisfaction with training initiatives suggests that organizations have a valuable opportunity to harness the potential of soft skills. A notable degree of consensus has been observed, particularly in the domain of Leadership soft skills, often referred to as Managerial Skills (SHRM, 2022). It is noteworthy that 54% of employees express a desire to partake in such soft skills courses, closely mirrored by 53% of organizations that aspire to provide Continuous Vocational Training in this area. Consequently, these results suggest that a delicate equilibrium may exist between demand and supply in the current landscape. This equilibrium is further supported by another study, "Closing the Skill Gap 2023," which corroborates the high demand for such skills, registering at 34% (Capranos & Magda, 2023). Despite this figure being relatively lower, it underscores the continued relevance and necessity of these soft skills in contemporary corporate settings.

The soft skill of Problem Solving emerges prominently in both reports as a subject of relatively high interest among organizations. According to the "2022 Workplace Learning and Development Trends," 49% of organizations express a desire to provide training and enhance this skill among their employees. This trend is further corroborated by findings from "Closing the Skill Gap 2023," where 42% of companies identify Problem Solving as the most sought-after skill within their organization, marking the highest response rate in the survey. It is noteworthy that Problem Solving is intrinsically intertwined with daily work activities, underlining its significance as a vital soft skill that directly impacts organizational success (Capranos & Magda, 2023; SHRM, 2022).

The soft skills of Communication and Collaboration stand out as pivotal competencies. Within the "2022 Workplace Learning and Development Trends," a slight disparity becomes evident, with 54% of organizations expressing an inclination to provide training in these areas. In contrast, only 44% of employees demonstrate an active interest in participating. Moreover, findings from the "Closing the Skill Gap 2023" report indicate that the demand for these soft skills among organizations is at 24%. This relatively lower demand underscores the complex nature of Communication

and Collaboration skills, which are heavily influenced by social dynamics and individual selection pressures for developing effective communication abilities (Janik et al., 2013).

Last but certainly not least is the well-established soft skill of Teamwork (or Collaboration), which has traditionally held a prominent position in the realm of soft skills. However, based on recent surveys, a discernible decrease in its demand is observable within the current business landscape. According to the findings of the "Closing the Skill Gap 2023" report, only 10% of companies express a desire to develop and provide Continuous Vocational Training for this skill among their employees. Interestingly, several surveys have begun to intertwine Teamwork with the broader category of Collaboration. This shift is evident in studies such as "Soft Skills for Business Success" conducted by Deloitte in 2017, which categorizes Teamwork under Collaboration, often in conjunction with Communication skills. A similar approach has been adopted by the aforementioned "2022 Workplace Learning and Development Trends" report. These evolving trends suggest that the contemporary business environment places a high premium on principles that integrate employee communication within the broader context of collaboration. This integration implies that internal and external communication skills are no longer viewed in isolation but are recognized as interconnected and integral components of effective collaboration (Capranos & Magda, 2023; Deloitte, 2017; SHRM, 2022).

Based on the aforementioned results, three primary soft skills emerge as exceptionally important for the contemporary business environment:

- Management Skills;
- Problem Solving;
- Communication and Collaboration;

In an effort to gain deeper insights into the prevailing conditions within the European market, the author has harnessed data from the Continuing Vocational Training Survey conducted by Eurostat. Table 1, Table 2 and Table 3 below present the results from three countries that have attained the highest scores within the specified skill category. Furthermore, the author has highlighted the lowest score achieved by a country in chosen skill area, denoted in red for clarity.

Table 1 Management Skills

Market	Management skills
Finland	50,3 %
Spain	44,3 %
Sweden	34,2 %
Bulgaria	6,4 %

Source: Own processing based on data from Eurostat

Finland achieved the highest score, surpassing the 50% mark, indicating that more than half of the organizations in the country offer Continuous Training in Management Skills to their employees. In contrast, Bulgaria reported the lowest figure, with only 6% of all organizations providing this type of training. In a broader context, it is noteworthy that the Northern European countries have demonstrated a primary emphasis on Management Skills in the European region, as evidenced by the higher prevalence of such training initiatives in this region compared to others.

Table 2 Problem Solving Skills

Market	Problem Solving skills
Romania	43,3 %
Austria	37,9 %
Hungary	37,6 %
Ireland	12,2 %

Source: Own processing based on data from Eurostat

Approximately 43.3% of organizations in Romania offer Management Skills training. This suggests a relatively high emphasis on this skill development within the Romanian market. In contrast, Ireland stands out with only 12.2% of organizations offering Management Skills training, suggesting a lower prevalence of such programs compared to the other mentioned markets. These results provide insight into the varying degrees of emphasis placed on Management Skills training across different European markets. Besides the previously mentioned soft skills, European enterprises are actively prioritizing Teamworking, which has garnered the highest attention in Romania, with 73% of companies emphasizing this skill.

Additionally, Communication skills take centre stage in the Czech Republic, with a notable emphasis from 19.6% of companies. In stark contrast, Spain demonstrated the lowest focus, registering a mere 2.7%. An intriguing pattern emerges, with the highest scores clustered within Central European countries such as the Czech Republic, Austria, and Slovakia.

Table 3 Communication and Collaboration Skills

Market	Communication and Collaboration skills
Czechia	19,6 %
Austria	15,0 %
Slovakia	12,3 %
Spain	2,7 %

Source: Own processing based on data from Eurostat

As previously discussed, the development of these soft skills is ongoing, and many businesses are encountering them in an interconnected manner. Therefore, for the purposes of this research paper, the author has identified these crucial soft skills as Communication and Collaboration.

3.2 Potential of the Artificial Intelligence within the training of employee soft skills

The preceding chapter has showcased and affirmed the significance of three essential soft skills that companies are compelled to develop, which concurrently align with the demands of contemporary employees. Nevertheless, traditional training methods are now being actively supplemented with the development of innovative approaches and combinations aimed at enhancing overall efficiency and fostering increased employee engagement. For these reasons, the implementation of contemporary trends such as Artificial Intelligence (AI) presents an opportunity for the successful execution of soft skills training within organizations. Integrating AI into training programs offers several potential benefits, including scalability, personalization, and enhanced effectiveness. One key aspect of AI in soft skills training is its ability to tailor learning experiences to individual learners. AI algorithms can analyze learner behaviour and adapt the training content to meet specific needs, ensuring that employees receive targeted instruction in areas where they need improvement. This personalization can lead to more efficient and effective training outcomes (Janik, 2013; Oh et al., 2015).

Based on the results from the 'Learning at Work 2023' survey, current employees are grappling with challenges related to limited availability and time constraints, which hinder their participation in various development courses and programs (CIPD, 2023). These employees perceive these factors as barriers to engaging in Continuous Vocational Training. This observation aligns with the findings of Cermak and McGurk (2010), who have already in 2010 confirmed, that time constraints represent one of the most common and persistent challenges in training. Therefore, it can be inferred that time constraints may continue to be a significant and enduring barrier in the future as well (Cermak & McGurk, 2010). To address these challenges, Artificial Intelligence (AI) can serve as a powerful tool, offering solutions to alleviate the issue of time constraints for employees while also managing costs for employers. The PwC Global Workforce Hopes and Fears Survey 2023 has revealed that 27% of respondents believe AI will create opportunities for employees to acquire new skills, and 31% of respondents anticipate that AI will enhance overall productivity and efficiency. This trend is also reflected in other surveys, where there is a growing willingness among employees to embrace digital solutions, including AI. According to the Learning at Work 2023 survey, there has been a notable 48% increase in the adoption of digital learning solutions (CIPD, 2023; PricewaterhouseCoopers, 2022, 2023).

Therefore, the integration of AI can have a positive impact on fostering the synergy between soft skills and digital skills. These employee skills now encompass some of the most sought-after attributes for effective business processes and employee learning. Furthermore, in alignment with the aforementioned assertion, we can draw upon insights from a recent LinkedIn survey, which sheds additional light on the intricate interplay between digital (AI) and leadership (soft) skills. This survey underscores the evolving landscape of leadership processes, which are increasingly influenced by the inexorable rise of 'artificial intelligence and technology' as one of the primary driving forces. The survey's results provide valuable insights into the collective perspective of respondents, revealing a noteworthy consensus. A significant 59% of survey participants expressed a robust conviction regarding the pivotal role of artificial intelligence in shaping the future of leadership. This resounding endorsement underscores the growing recognition of AI as a transformative force in leadership and underscores its significance as an area that demands attention and proactive engagement. These findings reinforce the notion that digital and leadership skills are becoming intricately interconnected. As organizations navigate the evolving business landscape, leaders must not only possess conventional soft skills but also be adept at harnessing the potential of AI and technology, making it an integral component of effective leadership in the future (Morgan, 2020).

4 Conclusions

In conclusion, the influence of Artificial Intelligence (AI) on employee learning and development is both substantial and transformative. AI presents a wealth of opportunities for enhancing training activities, particularly in the realm of soft skills development - an area of paramount importance in the modern business landscape. Throughout this research paper, the primary objective has been twofold. Firstly, this paper delved into the analysis of the soft skills that are currently in high demand within the dynamic business environment. Findings underscored the enduring importance of these skills as critical drivers of organizational success and individual growth. Secondly, this research paper has showcased the substantial potential for integrating AI into the training of employees' soft skills. However, it is important to acknowledge that this research does have limitations, primarily stemming from its reliance on secondary data obtained from various surveys and reports. Nevertheless, this research paper serves as a solid foundation for future investigations, which may involve primary research methods such as semi-structured interviews and quantitative analysis. In summary, this research paper has underscored the pivotal role of AI in revolutionizing employee learning and development. By leveraging the potential of AI-driven soft skills training, organizations can not only meet the demands of today's business environment but also propel themselves toward a future marked by innovation and excellence.

Acknowledgement

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Transformation or revolution? The role of Artificial Intelligence in the new era of learning

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Abstract: The article explores the significance of artificial intelligence (AI) in education in the 21st century. With the continuous advancement of technology and data resources, AI plays an increasingly crucial role in reshaping how we learn and teach. The article deals with the profound transformations and crises affecting the contemporary world and education. It highlights that new artificial intelligence tools will undoubtedly bring unprecedented changes to education. These changes, although still very new, have the potential to redefine traditional education. The world itself is going through many crises. Higher education is not immune to these challenges; the various crises affect its ideological, intellectual, managerial, and ethical dimensions. This paper introduces the concept of "turn to artificial intelligence" in education, highlighting the role of artificial intelligence (AI) in reshaping educational paradigms.

Keywords: education, Artificial Intelligence, technologies, ethical and social aspects

JEL Classification: I21, I24

1 Introduction

Education plays a key role in finding ways to respond to the changes in today's world marked by multiple crises. However, education itself is undergoing unprecedented transformation. The world of education is being transformed by new tools that are completely transforming existing ways of doing academic work and, above all, working with texts.

The main aim of this article is to show that, both the contemporary world and education are in an unprecedented crisis and that education will certainly undergo a transformation thanks to new AI tools. What this change will look like cannot be said today, but it is undeniable that it will happen and that it will be unprecedented. Research in this area is still in its infancy, which is why all predictions are a bit like crystal ball divination.

In my article I do not offer a detailed review of this current research, but rather a new perspective through which the current state of affairs can be viewed and understood. I focus on broader contexts and parallels that might open the way, or at least suggest a direction in which research in the area of AI and education might go.

2 The World of Crisis

It can be said with certainty that the word "crisis" defines the beginning of the 21st century. The world has gone through the COVID-19 pandemic, a crisis of economic systems, a social crisis, and is facing a humanitarian crisis, with millions of people facing extreme poverty, hunger, racism, and injustice. (Lagadec, P., 2005) There are also migration and political crises with new authoritarian regimes and wars that have emerged in recent years, and unfortunately in recent days. (CNN, 2023) There are many more crises such as the energy crisis and imbalances with global implications. Among other crises, we can certainly mention the global crisis of liberal democracy, the crisis of inequality, the crisis of public health, and even the crisis of confidence in public health. (Leslie, J., 2023). Many scientists believe that all these crises are dominated by the ecological crisis and the problems associated with our historical era, which they call the "Anthropocene". "The changes that humans have made in recent decades have been on a scale that has altered our world beyond anything it has experienced in its 4.5 billion year history. Our influence is so profound that it is moving the planet into a new age that geologists call the Anthropocene: the age of humans." (*Future Earth. Our Future on Earth 2020.*)

The world of the 21st century is unlike anything in our history. The situation on our planet is completely unprecedented. Inequality between people is widening, with the rich amassing incomprehensible wealth and standing apart from the rest of the world, while millions of people live in extreme poverty in both poor and developed countries. We are witnessing billionaires going on their joy rides into space while millions of people are starving. (Popenici, 2023). The climate crisis has become a direct existential threat to humanity, and the reality of total global catastrophe is being

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openly discussed among world leaders. In short, it can be said that we are facing the biggest cascade of crises in our history.

3 The Crisis of Higher Education

It is obvious that if the world is being so fundamentally transformed, the education that prepares us for this world, and not only for survival but also for ordinary life in it, cannot remain the same. If it stays the same, it must also necessarily be in crisis, and that unfortunately seems to be the case. Regular publications devoted to higher education, such as *The Chronicle of Higher Education*, *Times Higher Education*, *Inside Higher Education*, and others, devote a great deal of space to the crisis in higher education. „In fact, we have several crises of higher education in the English-speaking Western world: ideological, intellectual, managerial, and ethical crises." (Popenici, 2023, p. 3).

Popenici focuses on the situation of higher education and points out that universities now stand as marketized, narrowly graduate-employability-oriented institutions, with the dysfunctional ethos and intellectual endeavors reduced to economic returns and sloganeering. He defines universities in terms of mediocrity and short-termism. Although „in the history of education and the history of universities, there are times when changes are revolutionary, involving different ways to think about teaching, learning, culture, and humanity“ there is a kind of refrain of universities that do not change, and they remain too rigid. (Popenici, 2023, p. 75.) According to many other scholars, universities are in deep crisis. The sources of this crisis are still debatable. Some theorists believe that there is insufficient commercialization of universities, while others point to decades of defunding of universities (Biesta, 2011). They all agree that higher education is currently in a phase of a complex crisis.

Let's try to find one possible root of this crisis and quote from the book *Anti-Intellectualism in American Life* by Richard Hofstadter, a professor of American history at Columbia University, for which he also won the Pulitzer Prize in 1964, the same year the concept of artificial intelligence was born. Hofstadter makes a distinction between intelligence and intellect, which I believe could be useful in what follows.

Although the difference between the characteristics of intelligence and intellect is more often assumed than defined, the context of popular usage makes it possible to extract the nub of the distinction, which seems to be almost universally understood: intelligence is an excellence of the mind that is employed within a fairly narrow, immediate and predictable range; it is a manipulative, adjustive, unfailingly practical quality – one of the most eminent and endearing of the animal virtues. Intelligence works within the framework of limited but clearly stated goals, and may be quick to shear away questions of thought that do not seem to help in reaching them. (...) The intellect, on the other hand, is the critical, creative, and contemplative side of the mind. Whereas intelligence seeks to grasp, manipulate, re-order, adjust, intellect examines, ponders, wonders, theorizes, criticizes, imagines. Intelligence will seize the immediate meaning in a situation and evaluate it. Intellect evaluates evaluations and looks for the meaning of situations as a whole. (Hofstadter, 1963, p. 24-25.)

The difference between intelligence and intellect as understood by Hofstadter was also mentioned already in 1922 by Roback. (See Roback, 1922). Hofstadter noted that we are witnessing the definitive success of anti-intellectualism, in which we can also see the roots of the crisis of higher education and the steady decline of higher education in Europe. He warned that virtues such as education, wisdom, erudition, and deep knowledge are not adored in the way they should be and are not associated with respected people, either in popular culture or in real life. The emphasis on intelligence instead of intellect has led to the commodification of learning and teaching and to nowadays crisis. Hofstadter reaches conclusions similar to those of Popenici. Education has become a commodity, professors have become service providers, and students have become customers. Leaders in education have become managers who are responsible for efficiency, adapting to market demands, and partnering with industry and other corporate structures. The rankings of what some universities call "product" are actually a caricature of what is left of the goals of education, lacking coherence in teaching and belief in the power of good teaching. (Popenici, 2023, p. 82)

It seems logical that if we blame the emphasis on intelligence on the current state of education, then an emphasis on intellect might be the way out of this crisis. Let us try to see whether it is possible to strengthen skills that we connect with the intellect, as Hofstadter describes it, even in an age that celebrates and adores intelligence and, moreover, artificial intelligence. Whether and why artificial intelligence could lead to a revolution in education and to the strengthening of such skills. To do this, let us focus on turns in education and on the last turn which we could name AI turn.

4 "AI Turn". The New Era of Education?

The utilization and transformation of Artificial Intelligence (AI) have been in existence for many years. It can be traced back to the 40s and 50s. (Hamdan, A., (2021). p.223) AI usage can be seen as a simple computer or machine that is able to read handwritten documents to Google, Google translation, face recognition, voice recognition, GPS system, or a robot that can do a sophisticated surgery operation on its own.

AI is a technology that is changing our lives in an enormous way. Many areas of human life and various industries have already embraced AI and have begun to benefit from its technological advancement. Artificial intelligence meets the main requirements of today's business world and it benefits companies and businesses in many different ways, such as improving product features, functions, and performance, optimizing internal business operations, improving decision-making processes and workplace conditions, and enhancing employee creativity through automation and task shifting. (Hamdan, A., 2021, p. 222) As a result, AI applications are being applied in many industries and companies. One such industry is higher education, which can potentially also gain many benefits from the AI revolution. However, the roles, benefits, and promises of AI in higher education institutions are currently very new and still a changing topic that has not yet been adequately explored and requires further research.

I will not focus on the development of AI, but only on its current form and the tools that play a role in education. Of all the possible current AI tools, it is ChatGPT that, in my opinion, has transformed and will transform the shape of education in a significant way. But let's start with another important consideration.

For many decades, the world of academic education has also been a world of text. In the social sciences and natural sciences, but also in the whole area of our culture, there have been several major so-called "turns". The idea of these turns comes from the philosophy of Richard Rorty, according to whom the whole history of philosophy is a series of such turns. Rorty describes ancient and medieval philosophy as focused on the thing, eighteenth- and nineteenth-century philosophy as focused on the idea, and contemporary philosophy as preoccupied with words. The latest turn in Rorty's conception of history, the "linguistic turn," has become evident in the other social sciences as well. "Textuality", according to Rorty, became a central concept for the study of art, media and culture, and found its background in semiotics and linguistics. Society, he argues, has become a text, and nature and the natural sciences "discourses" (Koopman, 2011).

According to Mitchell, however, the "linguistic turn" was not the last turn in contemporary history. There has been another turn in the social and natural sciences, as well as in the whole area of our culture, that can characterize the present. The author sees hints of this turn already in the semiotics of Charles Peirce and later in Nelson Goodman's *The Languages of Art*. Goodman's theories and the non-linguistic symbolic systems he describes no longer stand on the assumption of language as a necessary, paradigmatic basis for grasping meaning. Mitchell also identifies this turn with phenomenological investigations of imagination and visual experience or with Jacques Derrida's "grammatology." With the turn of attention from a "phonocentric" conception of language to its visual side, with the Frankfurt School's explorations of modernity, mass culture and visual media, and with the results of Michel Foucault's philosophy. Here, according to Mitchell, one can see the foundations for the latest turn in Western culture, which he calls the "turn to the image".

According to Mitchell, this last turn for the time being occurred during the period for which the term "postmodernism" was adopted. The following paradox is characteristic of the postmodern period, he argues and underlines the change in the general attitude towards images. On the one hand, it is an era of video, cybernetic technologies, electronic reproduction, and the development of new, fantastic forms of visual simulation; on the other, it is a time fraught with fear and anxiety about the power of new images, technologies and electronics in general. Fear that images and advanced technology will eventually destroy their creators and users (Mitchell, W., T., J., 1994).

I believe that the last turn, "turn to the image", has not fundamentally changed the shape of academic education and that it has remained closely linked to the text. The text is still the essential and central basis of higher education and a major tool for enhancing knowledge and gaining intelligence. Students work with texts and their education is based on reading and writing. They have to write essays and term papers to get credit and exams and theses to get diplomas. Reading and working with texts is the most intrinsic core of education. Education that is in crisis.

I believe that this form of education is irreversibly disrupted by the advent of the latest AI technologies and that there is currently a turn that has not yet had its name. A turn that we could call the AI turn. Working with text will never be the same with the advent of ChatGPT and the requirements for writing text must fundamentally change. All of education will be transformed by new AI tools because these tools are changing the very foundation on which higher education is built. The new generative AI tools make it possible to produce texts that are innovative and original and therefore cannot be

considered plagiarised. It is no longer possible to ask students to do what they were asked to do before. The whole world of education must and will be transformed by AI tools.

I believe that this change will not just be about teaching students to acquire the new literacies (data literacy, technology literacy, and human literacy) they will need to survive in the digital age, along with changing their mindsets and ways of thinking about the world. ChatGPT will cause changes that we can only guess at today, but I think that by its nature it will not lead to the development of intelligence, but rather the kind of skills that we associate with intellect. If there is an artificial intelligence that human intelligence cannot overcome, then there is no need to even try. It is possible to focus with the help of the AI on other skills.

5 Conclusion

In conclusion, as under-researched as this consideration may seem if higher education is connected to textuality, and if textuality is now being overcome by AI tools, then these tools will transform and perhaps revolutionize education. What this transformation and possible revolution will look like, no one can say for sure today. But all would certainly agree that this transformation is happening and that it is unprecedented.

All of these considerations and conclusions are very recent and in some ways new and supported by only recent research. There are already a number of publications that focus on the goal of uncovering how universities can benefit from AI and what conditions need to be met to prepare for this powerful technology, but it is still a new topic. AI has a high potential to transform universities in many ways, and universities should therefore be prepared to reap its many benefits while being prepared for the risks.

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Possibilities of using ChatGPT in teaching the subject Methods of Information Processing

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Abstract: The article draws attention to the issue of texts generated with the help of artificial intelligence (AI). The paper deals with examples of the processing of some selected tasks from the subject Methods of information processing taught at the Faculty of Economics of the University of South Bohemia solved with the help of AI. The generated answers are critically assessed and compared with the procedures used in teaching.

Keywords: AI, ChatGPT, large language model, teaching

JEL Classification: C63, C88, I21

1 Introduction

The subject Methods of Information Processing is taught at the University of South Bohemia in České Budějovice.

This subject is offered for study programs Economics and management, Management of Regional Development and Tourism in the block of compulsory subjects and for study programs Analysis in Economic and Financial Practice and Finance and Accounting in the block of compulsory elective subjects. In the last academic year, 130 students completed this subject, of which 12 students chose it from other compulsory elective subjects. This academic year, 131 students are enrolled in the course, of which 25 students have chosen it.

The course Methods of Information Processing is focused on the practical use of information technologies with an emphasis on scientific work. It consists of three parts, characterized as searching, management and presentation of information. The student will complete partial homework assignments. An e-learning environment is exploited throughout the course. The course is intended primarily for students who are preparing to create a qualification thesis.

One of the credit requirements is the solution of several practical tasks related to the discussed topic. Topics include the following: numeral systems, terminology (information, data, knowledge, results), citation rules and citation errors, ethics in science, thesis, resume, business cards, web design, advertising and advertising slogan, accompanying text for presentation, abstract, annotation, keywords, video, audio and image editing, some tasks are based on the use of online tools, e.g., creation of comics, timelines, structured biographies, business cards, talking heads, etc.

With the onset of the development of artificial intelligence, there is a need to revise assigned tasks and existing methods of solving these problems. Many assigned tasks, which until now have been solved by students, will now be possible to solve by machine, when the student only interprets the task, and the robot offers him a solution. This problem applies mainly to tasks oriented to word processing, but not exclusively. We will introduce the ChatGPT tool, with the help of which students are able to solve many tasks on their own without much effort.

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2 ChatGPT

ChatGPT is one of the very popular AI tools used by users all over the world. There are many ways to use ChatGPT, a brief overview is shown in Figure 1. ChatGPT is based on a language model called Predictive Transformer (PT), which was originally developed by Google, for natural language processing (NLP).

The PT language model underwent extensive evolution during 2018-2023, which was directly related to the progressively larger training dataset. Each new version of the language model brought a dramatic change, especially in the number and depth of neural layers, which was directly related to the number of parameters of the PT model for learning. A comparison of the PT models can be found in Table 1.

Table 1 Overview of PT models and their parameters used in ChatGPT

Model name	Year	Architecture	Dataset size [GB of text]	Parameter Count [million]
GPT-1	2018	12-level	4.5	117
GPT-2	2019	As GPT-1, normalization	40	1500
GPT-3	2020	As GPT-2, Human feedback model	570	175 000
ChatGPT-3.5	2022	Enhanced GPT-2	N/A	175 000
ChatGPT-4	2023	Text Prediction + Learning from Human Feedback	N/A	100 000 000

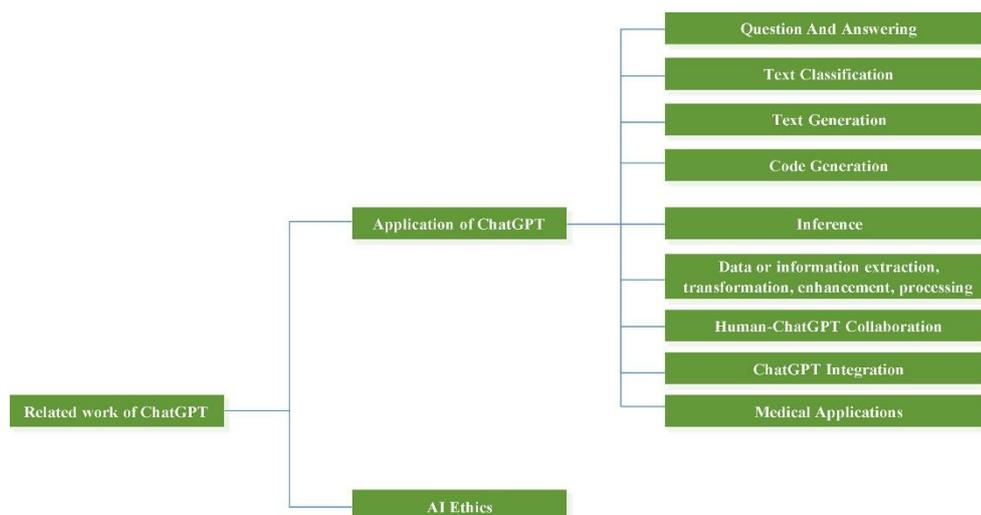
Source: Partha, 2023

3 How does ChatGPT work internally?

At present, it is not possible to find relevant detailed information about the inner workings of ChatGPT. What is certain is that ChatGPT works with tokens, which are individual natural language words converted into a binary representation (e.g., using the word2vec tool). The input sequence of tokens is gradually transformed recursively into new text. This is the reason why ChatGPT is currently unable to handle the context resulting from the previous queries.

ChatGPT itself is probably internally composed of multiple PT models. All PT models are likely to have the same architecture, however they differ in their internal parameter settings, which is related to the optimization for the specific application area (AA) shown in Fig.1.

Figure 1 The possible application areas of ChatGPT. Currently the model can generate textual answers from 9 different areas



Source: Yiheng et al., 2023

ChatGPT first imports the type of query asked (e.g., a numerical example, a history question, a request to generate a poem, etc.) and the PT for the specific AA is responsible for generating the answer.

The generation of the response itself, as already mentioned, is done recursively. This way of internal structuring is very efficient as it allows ChatGPT to scale well in terms of adding more AAs. It is also possible that this way of

decomposition is multilevel, i.e., for math questions there are several different PTs, each tailored to a specific sub-area of a given AA.

Thus, thanks to this structure, to add another AA, it is sufficient to train another architecturally identical PT model based on the new set, which is already optimized for that AA. To use the new PT model, it is also necessary to modify the determination of the type of the query asked, which then causes the query to be passed to the newly created PT model.

4 Examples of solved tasks

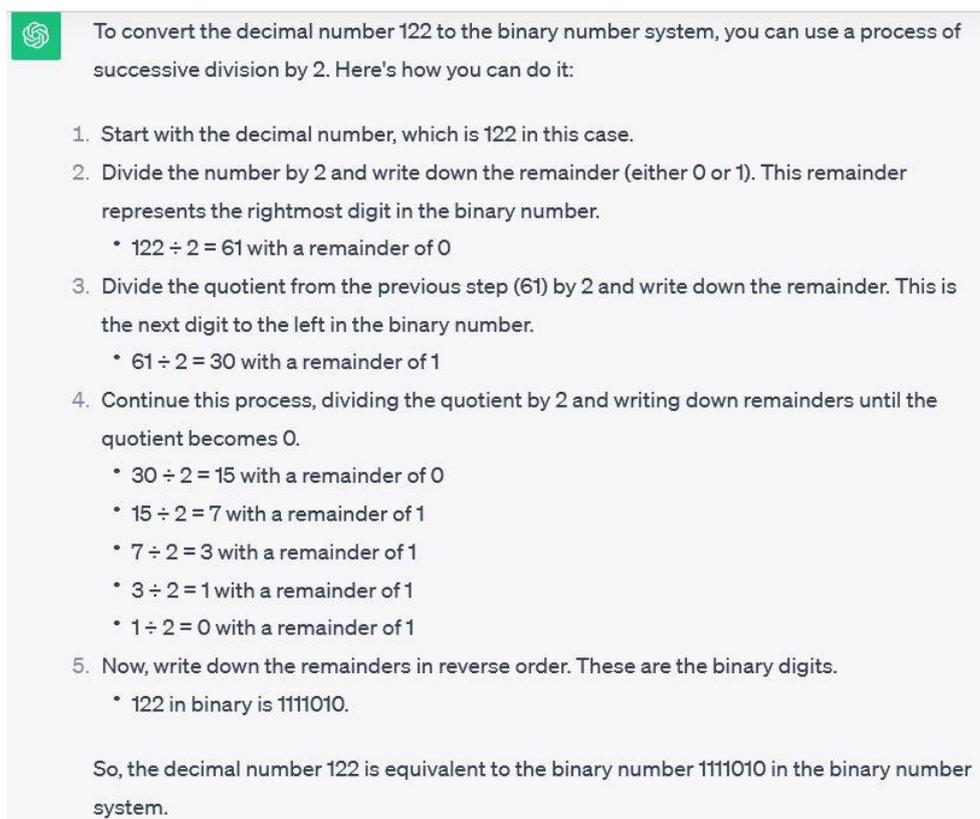
Now we will present some selected tasks for which the students have to work out solutions. We will try to get the correct solution from the ChatGPT system, preferably in such a form that we don't have to do any additional activities and have a direct result.

4.1 Conversion between number systems

One of the initial tasks concerns the conversion between number systems. Students have to write the procedure how they solved the example. Let's try typing this example into the ChatGPT prompt: Convert the number $(122)_{10}$ to binary numeral system.

The following Figure 2 represents the output that the system offered us.

Figure 2 The example of using ChatGPT for finding solution of conversion between numeral systems task



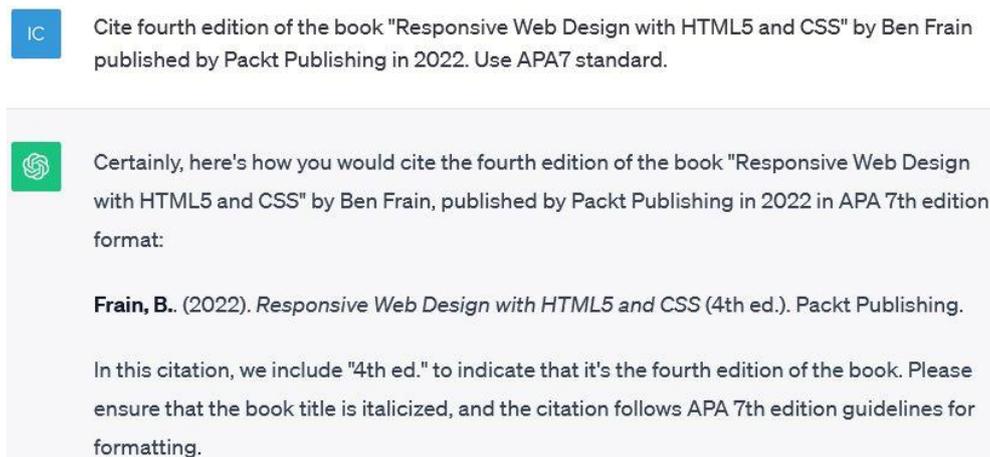
Source: Own processing in OpenAI, 2023

From the obtained output, it is evident that the student has a complete solution presented. This solution corresponds to a procedure that the student would have to work out on his own. Here, the student already has everything ready and does not need to make any further efforts.

4.2 Correct citation of the specified book in the required standard

Let's look at another example that the students are solving. In this example, students must correctly cite the specified book to the required standard. This places a requirement on the student to check the order and formatting of the individual items of the citation. Again, we put the task into the ChatGPT system and got the answer (see Fig. 3). It is also evident here that the system processed the entire task for us. However, if we compare the obtained solution with the correct result, we find that there is a small error in the double dot after the author's name. The other items are already fine, including the required formatting (American Psychological Association, 2020).

Figure 3 The example of using ChatGPT for finding solution of citation in correct standard task



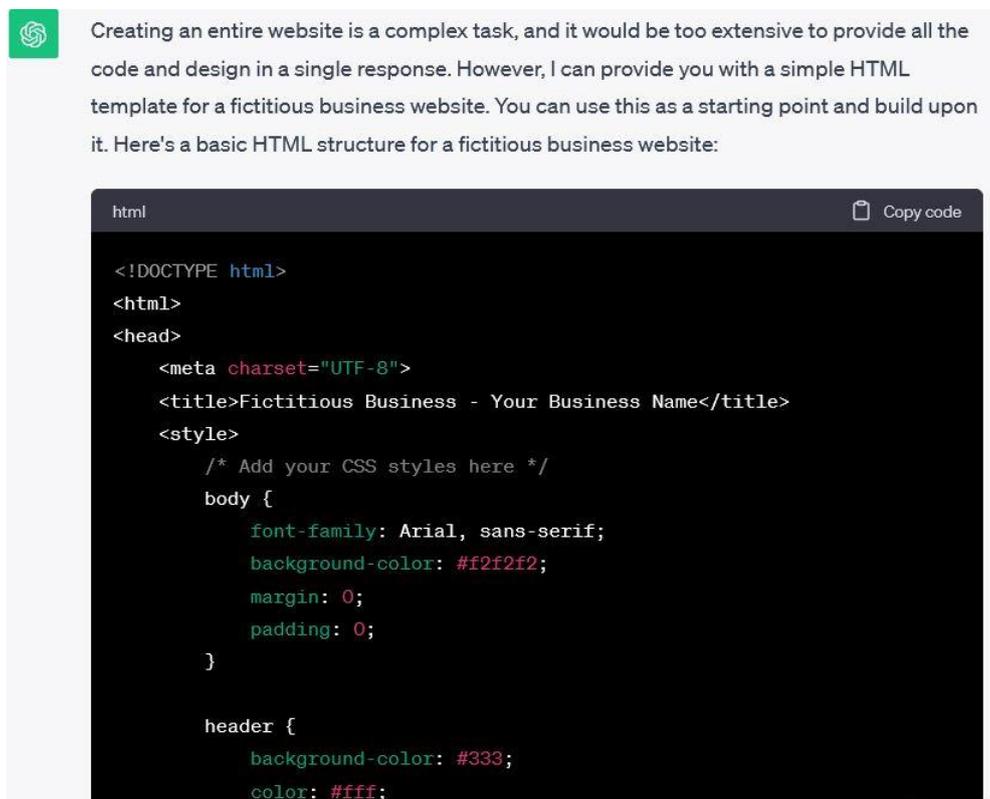
Source: Own processing in OpenAI, 2023

4.3 Creating a website for a fictitious business

The next student task is more complex and has several parts. Students must present a business plan for their company and prepare a presentation for it in the form of a website. Also, when solving this task, students using the ChatGPT system will get a lot of material for developing the final solution.

From the system we can get the basic structure of the website (Fig. 4). The given page is just a base, which contains only the most necessary. The page does not contain any recommended metadata (author, description, etc.) or the page is not responsive (Mozilla Foundation, 2023), but as a default state it is fully functional, although in terms of style and the chosen format it is rather below average, as can be seen from Fig. 5 on the left.

Figure 4 The basic structure of the website obtained from the ChatGPT system

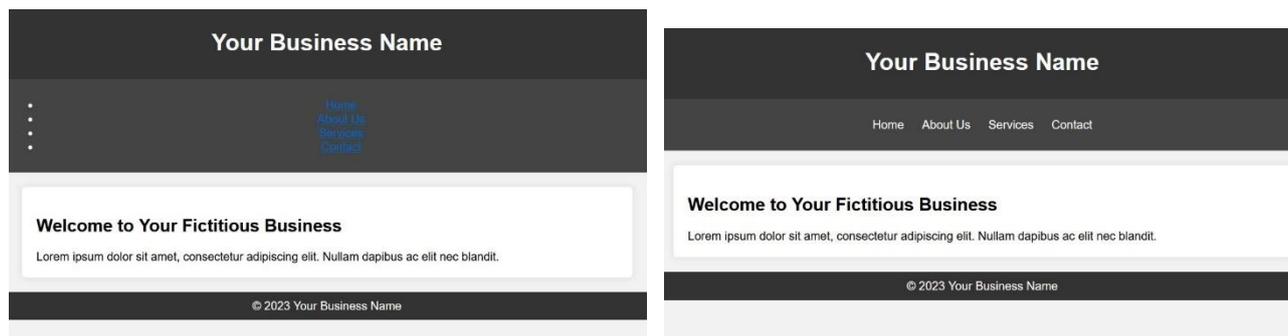


Source: Own processing in OpenAI, 2023

If we are not satisfied with the result, we can move on and try to get a better solution. We will ask ChatGPT in the command line to change the colors in the menu to other ones that will be more readable. The system will reply that of course it will. To make a change, we have just to modify the *nav* element where the colors are set. We can make any

further adjustments in this way according to our own choice of colors. A view of the changed colors for navigation can be seen in Figure 5 on the right.

Figure 5 The appearance of the page that was obtained from the ChatGPT system (left); with changed colors in navigation (right)

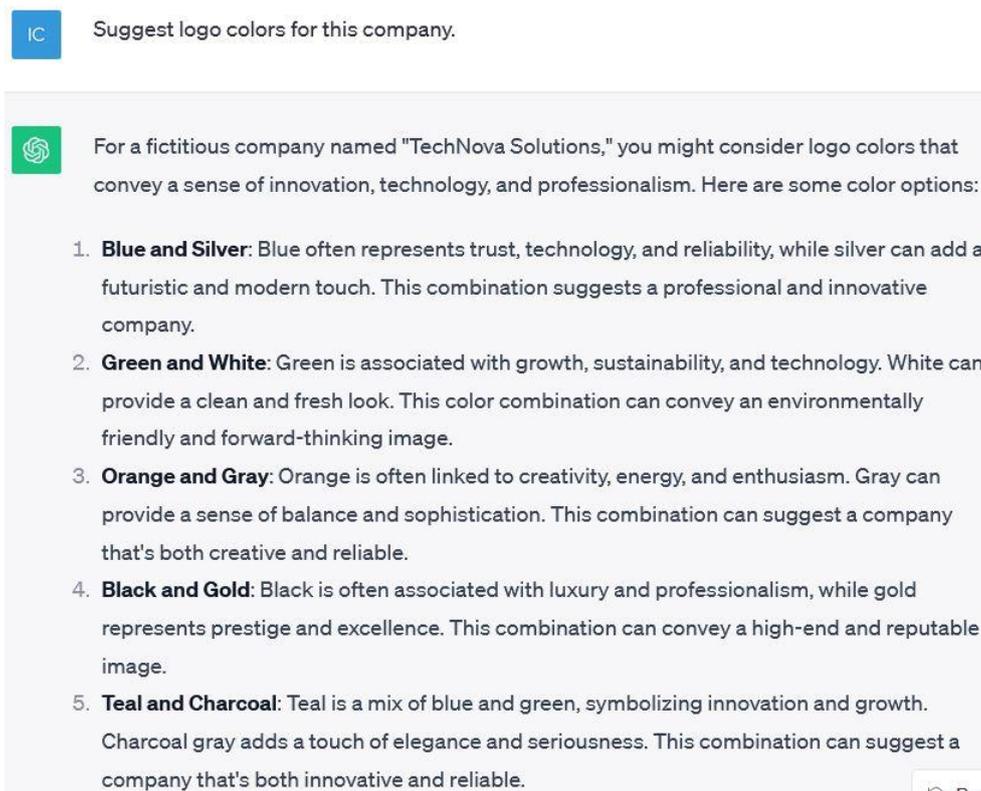


Source: Own processing in OpenAI, 2023

The fictitious company should be named, for which we will again use the ChatGPT system. We will ask him to suggest a name for our company. Received response from the system: “Certainly, here’s a fictitious company name: *Technova Solutions*. This name suggests a forward-thinking technology company that provides innovative solutions to its clients. You can use this name as a starting point for your fictitious business or modify it to suit your needs.” (OpenAI, 2023).

We also have to design a logo, so we will let the system design the color options for the appearance of our company logo. A sample of the submitted proposals, including their rationale and characteristics, is shown in Fig. 6.

Figure 6 The color design for company logo



Source: Own processing in OpenAI, 2023

Based on the submitted color proposals, we chose the color combination of blue and silver. We received the corrected source code of the website when we passed the request to ChatGPT. You can see its final appearance in Fig. 7.

The final step in this task is creating a business plan. This time, after the query, the system did not give us the final answers, but provided us with a list of key components that must not be missing in our business plan. For each point, the system provided brief information on what should be included here. For a better overview, we present the individual mentioned key components: 1. Executive Summary, 2. Business Description, 3. Market Research, 4. Product and Services,

5. Marketing and Sales, 6. Financial Plan, 7. Management and Operations, 8. Legal Structure, 9. SWOT Analysis, 10. Funding and Financing. 11. Contact Information, 12. Appendices.

Figure 7 The color design for company logo



Source: Own processing in OpenAI, 2023

5 Conclusions

One fact emerges from the above. If the tasks are given in a way to calculate something or find something out, the resulting solution can be easily obtained from the system and the students do not have to do any of their own initiative or creative activity.

If the task is more complex and consists of other sub-parts and is not focused only on obtaining a text result, the system will not present the result in the overall view. The student thus gets a helper and a mentor from the system, but not a tool for obtaining the entire result. The student will have to perform additional activities and make additional efforts to create their final solution. The development in the field of Large Language Model development not only brings us educators the benefit of using this system, but also presents us with new challenges in choosing appropriate teaching methods and how to continue preparing and educating students for their future life.

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Session:

Finance, Accounting, and Taxation:
Current Trends



Law and economics in the French budget

Richard Bartes¹

Abstract: The contribution deals with law and economics in the French budget. In other word, legal and economic aspects of the French budget and budgeting is mentioned in the contribution. Therefore, the contribution pays attention to the evolution of budget in France, its legal regulation and selected economic, or rather statistic data of the French budget. The contribution also explains the performance budget as a tool of performance budgeting.

Keywords: France, French budgetary law, French economics

JEL Classification: H60, K10, K34, K39

1 Introduction

Although law and economics are two separate and diverse disciplines, their mutual interconnection is absolutely necessary. This interconnection manifests itself especially in the area of taxes, public budgets and a control of public finance. While lawyers, or rather legislators create tax and budgetary laws, economists prepare economic prognosis or, on the contrary, prepare macroeconomic assessments. In other words, economists know which tax rate to choose and which tax exemptions to set, on the other hand lawyers know which provisions of the law to choose to apply to all or to include relevant exceptions.

The science of public finance distinguishes Anglo-Saxon, German and French conception of public finance discipline. Discipline of public finance can be examined from the point of view of economics as well as law. Differences among these conceptions consist in diverse legal construction of public finance law in relevant countries (i.e. the legal point of view), or in diverse economic thinking that reflects needs of state and society (i.e. the economic point of view). Since the paper is focused on the French budget, or rather on the French conception of public finance discipline, the author takes economics aspects (for example macroeconomic indicators and statistics in France) and legal aspects (for example budgetary law in France) into account. Given that the public finance law is primarily represented by budgetary law, it is necessary to pay attention to the legal framework of the budget in France.

In the paper, there is also mentioned non-legal and non-economics issue – the evolution of the notion of “budget”. The author also examines the historical origin of this notion and its meaning within the French framework. Budget is a main instrument of the public economic policy. For the purpose of this paper, the *budget* means the state budget, its legal regulation and its economic side. In other words, the paper deals with the state budget in France.

In this context, it is convenient to mention the government sector institutional structure. In France, from the point of view of the fiscal federalism, there are four levels of governance with own budget system. The lowest level is the municipal management level, or rather municipal budget. Another levels include departments as well as regions and their budgets. The top level is the state level with the state budget and state administration. Since the 1970s, especially in France and other European countries, the understanding of public administration as not only a power activity, but also as a production activity, providing goods and services to citizens, has begun to be promoted (Goldsmith, Eggers, 2004, 56).

This role of public administration begins to gradually increase, and the division of public administration into a power part and a part providing services is essentially preserved to this day. A logical consequence of increasing interventions in production activities on the part of the public administration is an increasing number of institutions having a so-called public-law character, i.e. public-law entities. The purpose of public-law entities is primarily to implement the economic and social policy of the state, especially in the areas of services such as healthcare, education, transport, sports, etc.

Nowadays, the State Secretary for the Social and Solidarity Economy and Associative Life represents social economy system in France at national level. The task of this crucial institution is to set and to implement policies for the development of the social and solidarity economy and to support a consumption based on a solidarity. The effectiveness of this authority is enhanced by the fact that it cooperates with the French Ministry of Economy and the French Ministry of Finance. At local government level, French regions and departments support the social economy by backing measures for increasing a social welfare.

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The main aim of the paper is to present relevant economic and legal framework of the French budget. The secondary objective of the paper is to present evolution of the notion of budget in France. The hypothesis of the paper is defined as “*France was the main innovator of the budget*”. This hypothesis will be confirmed or disproved in the conclusion of the paper.

2 Methods

As far as the part dealing with the economics of the French budget, the paper draws information from official economic statistics as National Institute of Statistics and Economic Studies (hereinafter Insee) or Fitchratings. The part of the paper concerning the budgetary law and the notion of budget proceeds from the scientific literature, for example the French financial law literature. Authors as Michel Bouvier, Joël Molinier or Edgard Allix and their works are mentioned in the paper. The author of the paper also draws from his preceding work.

Scientific methods are compliant with the main aim of the paper. That is why the the descriptive method, method of analysis and synthesis and finally comparative method are used. For example, description method was used for presenting relevant economic data and legal framework of the French budget. Description, or rather historical description method was used for describing the evolution of budget in the history. Method of analysis and synthesis was used to draw conclusions from economic data. Comparative method helped to compare economic data, legal frameworks of various states and evolution of budget in various countries.

3 Research results

The chapter „Research results“ is divided into three general parts. The first part (or rather the first subchapter) is dedicated to economic data linked with the French budget. There are presented also selected macroeconomic indicators in France. The second part of the paper deals with the legal framework of the French budget (for example the kind of budget and budgeting is mentioned there). The third part of the papers occupies with the evolution of notion of budget in two selected countries – France and England.

3.1 Economic aspects of the French budget and its macroeconomic context

Although the economic growth in France is supported by automotive industry, sector of nuclear energy, machinery, chemicals, metallurgy, energy production or fashion, the French economy falls behind for example the German economy. Within national accounts, the French public entities are categorized under three sectors of the general government sector into (1) the state, or rather independent administrative bodies, which constitute Central Government, (2) the social security including many authorities managing benefits and (3) Local Government Sector.

The social security was founded after the Second World as autonomous public institutions with an administrative structure separate from the State. This social system has own origins in model “Bismarckian”, it means it was based on the social insurance model where workers had various allowance depending on levying mandatory contributions on employees and employers. This fact is due to the fact that in France there are many types of social benefits and the total amount allocated to social expenses is very high. From the point of view of the French budget, or rather the French public finance, the social security is one of the most important components. For example, social security spending has represented for the majority of government spending for more than 10 years, rising to 26% of GDP in 2016 (OECD).

The French structural deficit has been progressively decreasing since 2012 and the nominal deficit was at 2.6% of GDP in 2017. The problem remains in the structural deficit, which is still high, because the reduction in the nominal deficit is due to an increase in tax revenues (rather than a decrease in public spending). If we compare the year 1978 with the year 2017, the public debt in France increased from 21.2% of GDP to 96.8 in 2017. Nowadays, the French debt level is higher than the average in the Eurozone. The reason for contemporary public debt is the state, which as the only sector of the general government created a deficit, because the social security and local government generated a budget surplus (OECD).

In order to change this unfavorable development and revive the national economy, the government has undertaken several important reforms since 2017. The essence of these reforms was to reduce the tax burden, make investments in production capacities and change the functioning of public finances and public management. The specific steps taken by the French government consisted of cuts. Since 2017 salary growth in the public sector was moderated, housing subsidies were reduced and health spending was reduced. On the other hand, in order to support economic growth and the purchasing power of consumers, the government decided on large tax reliefs.

It should be written that the French budget has been in the negative for a number of years – since the first oil shock in 1975 and without regard to up-turns or down-turns of the economic cycle. For that reason, the main aim is the gradual reduction of the fiscal deficit with the help of limited spending cuts. In this context, the new budget proposal for 2024 is also being relied upon, which is based on favorable macroeconomic surmises. The continued high indebtedness to France

was the reason why France's Long-Term Foreign Currency Issuer Default Rating (IDR) was downgraded to 'AA-/stable' from 'AA/negative' (Fitchratings).

According to the proposal of the French budget for 2024, a fiscal deficit of 4.4% of GDP is indicated, which is better than in 2023, when the fiscal deficit of GDP was 4.9%. The mentioned savings are mainly achieved thanks to the termination of energy subsidies in the total value of 15 billion euros (this corresponds to 0.5% of GDP) and also due to the termination of support in connection with the Covid-19 pandemic. On the other hand, defense spending increased by 3.3 billion euros over the next two years due to new security threats. In the draft budget for 2024, you can also see a favorable assumption of employment growth, as well as an assumption of real GDP growth, which should have a value of 1.4%.

As for other key indicators and their development in the past, 57% of value added was represented by traded services. In 2022, the annual inflation in France was +5.2% (compared to 2021 when it was only +1.6% and +0.5% in 2020). Likewise, purchasing power represented by a disposable income increased by +0.2% over the previous year. This situation is caused by a demographic growth. On the other hand, the consumption of each person (consumption unit) decreased by -0.3% (Insee).

3.2 Legal aspects of the French budget

Budgetary law legally regulates budget as an economic and legal instrument. However, budgetary law is not an independent legal branch, but it is a sub-branch of financial law. More precisely, it is a legal branch belonging to the fiscal part of financial law (from the point of view of the Czech financial law theory). In the case of France, this area is called public financial law, or law of public finance. In France, the notion of financial law means banking law and law of financial markets (from the point of view of the Czech financial law theory, this is a non-fiscal part of financial law). It is possible to state that budget law is probably the most important sub-branch of public financial law, because it is a legal regulation of public finance drawing from public budgets (including the European Union budget). Compared to budgetary law, for example tax law has a different position in France. For the sake of completeness, it is appropriate to add that tax law in France is considered, due to its historical evolution, as a separate branch of law.

In France, budgetary law is linked with to multi-annual financial planning at all levels of fiscal federalism. It means that multi-annual financial plans are being prepared both in the case of the state budget and in the case of municipal budgets. Within multi-annual financial planning, a distinction is made between short-term, medium-term and long-term financial planning. These kinds of multi-annual financial planning are used in practice depending on how public funds are acquired and spent or how detailed the financial plan should be planned. The length of multi-year financial planning is naturally related to the needs of the relevant public administration unit.

In France, budgetary law is interconnected with the public accounting, which is considered as another sub-branch of public financial law. Public accounting is the French specialty, because its substance (including accounting standards) was adopted from corporate accounting. In other words, corporate accounting significantly inspired the French model of public accounting. Public accounting in France affects the budgets of the entire public sector (state, territorial self-governing units or public hospitals), and at the state level it mainly affects the so-called main account of the state (Bartes, 2022, 256).

As for the distinguishing features of the French budget, it can be characterized as a performance and multi-annual budget. It is very important to make a distinction between terms *budget* and *budgeting*. Whereas notion *budget* means crucial instrument for planning and managing of public finance in the state, notion *budgeting* presents whole process connected with economic activities of states or another public entity. Notion of *budgeting* includes notion of *budget* as a financial plan, but includes also a budget preparation, an implementation of budget, a control of budget (internal and external control). For that reason, it can be concluded that the term *budgeting* is a much broader and more comprehensive term than the term *budget*. According to features of budgeting, the French method of budgeting can be characterized as multi-annual, performance and programme budgeting.

The Polish important and well-known scientists T. Lubińska has defined performance budgeting as „*managing of public funds through specific and hierarchical objectives in order to achieve specific results (fulfilment of tasks), measured using a set system of indicators (so-called management by objectives)*” (Lubińska, 2007, 9). For that reason, performance budgeting as a method of planning, execution and control of the performance budget in the legal sense can only be used in countries where the performance budget has replaced the traditional budget. Such a situation occurred in France, and therefore there is no doubt that in the case of France, the performance budget is prepared, executed and controlled through the performance budgeting method (Bartes, 2019, 54). The performance budget is one of the methods of budget programming, or planning. The gradual replacement of the previously used term budget planning with the term budget programming is a consequence of the transfer of methods of modern public spending planning based on

measurement of results to the public sector. Planning and programming can be expressed by the common concept of designing or projecting, which is an integral feature of any budget, regardless of the technique used to estimate its numerical values. The key elements of the performance budget are both task-based and performance classification, which in France consists of functions, tasks and then the so-called performance part (Zawadska, 2014, 19).

The French budgetary law is based on the principle of unity. This principle means, that all revenues and expenditures of the state are included in the same law – the financial law. In France, the stated principle of unity is supplemented by a so-called time requirement. In other words, due to its predictability, the financial law must be adopted before the end of the fiscal year, i.e. before December 31 of the year preceding the year to which the budget applies. Every year, the Parliament comments on the income and expenditure of the state, which it subsequently approves. For example, in England, a certain portion of income and expenditure is approved permanently, usually during the election of the monarch to office and for the duration of his reign. The rest of the income and expenditure are repeatedly approved by the Members of Parliament. This English system was promoted in France by René Stourm, as it would allow the French parliamentarians to concentrate their efforts only on those budgetary issues, the approval of which is really necessary (Stourm, 1900, 58). As in the Czech Republic, the fiscal year in France also coincides with the calendar year (i.e. from January 1 to December 31).

The material meaning of the notion *budget* is also an interesting thing. For example, on the one hand in England, from the 19th century until 1993, the notion of budget was basically used in connection with the proposal of revenues. A use of notion of budget in connection with public expenditures was not essentially exist. On the other hand, in France, this notion refers to both income and expenditure at the same time, and several legal and doctrinal definitions can be seen. Just to name a few, “*the budget is the act by which are foreseen and authorized the annual revenues and expenditures of the State or other service which the laws subject to the same rules*” (article 5 of the Decree of May 31, 1862 concerning General Regulations on Public Accounting). In later French law the budget was defined as “*The state budget provides and authorizes, in the legislative form, the state's costs and resources*” (Article 1 of organic decree of 19 June 1956 determining the method of presentation of the State). According to the Article 2 of the Regulation of January 2, 1959, on the Organic Law on Financial Laws, “*the annual financial law (= state budget) determines and approves, for each calendar year, all resources and costs of the state.*”

3.3 Evolution of the notion of budget and its context

It is no coincidence that France and the budget institute are chosen for this paper. Notion of budget has its origins in the French word *bougette*, which means a small leather bag (for coins), diminutive *bouge*, i.e. the old term for sac. This term was exported to England very soon and caused the oral deformation of the French word *bowgette* (1432-1450), *boget* (1548), *boudget* or *bouget*. At first, these terms denoted a travel rucksack, pouch or money box. The word *budget* was used in such expressions as “a budget of paradoxes” or “a budget of inventions”. The financial importance was manifested, for example, in the speech of the Chancellor of the British Ministry of Finance, who became famous with the statement “*he opens his budget*”. The first official use of this term appeared together with a pamphlet called “The Budget Opened” published in 1733 by the then ruling garniture. Roughly 30 years later, this term was already commonly used in English and returned to France, but this time enriched with its financial meaning (Rey, 1992, 236).

After 1768 the notion of budget denoted the annual statement of public expenditure and revenue (Brittain, 1959, 23). The notion of budget in this sense did not spread in France until after the Revolution, when the term “budget” appeared for the first time in the laws of the French government from the period of the 4th Thermidor of the year X and from the 17th Germinal of the year XI (i.e. the period between the months of August 1802 and the month of April 1803), when this term replaced the previous French designation of the statement of income and expenditure (Orsoni, 2005, 207).

The basis of the French budgetary law date back to 19th century, when Baron Louis introduced his concept of the budgetary law and thus laid the foundations in France of the rule here called four alternating phases – preparation and implementation of the budget are subordinate to the government, voting and control are subordinate to the chambers of the Parliament. For almost two centuries, the entire French budget law has been governed by this cardinal rule. All publications devoted to state finances respect the mentioned budgetary procedure, whether they are publications from the first half of the 20th century (e.g. Allix, 1931) or those that touch on positive law under the Fifth Republic (e.g. Bouvier, 2004).

In 1814, Baron Louis suggest to set expenditure first, and then to set incomes. This procedure was inspired by the English budgeting tradition according to which the British Parliament approves and allocates resources and subsequently finds the necessary resources to cover them (Molinier, 1969, 65). The rule of four alternating phases has characterized English budgetary law since the Glorious Revolution of 1688, i.e. more than a century before it happened in the French budgetary law. However, it was not only a rule of four alternating phases, because overall it can be stated that the parliamentary usurpation of financial rights as such took place in England a century before France (Jèze, 1910, 46).

Likewise, the principle of consent to taxation was declared in England through the Magna Carta in 1215, while its recognition in France only resulted from the Assembly of Estates in 1314. In England, the principle of consent to taxation had to be re-emphasized after the Glorious Revolution through the Bill of Rights from 1689. In France, this happened at the time of the Revolution in 1789 through the Declaration of the Rights of Man and Citizen, i.e. again centuries later.

4 Conclusions

The paper dealt with economic and legal issue of the French budget. For that reason, the author focuses on main economic indicators of the French economics and then the legal framework of the budget in France. To the above, the author added the historical evolution of the term budget and its relevant context. In these parts the author used suitable scientific methods as for example methods of analysis and synthesis, comparative method or descriptive method.

In the part which was dealing with the economics of the French budget, there were mentioned crucial macroeconomics indicators as GDP, inflation or unemployment rate. The economics data covered both previous years and the proposal of the French budget for the next year. According to general data, France has a problem with permanent indebtedness, but it is managing to slowly reduce its fiscal deficit. In the second part devoted to the legal aspects of the French budget, there was mentioned the systematics of the financial law, or rather French public financial law. Within the system of the public financial law, the position of budgetary law was determined. Subsequently, the specifics of the French budget law were presented and differences between terms *budget* and *budgeting* were pointed out. Finally, the French budget, or rather budgeting was characterized by the view of its defining features, among which performance budgeting ranks. In the third part of the paper, the author analyzed the notion of budget, focusing on etymological basis and its subsequent development. Attention was also paid to the material meaning of the term budget, when this meaning was demonstrated by comparing the French and English budgets.

It was the comparison of the concept of the budget in France and England, including the analysis of its historical context, that significantly helped to answer the hypothesis set out in the introduction of the paper. From this comparison, it was found that although the term budget is etymologically French, England was a significant innovator of its material meaning. For that reason, the hypothesis stated in the introduction as “*France was the main innovator of the budget*“ was disproved. The conclusion can be stated that the main and secondary aims of the paper have been met.

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Innovative forms of financing and capital structure transformation in the digital age

Silvia Bastyr¹

Abstract: This article focuses on innovative forms of financing and their impact on the transformation of capital structure in the digital age. With the rapid development of digital technologies and the environment, new financing opportunities are emerging for businesses and investments. Crowdfunding, Initial Coin Offerings (ICO), peer-to-peer loans, and other innovative tools are bringing alternatives to traditional forms of financing. The article will address how these innovations are changing the way companies acquire and manage capital. Additionally, we will explore the challenges that these new approaches bring, including regulatory frameworks and security questions. The article aims to contribute to a better understanding of this issue and discuss general trends in innovative forms of financing and capital structure.

Keywords: innovative financing, capital structure, digital age, crowdfunding, initial coin offerings, peer – to – peer loans, venture capital, regulation

JEL Classification: O10, O33

1 Introduction

With the onset of the digital age, where digital technologies permeate every aspect of our lives, significant changes are also occurring in the field of finance. The rapid development of digital technologies and the dynamic environment of the digital world open up new perspectives in addressing financial challenges and achieving new goals. The way companies acquire and manage capital is changing. With the entry of the digital revolution into the financial sector, traditional methods of capital procurement are gradually becoming inadequate and are being replaced by new, innovative approaches brought by the digital age

In the last decade, we have witnessed a rapid development of technologies, bringing about new possibilities in the field of finance.

These changes are driven by factors such as globalization, digitization of economies, and shifts in consumer habits. Consumers, investors, and the business sector all demand faster, more transparent, and more flexible financing. It is an undeniable fact that the world around us is changing faster than ever before. The main driver of this change is technological progress, particularly in the field of information and communication technologies. These technologies open the doors to new forms of communication, interaction, and commerce. In this rapidly evolving environment, businesses are seeking more flexible and innovative ways to raise capital, enabling them to respond more agilely to new opportunities and challenges.

Innovative forms of financing bring new ways of acquiring capital that were hard to imagine just a few years ago. While traditional bank loans may be limited by various regulatory factors, new forms of financing, such as crowdfunding or Initial Coin Offering (ICO), introduce greater flexibility and access to a broader range of investment sources. These innovations open doors for businesses of all sizes and investment projects, thereby reshaping the traditional financial model. They can lead to the diversification of the capital structure and, at the same time, better adapt to dynamically changing market conditions.

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As the title of the article already suggests, the main objective of this contribution is to analyze the impact of innovative forms of financing on the transformation of companies' capital structure. In this context, the capital structure is understood not only as sources of financing but also as the way these resources are utilized and managed

In the following chapters, we will explore specific examples of innovative forms of financing, their advantages, challenges, including aspects related to regulation, security, and their impacts on corporate capital structures in the digital age.

2 Methods

In order to provide a comprehensive and in-depth view of innovative forms of financing in the digital age, we employed a mixed-methods approach encompassing various research methodologies.

- **Literature Review:** Our first phase involved a systematic analysis of current scholarly literature. This allowed us to identify key discussions, trends, and gaps in existing knowledge, informing the theoretical foundation of our research.
- **Quantitative Analysis:** Simultaneously, we collected and analyzed data from relevant platforms and databases. Using statistical methods, we examined trends and patterns in innovative finance, such as peer-to-peer lending or crowdfunding campaigns.
- **Case Studies:** Complementary to the above methods, we conducted detailed examinations of specific companies or projects in the field. These case studies provided us with a deeper understanding of the successes and challenges associated with the use of innovative forms of financing.

3 Innovative Forms of Financing: Fundamental Concepts and History

It is appropriate to begin by asking the question: What do we actually mean by the term "innovative forms of financing"?

Innovative financing methods represent alternative means and tools for obtaining capital that differ from traditional methods of financing, such as commercial bank loans or stock issuances. They often involve raising funds from the general public, utilizing decentralized platforms, and leveraging digital technologies for managing financial transactions. These forms of financing often become an alternative way for organizations and individuals to acquire the necessary capital for funding their projects, developmental initiatives, and investments. What truly makes these forms of financing innovative is their ability to change the way financing is conducted.

The extensive history of innovative forms of financing provides an important historical context for understanding how these new methods have evolved and become a significant part of the current financial ecosystem. Innovative forms of financing, although they may seem like a novelty of the modern digital age, actually draw from practices that have existed for centuries. Historical records, for example, show that in the past, pre-selling tickets was used as a mechanism for financing various projects, including the construction of statues and other public installations in the 18th and 19th centuries.

With the advent of the internet in the 1990s, the first signs of new and innovative forms of financing emerged. The beginnings of peer-to-peer lending can be traced back to the early 21st century, this period laid also the foundation for the later development of crowdfunding. Researcher and professor at the Wharton School, University of Pennsylvania, Ethan R. Mollick, in his article "The Dynamics of Crowdfunding: Determinants of Success and Failure," (2014), analyzed the factors influencing the success and failure of crowdfunding campaigns, providing us with a comprehensive overview of the evolution and effectiveness of this financial tool. The expansion and popularity of crowdfunding methods reached its peak with the arrival of the Kickstarter platform in 2009, which popularized the model of funding projects through pre-selling products or services. This period was followed by a series of other platforms, including Indiegogo and GoFundMe, each with its own unique approach to this form of financing. Concurrently with this development, platforms like LendingClub and Prosper began to emerge, revolutionizing the lending industry by enabling individuals to borrow money directly from individual investors without the need for a traditional banking institution as an intermediary. Over the next few years, with the rise of cryptocurrencies and blockchain technology, another breakthrough occurred in the world of financing. New forms of capital acquisition were created, including Initial Coin Offerings (ICO) and Security Token Offerings (STO), allowing businesses to raise funds directly from investors by issuing digital tokens or cryptocurrency. Many publications, such as the work of Sabrina T. Howell, a professor at the Stern School of Business, New York University, in her paper "Initial Coin Offerings: Financing growth with cryptocurrency token sales," (2019) explored the phenomenon of ICOs and their impact on project financing, offering valuable insights into this new method of funding and its ascent. These and other events and developmental milestones clearly demonstrate the significant evolution and innovation in financing methods over the past few decades

In the world of modern finance, new methods for companies to access capital outside of traditional banking channels continue to rapidly evolve. Innovative forms of financing represent contemporary and unconventional ways of raising capital. These methods are emerging in response to the rapidly changing technological landscape, shifts in consumer habits, and the need for greater flexibility in funding various projects and business initiatives.

These forms of financing may include, for example:

- **Crowdfunding:** Online platforms where individuals or organizations can raise funds from the general public based on various models, such as rewards, equity, bonds, or donations.
- **Peer-to-Peer Lending:** Platforms that enable individuals or businesses to borrow money directly from other individuals or groups without a traditional banking intermediary. These loans offer a decentralized approach to financing and can support small businesses and individuals.
- **Initial Coin Offerings (ICO) or Security Token Offerings (STO):** Processes for raising capital by issuing new cryptocurrencies or tokenized assets
- **Venture Capital:** Investment in startups and young companies with significant growth potential in exchange for ownership in the company and active involvement in its development.
- **Digital Asset Financing:** Involves trading tokenized forms of assets, such as real estate, art, or commodities, on blockchain platforms.
- **Other Technology-Based Platforms:** Such as AI-based investment platforms, micro-investment platforms, or platforms focused on specific sectors or types of businesses.

Innovative forms of financing often come with advantages such as faster access to funds, greater flexibility, and opportunities for a wide range of participants. However, they can also bring new risks and challenges associated with regulation, transparency, and security. The brief historical overview provided helps us understand how these forms of financing have evolved and adapted to new technological and societal trends in recent years. It's important to keep in mind that these forms of financing are dynamic, and their development is continuously ongoing.

4 Approaches to innovative forms of financing (selected forms)

Crowdfunding, often referred to as collective financing, is a phenomenon representing an alternative way of funding that fundamentally shifts the paradigm of project and business financing. Its significant impact on the capital structure of organizations lies in its ability to enable organizations to raise funds from a large number of individual investors, each of whom may have a stake in the project or a claim to future profits. The process of gathering funds from the "general public" typically takes place through specialized platforms that connect those seeking financing with potential investors.

Researchers in the field of crowdfunding are actively analyzing various forms of this alternative financing method, not only in terms of their impact on organizations but also concerning individuals. Given the diverse aspects of crowdfunding, researchers strive to analyze its manifold manifestations and consequences, sparking discussions about potential benefits and risks associated with this form of financing.

Various forms of crowdfunding, also known as collective financing, are subjects of intensive research. Researchers examine these financing forms not only in their impact on organizations but also in relation to individuals. They seek to understand their diverse expressions and consequences, including potential advantages and risks that can affect not only businesses but also individual investors and contributors.

The types of crowdfunding can be summarized as follows:

- **Reward-based Crowdfunding:** In this case, supporters contribute money to a project in exchange for a reward, often in the form of a tangible product or service. Popular platforms such as Kickstarter or Indiegogo operate on this principle.
- **Equity-based Crowdfunding:** Investors are offered shares or equity in the company in exchange for their investments. It's a way for small businesses to raise capital outside traditional stock markets.
- **Debt-based Crowdfunding:** This form, often referred to as peer-to-peer lending, allows individuals to borrow money directly from investors.
- **Donation-based Crowdfunding:** This model is purely philanthropic, where people donate money to support causes or projects they consider valuable, without expecting financial returns.

Crowdfunding offers numerous benefits, such as quick access to funds, the opportunity to test the market or product, and building a community around the project. However, it also comes with disadvantages like competition and the demanding campaign preparation process. Crowdfunding challenges are related to the need for active communication

with contributors, risks of unfulfilled promises, project failure, as well as legal regulations and compliance in some jurisdictions.

Initial Coin Offerings (ICO) have become a significant financing tool in the digital age over the past decade. In the context of the growing importance of blockchain technology and cryptocurrency, ICO has emerged as a mechanism that transforms traditional capital-raising methods for new and innovative projects. Historically, ICO represents the democratization of the investment process. While traditional financing methods often require intermediaries or complex regulatory processes, ICO allows businesses and organizations to raise capital directly from the general public. This has shifted the power from the hands of traditional financial institutions to individuals and small investors who can actively participate in financing and influencing new technological initiatives.

Another significant aspect of ICO is the speed and efficiency with which capital can flow. In the globalized digital economy, projects can raise significant funds from investors worldwide within a matter of weeks or even days. This phenomenon is particularly important for projects that may be considered too risky or unorthodox for traditional investment channels.

A key characteristic of ICO is also the ability to tokenize assets and services. This represents a fundamental change in how value and ownership can be distributed and traded. For example, instead of issuing shares, a company can issue digital tokens that represent ownership rights, dividends, or any other form of value. However, like any innovative financing mechanism, ICO comes with significant risks. Due to its novelty and unfamiliarity, this area has become a target for many fraudsters and dishonest actors.

The regulatory framework for ICO is still evolving in many jurisdictions, bringing significant legal uncertainty. Despite these challenges, it is clear that ICO represents a revolutionary change in the field of financing and opens the doors for many innovative projects and technologies. Its role in modern finance is inseparable, and it is important to understand its potential as well as the challenges it brings.

Peer-to-peer lending (P2P), often referred to as social lending, represents an innovative financing model that utilizes digital technology to maximize efficiency and transform the traditional banking system. In the context of this model, platforms act as intermediaries between individual lenders and borrowers, eliminating the need for traditional financial institutions. For small businesses, this approach to financing can bring significant advantages. In particular, small businesses, which are often perceived as high-risk by traditional banks due to their novelty or limited credit history, may face challenges in obtaining funding. P2P platforms, however, often provide more flexible evaluation criteria, which can increase the chances of small businesses securing the desired funds

Furthermore, as P2P platforms operate without traditional banking and administrative costs, they can offer more competitive interest rates, which is economically attractive for small businesses. Given these lower costs and more flexible assessment models, P2P platforms can process and approve loans quickly, resulting in faster access to cash for entrepreneurs.

Moreover, transparency is another key characteristic of P2P lending. Many platforms allow borrowers and lenders to have a better overview of interest rates, terms, and risks, leading to better awareness and the ability to make informed decisions. However, like any financing model, P2P loans come with their challenges. Despite many advantages, this model can be vulnerable to risks associated with inadequate regulation, potential lack of security, or a higher rate of default. Ultimately, in the context of digital transformation and a changing financial landscape, P2P lending offers a new and innovative way of financing that can have a significant impact on small businesses.

Venture capital represents one of the primary pillars of financing for many startups and innovative businesses. Its primary goal is to provide investments in young companies with significant growth potential in exchange for equity in the company. Given the risky nature of these investments, venture capitalists focus on projects with high potential for return on investment.

Venture capital has several unique characteristics that set it apart from traditional forms of financing. Investors in this sphere are often willing to accept higher risks in exchange for the potential for significant returns. In addition to financial capital, they often bring their expertise, contacts, and mentorship to the invested companies, adding value beyond pure monetary investment.

Venture capital and innovative forms of financing provide companies with a variety of tools to acquire the necessary capital while also creating strategic partnerships that can support their growth and innovation. In today's dynamic and competitive business environment, the ability to leverage these tools is often key to success.

5 Impact on capital structure

The impact of innovative forms of financing on the capital structure of companies is undeniable and can have significant implications for their financial stability, competitiveness, and strategic growth. The capital structure, which characterizes the ratio between equity and debt capital, may change not only due to the volume of funds but also due to their source, terms, and flexibility that innovative forms of financing bring. In the context of a globalized economy and technological innovations, companies increasingly recognize the need to diversify their sources of funding. Venturing into the realm of innovative financial instruments can mean access to more flexible and often cheaper capital. This flexibility can lead to companies being less reliant on traditional bank loans and being able to optimize their capital structure for a competitive advantage. Furthermore, as many innovative forms of financing are less regulatory burdened and often less dependent on traditional credit ratings, companies in certain sectors or life stages can benefit from faster access to funds. For example, startups that may have difficulty obtaining traditional financing due to a lack of credit history or collateral can find opportunities in P2P lending, crowdfunding, or venture capital. All these changes in financing methods can affect the capital structure by increasing the proportion of equity (e.g., through crowdfunding or ICOs) or reducing the debt burden if companies prefer alternative financing methods over traditional debt. However, it should be emphasized that while innovative forms of financing offer many opportunities, they also come with certain risks. The absence of regulatory oversight, potential higher volatility, and uncertainty about the long-term sustainability of some of these instruments can complicate companies' decision-making processes in selecting the optimal capital structure.

Innovative financing approaches that have rapidly evolved in the past decade have fundamentally transformed the capital structure model of many organizations. These changes are reflected not only in the structure of financing but also in how companies approach the evaluation and management of their capital. Historically, many organizations relied on traditional sources of financing such as bank loans or bond issuances, resulting in a clearly defined capital structure based on the ratio of equity to debt.

The emergence of new forms of financing, such as crowdfunding, ICOs, P2P lending, and venture capital, has enabled organizations to access a broader range of financial instruments. One of the primary impacts of these innovative approaches is the diversification of capital sources. Companies are no longer limited to the local banking sector or traditional capital markets. This diversification can increase the financial resilience of companies against local or sector-specific economic shocks, as they have access to global sources of capital. Furthermore, the flexibility and speed at which funds can be obtained through innovative forms allow organizations to respond more quickly to market opportunities. This enhances their competitiveness and their ability to rapidly expand their operations. Equally significant is the impact on the risk profile and valuation of companies. In the event that a company chooses to finance itself through methods such as ICOs or crowdfunding, it may be perceived as the ability to attract capital without burdening the balance sheet with debt, which can positively affect the company's valuation and market value.

On the other hand, innovative forms of financing can also bring about certain challenges. Regulation in the field of new forms of financing is often unclear, which can create legal risks for organizations. Additionally, some of these forms may be associated with higher volatility and uncertainty, requiring thorough analysis and risk management. However, it is evident that innovative financing approaches are fundamentally changing the way organizations structure their capital and manage their financial resources. These changes bring not only new opportunities but also challenges that owners and financial managers of organizations must face in today's complex business environment.

Over the past decade, we have witnessed many examples of companies in international as well as local markets that have successfully utilized innovative forms of financing to support their growth, innovation, and expansion into new markets.

Here are a few examples of companies from various sectors that have significantly leveraged these modern financial tools:

- **Tesla, Inc.:** While Tesla is now synonymous with electric vehicles and energy innovations, in its early days, the company faced significant financial challenges. In its early stages, the company encountered significant financial hurdles and used pre-orders of its models to obtain the necessary capital and validate market interest in its products, representing a form of crowdfunding.
- **Ethereum:** This decentralized platform set a new standard for ICOs (Initial Coin Offerings) in 2014 when it raised over \$18 million in the sale of its native token, Ether. This funding enabled the development of the platform and laid the foundation for many other blockchain projects.
- **Kickstarter and Indiegogo projects:** These platforms are home to thousands of projects that have raised funds through crowdfunding. Examples include the game "Exploding Kittens," which raised over \$8 million in funding, and the high-tech Pebble smartwatches, which raised over \$20 million.

- LendingClub: The company transformed the peer-to-peer lending market, allowing individual and institutional investors to invest in personal loans. Its growth and success demonstrate the potential of this financing model in modern banking.
- WeWork: Despite its later troubles, this company secured a significant amount of capital from venture capital firms, highlighting the strength of this financing approach when it comes to growth and expansion.
- Pixel Federation: A Slovak company specializing in creating popular mobile and online games, used a form of financing known as equity crowdfunding, specifically on the Crowdcube platform, to fund its projects. This approach allowed its fans and players to invest in its projects and gain a share of the profits. Thanks to this strategy, Pixel Federation successfully obtained the necessary capital while engaging the community in its activities.

These examples of international projects as well as local companies illustrate that innovative forms of financing have the potential to support the growth and development of organizations. Many companies have successfully utilized these tools to change their capital structure and achieve their business objectives. Whether it's startups seeking initial funding or established businesses aiming to expand, modern financial instruments can offer individually tailored solutions that effectively address their unique needs.

6 Challenges and Opportunities

In the context of innovative forms of financing, the current digital age brings many challenges and opportunities. When analyzing this phenomenon, it is important to understand that while new financing mechanisms open doors for business innovation and growth, they are also associated with complex issues that require a thorough reconsideration of traditional business and financial models. In the realm of regulation, innovative forms of financing such as ICOs or P2P lending often find themselves in a regulatory gray area. Relevant regulatory authorities are systematically addressing the issue of how to regulate these new financial instruments adequately, aiming to strike a healthy balance between investor protection and innovation support. This is an aspect that contributes to creating legal uncertainty for businesses seeking to leverage new forms of financing. It is also a factor that potentially increases the risk for investors.

As for the risk profile, new forms of financing can bring higher volatility and uncertainty. An example is the value of cryptocurrencies, which can rapidly change due to market speculation, news, or geopolitical events. This risk can be heightened if businesses or investors do not fully understand the mechanisms and technologies behind these innovative financing tools. On the other hand, the opportunities associated with the development of innovative forms of financing are truly enormous. The availability of capital for entrepreneurs who would otherwise have no access to traditional sources of financing can significantly contribute to economic growth and innovation. These tools also enable businesses to quickly respond to market opportunities, diversify their sources of financing, and adapt to changing market conditions. Innovative forms of financing present an intriguing paradox for the modern business world. While they offer significant opportunities for growth and innovation, they are also accompanied by challenging issues that require a comprehensive understanding and a strategic approach from entrepreneurs, financial professionals, and regulatory authorities.

With the advent of innovative forms of financing, regulatory authorities worldwide have to manage or handle rapid developments and ensure that new financial instruments and platforms are transparent, secure. This regulatory need is often dictated by the necessity to protect consumers and investments while not stifling innovation. In many markets, efforts are made to create regulatory frameworks that promote stability and trust in these new methods of financing. These regulatory steps can have a direct impact on the attractiveness of a specific market for investments and can also influence capital flows on a global scale. Security concerns are an integral part of the discussion about innovative forms of financing. In the case of cryptocurrencies and blockchain technologies, there may be risks associated with unauthorized access, data loss, or potential network attacks. In the field of peer-to-peer lending, problems related to invalid or fraudulent loan requests can arise. These security threats can potentially erode the trust of investors and consumers in new financing platforms and tools. Legitimate concerns require companies and platforms to invest in robust security protocols and procedures to protect their users and ensure the integrity of their services. Regulation plays a key role in shaping and developing these mentioned new forms of financing. The primary goal of regulation is to ensure the protection of investors and the public who participate in these innovative forms of financing. Therefore, many measures have been adopted in the European Union (EU), as well as partially in Slovakia (SR) and the Czech Republic (CZ), in this context to increase transparency and risk management.

All of these regulatory steps aim to strike a balance between promoting innovation and ensuring the protection of investors and the public. Regulatory authorities in Slovakia (SR) and the Czech Republic (CZ) are determined to adapt to

the rapid development of new financial technologies and ensure that the market for innovative forms of financing is safe and transparent for all stakeholders.

As we have already mentioned before, innovative forms of financing also represent a tremendous opportunity. They can provide entrepreneurs with access to capital that might not be available in traditional financial systems. For example, through crowdfunding, companies can test market interest in their products before investing large sums in production. ICOs can offer startups the opportunity to raise capital without the need for traditional venture capital investors. And peer-to-peer lending can provide small businesses with the chance to obtain funding without having to meet strict banking requirements. These possibilities can create conditions for faster innovation, greater economic diversification, and democratizing access to financing. However, these mentioned benefits must be balanced against the potential risks and challenges that these new forms of financing bring.

7 Conclusion

In the current digital era, we are witnessing a transformation in the field of finance, where innovative methods are gaining importance and becoming an integral part of the global financial ecosystem. From a detailed analysis of various aspects of selected forms of innovative financing (crowdfunding, ICO, P2P, venture capital), including their definition, historical development, and current trends, it is evident that these methods bring new opportunities for entrepreneurs and investors and have significant potential to positively transform the capital structure of corporations. They provide flexibility, democratize access to capital, and can significantly increase capital efficiency. Regulatory aspects are crucial for stability and trust in new financing methods. Without appropriate regulation, the growing use of these tools can lead to legal uncertainty and potential financial crises. Security considerations are equally important, with platforms and companies offering these services needing proper security protocols to protect investors and users. On the other hand, innovative financing brings tremendous potential for businesses and investors. Access to new sources of capital, the ability to test market interest in products and services, or the ability to bypass traditional financing obstacles can contribute to faster innovation, economic diversification, and overall democratization of finance.

In today's dynamic world of finance, it is essential to be fully informed and prepared to implement these innovative financing approaches. By combining innovation, proper regulations, and a strategic approach to security, innovative financing can contribute to the long-term growth and stability of the economy in the digital age.

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Are new highways beneficial for regional economic development?

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Abstract: In 2007, a new 50-kilometer section of highway connecting Prague and Hradec Králové was opened to the public. This notably reduced travel time between these two cities by approximately 15 minutes. Employing a rigorous analytical approach that combines the difference-in-differences methodology based on the synthetic control method with panel regression techniques, this study investigates the impact of this highway expansion on regional economic dynamics, namely the pace of firm establishments. According to our results, the faster travel facilitated by the new highway had the consequence of slowing the pace of firm creation in municipalities lying close to the highway, which were able to benefit from faster travel times. We expect that the introduction of the new highway segment amplified the gravitational pull of major urban centers, attracting economic activity away from the surrounding regions.

Keywords: Commuting time, highway, road infrastructure, economic development, firm creation

JEL Classification: H54, R41, J61

1 Introduction

It is widely acknowledged that investments in transportation infrastructure play a pivotal role in driving economic growth (Aschauer 1989; Barro 1990; European Commission 2011; Ciani, de Blasio and Poy 2022). Enhanced infrastructure not only diminishes the time and financial burdens associated with transportation for both individuals and businesses (Gunasekera, Anderson and Lakshmanan 2008) but also facilitates the expansion of trade and transportation distance of companies (Pol 2003). This expansion grants producers access to more distant markets and allows them to source inputs from broader geographical areas, which may stimulate local production (Hong, Chu and Wang 2011). This argumentation, which is based on classical localization theory, assumes a high social return on investment in transport infrastructure, thus justifying the necessity of state intervention in this sector.

However, it is crucial to recognize that new infrastructure projects not only influence the overall level of economic activity but also shape its spatial distribution (Ciani, de Blasio and Poy 2022). Some firms located in more developed regions may indeed benefit from reduced transportation costs, enabling them to access new markets and supply more remote regions from greater distances. However, investments in transport infrastructure, especially in significant projects like new highways, may not necessarily lead to a reduction in regional disparities. Instead, they often promote further economic development in core areas while complicating the growth of economic activities in remote and disadvantaged regions. In evaluating the effectiveness of infrastructure investments, it is important to consider other factors of regional development, including educational, innovative, and institutional variables (Crescenzi and Rodríguez-Pose 2012; Crescenzi, Di Cataldo and Rodríguez-Pose 2016).

Empirical studies further substantiate the notion that new infrastructure projects do not guarantee equitable regional economic development. For instance, Pereira and Andraz (2005), in their examination of the consequences of infrastructure investment in Portugal, confirm economic development in the Lisbon metropolitan area and improved macroeconomic outcomes, but at the cost of persistent regional disparities. Similarly, the study conducted by Ciani, de Blasio and Poy (2022) reveals that the A3 Salerno-Reggio Calabria highway, constructed between 1962 and 1974, primarily led to the relocation of population and economic activities to areas adjacent to the highway, rather than fostering growth throughout the entire region. Mičúch and Tvrz (2015), in their analysis of the expansion of the highway network in Slovakia from 1995 to 2014, do not confirm a clear and enduring impact of new highways and expressways on the unemployment rate. Their findings suggest that, up until 2009, the introduction of new expressways did contribute to a

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reduction in the unemployment rate in neighboring districts (by 0.6% for highways and 0.4% for expressways), but this effect did not extend beyond a two-year horizon.

The literature indicates that high-speed communications play a crucial role in promoting the decentralization of economic activities (Baum-Snow, Freedman and Pavan 2018). However, it's important to note that they can also put distant localities at a disadvantage (Baum-Snow 2007). The main point to emphasize is that as new economic hubs develop, it can come at the expense of areas that are pushed towards the periphery (Redding and Turner, 2015). Infrastructure projects, particularly new ones, have a significant impact on the equilibrium between forces that encourage agglomeration and those that promote dispersion. Consequently, they can hinder the industrialization of peripheral areas. To enhance the competitiveness of domestic companies, supporting intra-regional transport networks may prove to be a more prudent solution (Vickerman, Spiekermann and Wegener 1999).

Towards the close of 2006, a new 50-kilometer stretch of highway linking Prague and Hradec Králové was made accessible to the public. This fresh infrastructure project had the remarkable effect of trimming the travel time between these two cities by an estimated 15 minutes while, making substantial enhancement to the quality of the road network in the surrounding regions. In this paper, our primary objective is to examine the impact of this transformation on economic development within the affected areas. As the literature survey has shown, the impact can manifest in a dual manner. On one hand, the newfound connectivity may serve to bolster economic activity within the region. On the other hand, it may trigger a migration of economic activities towards more sizable economic centres, particularly the large capital city of Prague, which is expected to have a strong gravity towards economic activities.

2 Methodology

In this chapter, we present the methodological framework employed to investigate the impact of a new highway segment on the economic activity in specific municipalities affected by an examined change. The economic activity within these municipalities is proxied through changes in the number of existing firms as its main drivers. To facilitate this analysis, we utilize data collected at the level of administrative units known as municipality with extended power ("obec s rozšířenou působností", abbreviated as ORP), which are municipalities endowed with enhanced rights and responsibilities in public administration, effectively serving as administrative centres for their respective microregions. These administrative units, from the systematic point of view, are smaller in compared to districts (LAU1) yet encompass several municipalities (LAU2). We use this level of aggregation as the Czech statistical office publishes more elaborate data on this level, than on a level of single municipalities – including data on a number of active firms that are crucial in our research.

To assess the causal effect of the new highway segment on firm creation, we have developed a methodological approach based on the difference-in-differences (DID). In this research framework, we construct synthetic control measures as counterfactuals for evaluation purposes. The synthetic control approach enables us to construct a hypothetical control group that closely resembles the treated municipalities but did not experience the introduction of the new highway. Synthetic control measures are constructed for each treated ORP based on a weighted combination of control municipalities based on several criteria, that should, through the optimisation process, create the synthetic control resembling the original ORP. Namely, they are listed in table 1.

Table 1 List of variables used for the synthetic control estimation

Variable	Unit of measure
Number of municipalities in ORP	Number
Acreage of land	Hectars
Population density	Inhabitants/km ²
Unemployment rate	Percentage
Number of completed dwellings	Number per 1,000 inhabitants
Increase by moving	Number
Natural population increase	Number
Average age - men	Years
Average age – women	Years
Vacancies	Number

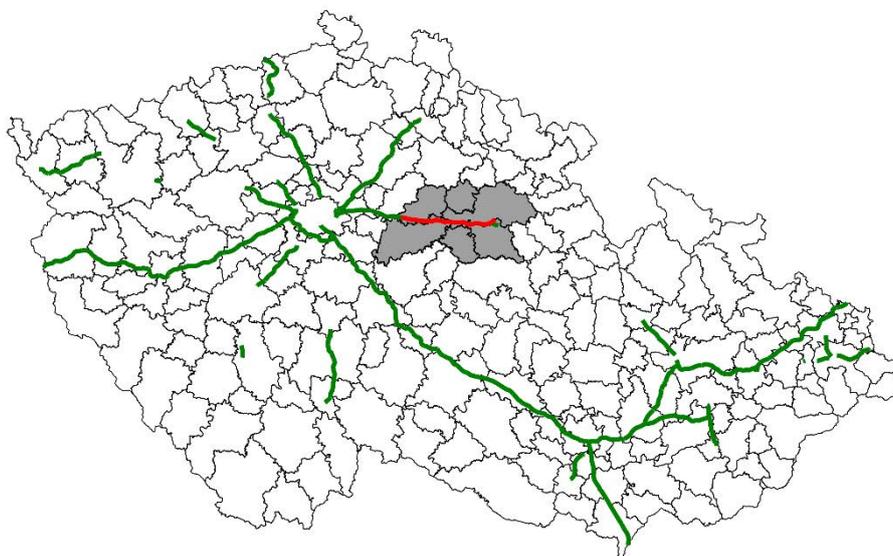
All the variables were obtained from the Czech statistical office regional database and all of them are at the level of ORP, as described above. Using the synthetic control estimated using Stata "Synth" package, we were able to estimate the following model:

$$\Delta \frac{subjects_{i,t}}{inhabitants_{i,t}} = \beta_0 + \beta_1 \Delta synth \left(\frac{subjects}{inhabitants} \right)_{i,t} + \beta_2 dummy_t + \beta_3 dummy_t * years + \mu_t + \epsilon_i + \epsilon_{i,t} \quad (1)$$

Where $\Delta \frac{subjects_{i,t}}{inhabitants_{i,t}}$ is a first difference of the number of economic subjects located in ORP i in year t divided by number of inhabitants in the same territory and time, β_0 is a constant of the regression, β_1 , β_2 and β_3 are parameters of the regression, $\Delta synth \left(\frac{subjects}{inhabitants} \right)_{i,t}$ is the first difference of synthetic control of the proportion of number of economic subjects and number of inhabitants in respective municipality, *dummy* is a dummy variable marking years in which the new section of highway was already in use, *dummy_t * time* is the interaction term, where dummy is multiplied by number of years from the highway opening, μ_t are time fixed effects, ϵ_i are spatial fixed effects and $\epsilon_{i,t}$ is the error term.

In our research, we have turned our lens toward six selected ORPs within the Czech Republic that lie along the newly opened piece of highway. These ORPs, which play a main role in our investigation, encompass Hradec Králové, Nový Bydžov, Kolín, Přebouč, Pardubice, and Poděbrady. Overall, there are 205 ORPs in the Czech Republic, the rest of them serve as a base for synthetic control calculation. They effectively serve as a counterfactual in our estimations, enabling us to compare the economic dynamics of the treated ORPs (those directly influenced by the new highway segment) with the expectations based on this counterfactual. To offer an overview of the context, Figure 1 depicts the overall situation. It represents the distribution of ORPs across the Czech Republic, highlighting the six selected ORPs in our research.

Figure 1 Map of the Czech republic with highlighted ORPs affected by the new highway section (in grey, new highway section highlighted in red)



Our analyses use the data spanning between the years 2002 to 2021. This specific timeframe was chosen due to the availability of comprehensive statistics at the ORP level from the Czech Statistical Office. These years mean 20 distinct periods shrinking to 19 after differencing, comprising 5 years leading up to the change of interest and an ensuing 14-year period following this transformative event. With our study focusing on six specific ORPs, this results in a total of 114 observations.

In order to provide a structured overview of our dataset, we present detailed descriptive statistics in Table 2. This table serves as a reference point, offering insights into the key characteristics of our data. Both the treated values and the synthetic control values are presented in first differences, as described in Equation 1. This approach captures rather the changes over time than the actual values, allowing us to overcome the issue of non-stationarity of our data.

Upon close examination of the descriptive statistics, the means of the changes in both the treated and synthetic control variables are very similar as well as the standard deviations, showing no obvious difference straight from the descriptives.

Table 2: Descriptive statistics

Variable	Obs	Mean	Std. dev.	Min	Max	Skewness	Kurtosis
Δ Subjects p.c.	114	0.0027	0.0033	-.0046	0.0139	0.7631	4.5918
Δ Synthetic control	114	0.0026	0.0033	-.0069	0.0119	0.2816	4.6112
Dummy	114	0.75	0.4348	0	1	-1.1547	2.3333
Interaction	114	6	5.120	0	15	0.2715	1.6858

3 Results

Our analysis, conducted in accordance with the methodological framework previously described, yielded a series of regression estimations aimed at unravelling the impact of the newly constructed highway segment on firm creation rates within specific ORPs. We present a summary of these estimations in the table 3, shedding light on the nuanced relationship between transportation infrastructure and economic performance in regions.

The initial set estimations (1 and 2) is conducted without fixed effects. They revealed that the synthetic control proved to be a significant predictor of actual values. Notably, the inclusion of a basic dummy variable yielded a significant negative coefficient. This intriguing result implies that municipalities located in ORP administrative units that gained swifter connections to larger cities experienced a slower pace in firm creation compared to what would be expected based on the counterfactual. Building upon the first estimation, we introduced an interaction term. However, this term did not achieve statistical significance, indicating that the interaction between the highway segment and time had no substantial impact on firm creation rates in this model specification.

To capture the specifics of particular years, we incorporated time fixed effects into the analysis. Interestingly, these fixed effects supplanted the significance of the synthetic control variable. Nevertheless, the dummy variable remained both significant and negative in this particular regression, suggesting that the pace of firm creation remained lower in treated ORPs as compared to the counterfactual. After the introduction of the interaction term, we found that it, in contrast to estimation 2, became statistically significant. Together with the persistently significant and negative dummy variable, this result implies that while the initial impact of the new highway segment was associated with a decrease in firm creation rates in treated ORPs, this disparity slightly weakened over time, probably finding a new equilibrium.

The final estimations 5 and 6 introduced spatial fixed effects. Overall, the inclusion of these effects did not substantially alter the results observed in previous estimations, both in terms of coefficients and significance. The key variables of interest, the dummy and interaction terms, remained stable.

Table 3: regression results, dependent variable is a first difference of a number of economic subjects per inhabitant in respective ORP

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Subjects p.c.					
Δ Synthetic control	0.644*** (0.000)	0.656*** (0.000)	-0.152 (0.225)	-0.152 (0.225)	-0.178 (0.169)	-0.178 (0.169)
Dummy	-0.001* (0.011)	-0.001 (0.417)	-0.006*** (0.000)	-0.071*** (0.000)	-0.006*** (0.000)	-0.073*** (0.000)
Interaction		-0.000+ (0.076)		0.004*** (0.000)		0.004*** (0.000)
Constant	0.002*** (0.000)	0.002*** (0.000)	0.013*** (0.000)	0.013*** (0.000)	0.013*** (0.000)	0.013*** (0.000)
N	114	114	114	114	114	114
R ²	0.514	0.528	0.721	0.721	0.721	0.721
FE	No	No	No	No	Yes	Yes
Time FE	No	No	Yes	Yes	Yes	Yes

A question may arise when interpreting our findings: to what extent are our results influenced by the presence of two large ORPs – Pardubice and Hradec Králové – both of which encompass sizable towns and serve as regional capitals? These larger ORPs undoubtedly wield substantial economic influence within their regions. Moreover, it is essential to consider that while both larger and smaller ORPs experienced better connection to the capital city of Prague, smaller ORPs also benefited from improved access to the above-mentioned regional capitals. To address this dynamic, we executed separate regression analyses—one set focused on the four smaller ORPs and another set solely dedicated to the two larger ORPs. The results of these distinct analyses are presented in Table 4.

Within this set of estimates, the differences emerge. In the case of the four smaller ORPs, the results echo the patterns observed in our previous analysis. Specifically, in regressions labeled 1a and 2a, encompassing these smaller municipalities, the key dummy variable remains statistically significant, retaining its negative coefficient and maintaining a numerical resemblance to our prior findings. This persistence underscores that the inclusion of larger towns did not significantly alter the observed effects.

Conversely, when we shift our focus to the two larger ORPs, a notable departure from the previous results becomes evident. In this scenario, the dummy variable fails to achieve statistical significance, exhibiting a lack of impact on firm creation rates. Moreover, the sign of the dummy variable varies across different variants of these regressions. This contrast

suggests that the swifter connection to the capital city of Prague did not affect on the pace of firm creation within the context of larger towns. Simultaneously, the results imply that smaller municipalities experienced a substantial influence, as they found themselves subject to a notable economic drain facilitated by their improved connection to both the capital city and the larger towns of Pardubice and Hradec Králové.

Table 4: regression results, dependent variable is a first difference of a number of economic subjects per inhabitant in respective ORP, dataset is divided into two parts, small (regressions 1a and 2a) and large ORPs (regressions 1b and 2b)

	(1a) ΔSubjects p.c.	(2a) ΔSubjects p.c.	(1b) ΔSubjects p.c.	(2b) ΔSubjects p.c.
ΔSynthetic control	-0.227 (0.128)	-0.227 (0.128)	0.657+ (0.097)	0.657+ (0.097)
Dummy	-0.008*** (0.000)	-0.065** (0.008)	0.001 (0.722)	-0.042 (0.219)
Interaction		0.004* (0.020)		0.003 (0.203)
Constant	0.014*** (0.000)	0.014*** (0.000)	0.003 (0.489)	0.003 (0.489)
N	76.000	76.000	38.000	38.000
R ²	0.727	0.727	0.905	0.905
FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Sample	Without large ORPs	Without large ORPs	Large ORPs only	Large ORPs only

4 Conclusions

In this concluding chapter, we summarize the key aspects of our research, which has investigated the impact of a new highway segment on the pace of firm creation in specific municipalities affected by this change. Our analysis has revolved around the utilization of a methodological framework anchored in the difference-in-differences (DID) approach, complemented by synthetic control measures as counterfactuals for our evaluation. Our study has been based on a dataset collected at the level of administrative units known as municipality with extended power (ORP), which serve as administrative centers for their respective microregions.

Initial estimations conducted without fixed effects showcased the significance of the synthetic control variable and the negative coefficient of the dummy variable. This finding suggested that municipalities within treated ORPs that gained swifter connections to larger cities experienced a decrease in the pace of firm creation compared to the counterfactual. After the incorporation of time and spatial fixed effects, results revealed that the initial impact of the new highway segment was associated with a decrease in firm creation rates in treated ORPs, although this effect slightly weakened over time, likely finding a new equilibrium. The introduction of spatial fixed effects over time had minimal impact on our results, reaffirming the stability of our findings.

A secondary question arose regarding the influence of two larger ORPs, Pardubice and Hradec Králové, both serving as regional capitals and encompassing sizable towns. Our subsequent analysis divided the ORPs into two categories: smaller ORPs and larger ORPs. While the findings for smaller ORPs echoed our prior results, larger ORPs exhibited distinct patterns. In these larger municipalities, the dummy variable failed to achieve significance, indicating that the swifter connection to the capital city of Prague did not affect firm creation rates in their case. Conversely, smaller municipalities experienced a substantial influence, characterized by notable economic outflows facilitated by improved connections to both the capital city and the larger towns of Pardubice and Hradec Králové.

In conclusion, our research sheds some light on the dynamics between transportation infrastructure development and regional economic activity within the Czech Republic. It underscores the differentiated impacts experienced by municipalities of varying sizes and roles within their respective regions.

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Financial digitalization: Trends, opportunities and risks

Peter Golha¹

Abstract: During the last decade, we have observed a reinforcing trend of declining share of traditional banks in financial intermediation. One of the causes of this development is the process of digitization of the financial industry. In the financial sector, or better said, beside it, virtually new industry of FinTech has developed. This development brings several significant opportunities and risks in many aspects, especially in areas such as consumer satisfaction, effectiveness of financial intermediation, the effectiveness of monetary policy, or in the broader context of financial stability. In this article, we present a literature overview on the topic and formulate the most significant opportunities and risks of ongoing innovations in the financial sector, with a special focus on digitization and the FinTech sector.

Keywords: financial industry, banks, fintech

JEL Classification: G21, G23, O33

1 Introduction

One of the most significant trends in the financial market in recent decades is growing competitive pressure on banks from Non-bank financial intermediaries (hereinafter referred to as NBFIs). This statement results from monitoring the development of the financial market, which is manifested through a number of "soft" indicators, such as marketing communication of banks and NBFIs, relatively lower market entry limits for NBFIs compared to banks (lower capital requirements, lower regulatory requirements) or the dynamics of innovations in the banking and non-banking sectors. The growing competitive pressure from the non-banking part of the financial system can be demonstrated through the development of market shares of various sub-sectors of the financial system. We consider the volume of assets under management of both subsectors to be a suitable indicator of the market shares of banks and NBFIs.

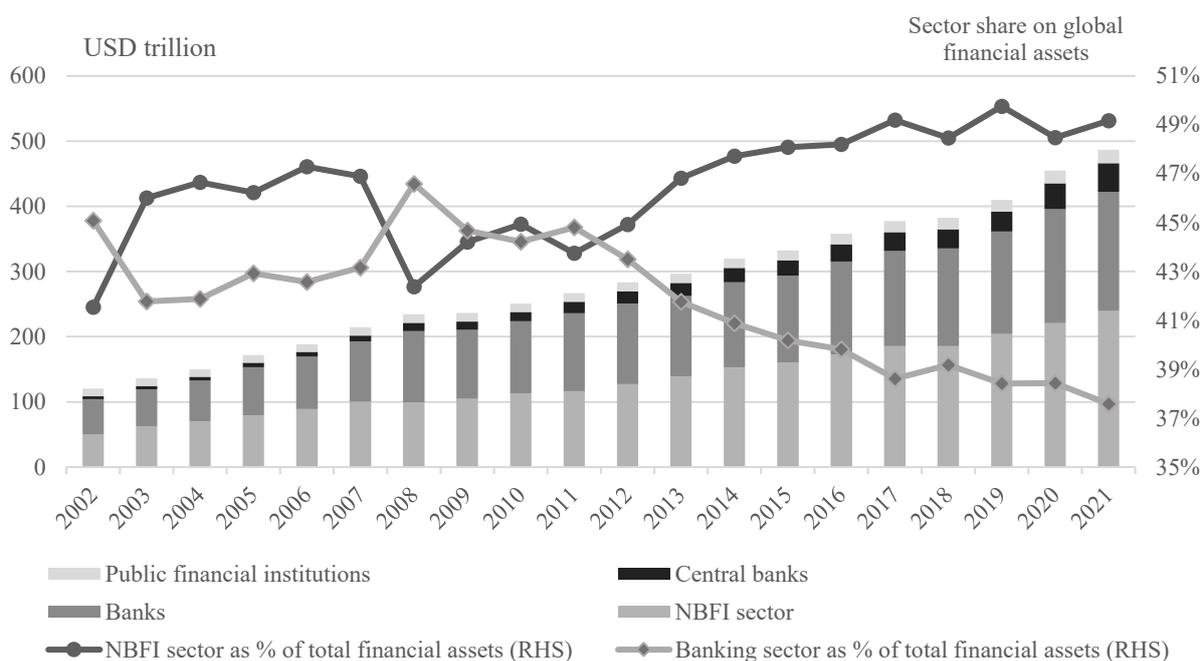
As we can see on Figure 1, there is an evident trend of a decrease in the share of banks in the management of financial assets on an (almost) global scale, especially in the last decade.² At the same time, market share of NBFIs have been rising accordingly. After the rapid growth of the market share of NBFIs at the beginning of the millennium, some consolidation took place during the global financial crisis, which was caused both by the decrease in the market value of financial assets under the management of NBFIs, but also to a large extent by the outflow of investors and savers to banks as "safe havens" during the escalation of the financial crisis. After the situation calmed down after the global financial crisis and the subsequent debt crisis in the Eurozone, NBFIs' share on the management of financial assets gradually grew and surpassed the values of the previous decade, while the share of banks restored its declining trend.

We also note that in the 29 monitored jurisdictions, the share of central banks in total financial assets has grown substantially over the last two decades, from 4% in 2002 to 9.1% in 2021. In absolute terms, the volume of central banks' financial assets has increased in this period more than 9 times. Such rapid growth in the volume of financial assets of central banks, as well as growth in their market share, occurred with the significant contribution of various asset purchase programs on the financial market (also known as "quantitative easing" of monetary policy), which several central banks implemented to support market liquidity and availability credit in times of crisis. In percentage terms, the growth of financial assets under the management of central banks in the monitored jurisdictions was the most significant between 2002 and 2021, when it grew by an average of 12.4% annually. The average annual growth rate of financial assets under NBFI management in this period reached 8.6%, which exceeded the growth rate of assets in the banking sector by exactly two percentage points. These data also confirm the hypothesis of growing competition from the non-banking sector for banks.

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² The data is drawn from the FSB report (2022), which covers 29 jurisdictions representing approximately 80% of global GDP (including several Eurozone countries, the USA, the United Kingdom, Japan, the BRICS countries, Switzerland, Australia, Mexico, etc.)

Figure 1 The amount of financial assets in selected 29 jurisdictions and the share of different sectors in the management of financial assets



Source: Financial Stability Board (2022) and own processing

2 Reasons behind the growth of NBFIs' and Fintech's role in the financial system

Vittas (1998) defines non-banking financial institutions as a diverse mix of institutions whose common feature is "the mobilization of savings and the intermediation of financing for diverse activities, while not taking deposits from the public". The NBFI sector consists of two subgroups: (i) insurance corporations and pension funds and (ii) other financial intermediaries, which include leasing and factoring companies, installment sales institutions, securities and derivatives dealers, venture capital companies, money market funds, hedge funds, Real Estates Investment Trusts (REITs), and more. However, it should be emphasized that despite some distinguishing elements of banks and NBFIs, these components of the financial system do not operate in isolation, but in mutual interaction. In some respects, their functions can be described as complementary (e.g. in terms of liabilities, banks and NBFIs largely satisfy the demand of different groups of investors, or savers, i.e. they do not compete with each other), in other respects they compete with each other. As Nijs (2020) notes, there is a competitive battle here, especially on the asset side, between bank financing products and the financing offer of other financial intermediaries ("market-based lending").

The NBFI sector is very diverse and therefore its crowding out effect on banks' share in financial intermediation has complex causes. The causes of the cyclical nature in the second decade of the 21st century include very low interest rates, which led to a lower attractiveness of the banking sector's savings products, and also the losses that the eurozone banking sector suffered as a result of the global financial crisis and the subsequent debt crisis in the eurozone. The subsequent consolidation and restructuring of banks' balance sheets naturally limited the possibilities and appetite for further expansion of the banking sector. In addition to cyclical factors that occurred in the past decade the European Central Bank's (hereinafter ECB) study (2016) adds long-term (structural) factors to the growth of the market share of NBFIs at the expense of MFIs:

- demographic changes as aging of the population leads to increased public interest in saving and investing through investment funds, insurance companies and pension funds. In addition to the conclusions of the aforementioned ECB study, we can add that, on the contrary, the younger generations Y and Z, who grew up with the onset and expansion of digitalization, often prefer alternative investment products and payment systems outside the sector of traditional banks.
- regulatory arbitrage, as less stringent conditions of the NBFI regulatory framework compared to banking sector can lead to the opportunistic transfer of certain activities from the banking sector to the NBFIs. In

this context, Jones (2000) works with the term "regulatory capital arbitrage, which he defines as a technique that allows companies to reduce the equity capital ratio without proportionally reducing the portion of risk to which they are exposed.

It is also necessary to mention the accelerating dynamics of innovations in the financial sector, while this factor could also be classified as structural. Similar to other sectors of the economy, the financial sector has also been affected by the significant impact of digitization and technological changes in recent decades. In the financial sector, or better said, beside it, virtually new industry of FinTech has developed. Financial Stability Board defines FinTech as "innovations in financial services enabled by new technologies that can lead to new business models, applications, processes or products with a significant effect on financial markets, their institutions and the provision of financial services". The emerging importance of FinTech in the financial sector has gradually become an accepted reality, but as new technologies keep coming, the FinTech subsector is also changing and evolving, while it does not have a precisely defined structure and position in the financial sector. Companies belonging to the FinTech group are also very diverse, with their size varying from the smallest start-up companies to subsidiaries or divisions of technology giants such as Google, Alibaba, Amazon, Facebook, Apple, Samsung, or Microsoft (so-called "BigTech"). In this context, one can identify with the broader definition of the FinTech sector, which according to Valverde a Fernández (2020) involves all kinds of channels that connect technological companies and their innovation with finance.

According to a 2019 estimate by The Business Research Company, the market capitalization of FinTech companies in 2018 reached 128 billion USD, while it was expected to grow to 310 billion by 2022. USD. In fact, this level was already surpassed in 2021, but in the following year there was a sharp decline in the valuations of the companies of the FinTech sector by an average of 60% globally. According to a Boston Consulting Group (hereinafter BCG) (2023) study, these dynamics have occurred as a consequence of rising interest rates that have raised the cost of capital and essentially stopped the supply of zero-priced funding. The decline in market valuation in 2022 occurred in many sectors as a result of steep growth of inflation and geopolitical tensions, however it was much more pronounced in the FinTech sectors. However, according to the available forecasts, the growth of valuations and revenues of fintech companies is expected to continue at an average annual rate of around 20% until 2030. According to the current forecast of BCG FinTech penetration of global banking revenues will rise from 4% to 13% between 2021 and 2030. For the same period, FinTech penetration of banking valuations is expected to rise from 9% to 25%.

In the context of digital innovations, Philippon (2015, 2017) points to a paradoxical phenomenon, as according to his research, unit costs in the financial intermediation sector have decreased only marginally in recent decades, which is in sharp contrast to other industries. In fact, after various adjustments, according to Philippon, unit costs in financial intermediation in 2012 were very similar to those of the early 20th century. Stagnation of productivity in the traditional banking sector thus creates space for further penetration of FinTech solutions. The dynamic growth of the FinTech sector pushes financial institutions to integrate more and more "fintech" solutions into their business. The main business areas of FinTech companies currently include digital payments, cloud programming and processing of financial data, cryptocurrencies and blockchain, loan mediation (e.g. through "Peer-to-Peer" schemes), technological innovations in insurance (so-called InsurTech). Since digital technologies are an absolutely crucial part of the business of FinTech companies, cybersecurity have naturally growing weight in their business.

3 Some implications of the growing role of NBFIs and FinTech in the financial system

The Financial Stability Board's (hereinafter FSB) study (2020) lists several positive impacts of NBFIs: "Non-bank financial institutions are a valuable source of financing for many companies and households. They strengthen competition on the supply side of financing and promote economic activity". Similarly, the study of European Systemic Risk Board (2019) (hereinafter ESRB) study states that non-bank financial institutions are a welcome factor in diversifying sources of financing for real economy entities. In addition, non-bank financial institutions can be an important source of financing for the banking sector itself. According to ESRB data (2019), the share of non-bank financial institutions in euro area banking sector funding was around 8% between 2011 and 2018. Thus, we could summarize the benefits of the operation and expansion of the NBFIs sector as follows:

- wider spectrum of financial services to clients,
- creation of additional resources and financing tools for economic agents,

- NBFIs expansion improves effectivity, productivity and quality of services in the banking sector through competitive pressure and potentially quicker digital innovations,
- liquidity and maturity transformation.

Another stream of literature points to increasing financial risks arising from growth of NBFIs sector. The FSB study (2020) states that non-bank financing can be a source of higher systemic financial risk, either directly or through existing links to other components of the financial system, especially if the institutions of the NBFIs sector carry out activities typical of banks, such as transformation of the maturity and liquidity of financial assets, or the use of financial leverage. A study by the European Commission (2012) generalizes the above: the impact of financial risks of individual financial institutions (including NBFIs) is increased by several multipliers, primarily the size and interconnection of financial institutions.

In the context of the impact of the expansion of the NBFIs sector on financial stability, its possible procyclical effect also resonates in the literature. Procyclicality in this sense means that the activities of the NBFIs sector can accentuate fluctuations in economic and financial cycles, i.e. j. in times of growth they support booming effects and in times of contraction their activity decreases disproportionately. In other words, NBFIs are much more willing to use financial leverage intensively in times of low risk aversion and high market valuation of financial assets. As shown by Adrian and Shin (2008), the leverage ratio of NBFIs is high in times of growth in their balance sheet amount and vice versa.

The procyclical nature of the operation of some NBFIs subsectors is also addressed by the authors of behavioral economics. Gennaioli et al. (2013) developed a theory of the individual decision-making process based on behavioral arguments. They are based on the knowledge that economic agents show a fundamental tendency to underestimate the risks associated with extreme values of the distribution ("tail risk") of economic variables and prices of financial assets. In their model, investors from the NBFIs sector systematically ignore possible worst-case development scenarios, which leads to too high investments and price bubbles in times of growth, and conversely to a disproportionate collapse of the investment activity of "shadow banks" in times of decline. As Adrian and Ashcraft (2012) document, this theory is supported by a wealth of empirical evidence, including the expansion and subsequent contraction of the NBFIs sector's activities before and during the global financial crisis.

Figure 2 Cryptocurrency market capitalization fluctuations since 2020



Source: tradingview.com

On the other hand, Mazelis (2016) argues that the expansion of the NBFIs sector can be beneficial from the point of view of financial stability, especially in conditions of extremely low interest rates. In such a situation, the NBFIs sector sees an influx of savers' deposits, as zero nominal interest rates discourage them from keeping deposits in banks. The transfer of deposits stimulates the supply of capital of the NBFIs sector and subsequently investments in the economy, which alleviates the recession and accelerates the return of the economy back to normal.

Large swings of crypto market capitalisation can be considered as a prime example of the tendency of NBFIs (in this specific case of the FinTech sector) to pro-cyclical fluctuations. The extraordinary volatility of the market

valuation of these assets is shown in Figure 2. From this graph, it is clear that since 2021, when cryptocurrencies experienced the most significant boom, the market capitalization of the cryptocurrency market and the volume of transactions have decreased significantly. Further developments will show whether this is just a period of consolidation in this asset market, or whether it is the beginning of a long-term decline. Although cryptocurrencies are a relatively popular topic these days, there are several reasons why they are unlikely to become a meaningful investment asset for a significant portion of investors in the foreseeable future. Probably the most important of these is the extreme volatility of this market. One should also take into account the relative size of this market. The market capitalization of cryptocurrencies in February 2020 reached 276 billion. USD (approx. 60% of that was Bitcoin). Market capitalization of companies in the S&P 500 stock index at the same time reached 26 trillion. USD, i.e. almost 100 times the entire cryptocurrency market.

Another group of authors addresses the issues of the effects of NBFIs expansion on the monetary policy environment and effectiveness. No doubt that the traditional banking sector plays a key role in the monetary policy transmission mechanism. ECB (2016) states that the growing role of NBFIs in the financial sector can lead to an acceleration of the transmission of monetary shocks, mainly through changes in risk attitudes. According to the cited study, the growing role of NBFIs can also lead to a faster transmission of monetary policy measures, as the NBFIs sector is generally less regulated and thus more flexible in the implementation of measures during monetary policy changes. Analogous to the above, Adrian and Liang (2016) state that the growth of the weight of NBFIs in the financial system since the 1980s has led to higher variability in the velocity of money over time. This fact can be attributed to faster responses of NBFIs to changes in financial, economic and regulatory conditions compared to banks. Lorenzo Bini Smaghi (2010) argues that the expansion of the NBFIs sector associated with the phenomenon of "collateralization" leads to a weakening of the transmission mechanism through the loss of control of central banks over some financial aggregates (e.g. credit creation) and a decreasing link between credit and monetary aggregates. In this regard, the International Monetary Fund's (hereinafter IMF) study (2016) notes that the activity of NBFIs can both weaken and strengthen the effects of monetary policy measures. One of the channels of weakening of the monetary policy is fact that NBFIs are able to compensate for fluctuations in the supply of bank credit because the cost of funding in the non-banking sector is less affected by changes in monetary policy.

On the other hand, the NBFIs sector can strengthen effects of monetary policy measures if the risk appetite in this sector is more sensitive to changes in monetary policy. Based on the conducted empirical analysis, the authors of the IMF study (2016) lean more towards this second option. Banks and most NBFIs sub-sectors are seen shrinking their balance sheets as monetary policy tightens. In general, NBFIs adjust their balance sheet more significantly in response to changes in monetary policy compared to banks. Difficulty for business to substitute bank financing (loans) with market financing (bonds) in the short term also works against the hypothesis of NBFIs' weakening of monetary policy measures.

We have shown that the impact of NBFIs expansion on the financial system cannot be understood as a binary choice. This also applies in the case of mutual relationship between traditional financial market institutions such as banks and the FinTech sector. In other words, both of these groups do not interact exclusively in a competitive position. According to international survey by Sopra Steria (2022), up to 77% of banks feel pressure to create partnerships with fintech firms, although almost the same percentage (74%) believe that fintechs are a threat to their existence. According to the survey banks are feeling the need to create partnerships with FinTech for several reasons, however the main ones come from constantly evolving requirements of their clients' which banks alone are not able to meet. At the same time, 66% of banks said that they feel the need to establish cooperation with FinTechs due to the new regulation. Despite banks' fears about the rise of FinTech, most banks recognize potential benefits and the opportunities from partnerships with fintechs outweigh the threats. When asked why banks are considering partnerships with fintechs, 78% mentioned revenue growth, 77% shorter time to market, 77% higher customer loyalty and 76% better customer service. Furthermore, 65% of banks would prefer to partner with fintechs to help with their own digital transformation rather than building everything in-house. 49% of banks admitted that they do not have the necessary infrastructure to be able to successfully carry out digital transformation on their own.

4 Conclusions

Over the period of 10 years until 2021, the share of banking sector in the assets under management decreased by 8% to the level of 37% on a global scale. This development was mainly caused by the growth of the market share of non-bank financial intermediaries (NBFIs), also with the contribution of the new FinTech industry. The decline

in the banks' market share was caused by several cyclical factors, especially by extremely low interest rates and the tarnished reputation of the banks during and after the global financial crisis. At least the first of the mentioned cyclical factors is already losing importance today in 2023. However, this does not apply to the structural reasons for the growth of the role of NBFIs (including FinTech), with (i) demographic changes, (ii) regulatory arbitrage and (iii) digitalization of financial services as most significant structural factors.

Assessment of the impact of the NBFIs expansion is not a clear-cut. In some aspects, positive impacts prevail, especially in the issues of expanding the spectrum of financial services, mobilizing additional financial resources, or increasing the quality and efficiency of financial intermediation with the help of digital innovations. On the other hand, when evaluating the impact of the expansion of the NBFIs sector on financial stability, pro-cyclical fluctuations in the prices of financial assets, or the efficiency of the transmission mechanism, there are more voices of caution. We assume that the dynamic growth of financial intermediation outside of traditional banks will continue in the coming years. As a result of the delay of the banking sector in the process of digital transformation, it can also be expected that the integration, or at least cooperation, between banks and the FinTech sector will deepen.

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Size of taxation and tax decentralization

Milan Jílek¹

Abstract: The paper deals with a mutual relationship between the size of taxation and the tax decentralization ratio. The size of taxation in an economy is approximated using a simple tax-to-GDP ratio, a tax decentralization ratio by share of subnational government tax revenue on general government tax revenue. Due to a lack of data, the subnational government's real decision-making power over taxation is not considered. The aim of the paper is the evaluation of a mutual relationship of both variables and a discussion of the economic background of the relationship. The paper departs from the normative theory of fiscal federalism and also from the positive approach to the problem. Quantitative analysis is based on panel data from countries of Europe from 2005 to 2020, taken from the IMF GFS database.

Keywords: tax burden, tax decentralization, fiscal consolidation, Europe

JEL Classification: H71, H77

1 Introduction

Fiscal consolidation, in principle, relies on increasing taxation, expenditure cuts, or a combination of both methods. The paper deals with the issue of changing the tax-to-GDP ratio and sharing these changes among levels of government. There is a vast body of literature on fiscal consolidation and the deficit bias of public finances (Alesina et al., 2002; Bayar & Smeets, 2009; Jílek & Lacina, 2011). Another stream of literature covers tax decentralization issue (Aristovnik, 2012; Arzaghi & Henderson, 2005; Bodman, 2011; Bojanic, 2020; Canavire-Bacarreza et al., 2017; Cibik, 2016; Jílek, 2015, 2018; D. Stegarescu, 2005; Stegarescu, 2006). Few articles deal with the mutual relationship between tax burden changes and its sharing among government levels (Baskaran, 2012).

The fiscal imbalance is usually most significantly demonstrated at the central government level. If a responsible, i.e., the central government, opts to increase the tax-to-GDP ratio, the issue of tax revenue distribution among government levels arises. The critical factor is the system of tax assignment. Unitary countries use prevalently tax-sharing arrangements with limited levels of tax autonomy.

Richer and larger countries are usually more decentralized than smaller and poorer ones, and the presence of ethnic, religious and linguistic differences is usually associated with a larger decentralization (Bakke & Wibbels, 2006). In almost all countries, subnational governments' share in total general government expenditure exceeds the same share in total revenue, suggesting that grants from higher levels of government are an essential part of local financing. Federal countries in Europe rely heavily on income and profit taxation (Belgium, Switzerland, Germany), while others (Austria, Spain) have a more balanced structure involving property tax and consumption tax as well. The UK is exceptional in employing exclusively property taxation to finance local governments. Nordic countries are exceptional in the sense of relying exclusively on income taxation. Italy and France use local business taxes, which rely on a broader definition of the tax base than profits (labour cost, imputed rents for industrial buildings, etc.). As these different sources of taxation possess a different elasticity to national income, this may have affected the evolution of the tax decentralization share.

The tax decentralization ratio offers only a very rough indicator of the actual taxing power of subnational governments, as it mixes different tax assignment methods, especially tax sharing and autonomous decentralized taxes. OECD performed numerous studies to reveal information about the vertical structure of decision-making in taxation. There is a considerable variation among countries in the level of taxation autonomy.

2 Methods

Choice of fiscal decentralization indicators is difficult (Blöchliger, 2013; Blöchliger & King, 2006; Dan Stegarescu, 2005). This study emphasizes the width of the sample and, therefore, uses the IMF decentralization dataset instead of Eurostat or OECD data. The IMF Decentralization database covers all European countries, but there are missing data for some of them. The best coverage is from 2005 to 2020. On the expense side, the use of goods and services (USG, subnational government to consolidated general government ratio) is used as a good proxy for decentralizing the allocation function. Even though the expenditure side of the budget is not a major concern in this paper, it is well-known

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that tax decentralization should follow expenditure decentralization (McLure, 1998, 2001). On the revenue side, which is the primary focus of the paper, the decentralization ratio (TAXD) is used, with no missing data.

The tax decentralization ratio (TAXD, IMF GFS) is the dependent variable in this research. The central hypothesis is that increases in taxation (TAX, IMF GFS, general government tax revenue to GDP) are not shared proportionately towards subnational governments. As an overall measure of tax burden, the tax-to-GDP ratio is calculated with the exclusion of social security contribution. The reason is, reflecting normative recommendations of economic theory (Oates, 1999), the prevailing centralization of redistributive policies. The fiscal consolidations, under the responsibility of central governments, usually deal with the problem of unsustainable fiscal imbalances. It is expected that the central governments, executing the highest power to tax in all European countries, would prefer not to share the increase in the tax-to-GDP ratio with the subnational governments. It is expected that this behaviour is stronger with larger fiscal deficits of the general government sector (BB_GG, AMECO). Also, the possible explanatory power intergovernmental transfers to subnational governments are considered (GR, % of GDP, IMF GFS). The model controls for other expected factors of tax decentralization, see (Jilek, 2015), such as land area (AREA, sq. km, WB WDI [AG.LND.TOTL.K2]), total population (POP, WB WDI [SP.POP.TOTL]), urban population (URBPOP, WB WDI, % of total population) [SP.URB.TOTL.IN.ZS], level of economic development (GDPPCPPP, GDP per capita, PPP, constant 2017 international \$, WB WDI [NY.GDP.PCAP.PP.KD]), federalization dummy (FED, Spain among federations), language heterogeneity (LANG, (Alesina et al., 2003).

The hypothesis is tested on the panel dataset of European countries (table 1) from 2005 to 2020. Since there are presumably numerous factors of time-invariant character, the model of dependent tax decentralization ratio variable (TAXD) and explanatory general government tax to GDP ratio (TAX) is estimated with cross-section random effects. Moreover, the Hausman test suggests that the use of random effect is appropriate. The cross-section country effect may result from random causes. This approach allows us to focus on the slope parameter, capturing the influence of the tax burden size on the tax decentralization ratio, while the amount of variability of TAXD explained by the model is not a major concern in this study. All the continuous explanatory variables (AREA, POP, GDPPCPPP) enter the model in natural logarithm specification.

The model specification follows:

$$TAXD_{it} = \alpha + \beta_1 TAX_{it} + \beta_2 Other_{it} + v_{it} \tag{1}$$

where	<i>TAXD</i>	...	<i>dependent tax decentralization variable</i>
	<i>i</i>		<i>country</i>
	<i>t</i>		<i>period</i>
	<i>TAX</i>	...	<i>general government tax to GDP ratio</i>
	<i>Other</i>	...	<i>control variables</i>
	<i>v_{it}</i>	...	<i>residual</i>

$$v_{it} = \mu_i + u_{it} \tag{2}$$

where	<i>μ_i</i> ,	...	<i>is the unobservable individual effect of i</i>
	<i>u_{it}</i>	...	<i>unidentifiable effects</i>

Table 1 Analyzed countries' regional classification

Austria	CENTRAL	FED	Albania	SOUTHEAST	
Czech Republic	CENTRAL		Bosnia and Herzegovina	SOUTHEAST	FED
Germany	CENTRAL	FED	Bulgaria	SOUTHEAST	
Hungary	CENTRAL		Croatia	SOUTHEAST	
Poland	CENTRAL		North-Macedonia	SOUTHEAST	
Slovak Republic	CENTRAL		Romania	SOUTHEAST	
Switzerland	CENTRAL	FED	Serbia	SOUTHEAST	
Denmark	NORTH		Slovenia	SOUTHEAST	
Estonia	NORTH		Belgium	WEST	FED
Finland	NORTH		France	WEST	
Iceland	NORTH		Ireland	WEST	
Latvia	NORTH		Luxembourg	WEST	
Lithuania	NORTH		Netherlands	WEST	
Norway	NORTH		United Kingdom	WEST	
Sweden	NORTH				
Cyprus	SOUTH				
Greece	SOUTH				
Italy	SOUTH				
Malta	SOUTH				
Portugal	SOUTH				
Spain	SOUTH	(FED)			

Classification according to Anděl et al. (2019)

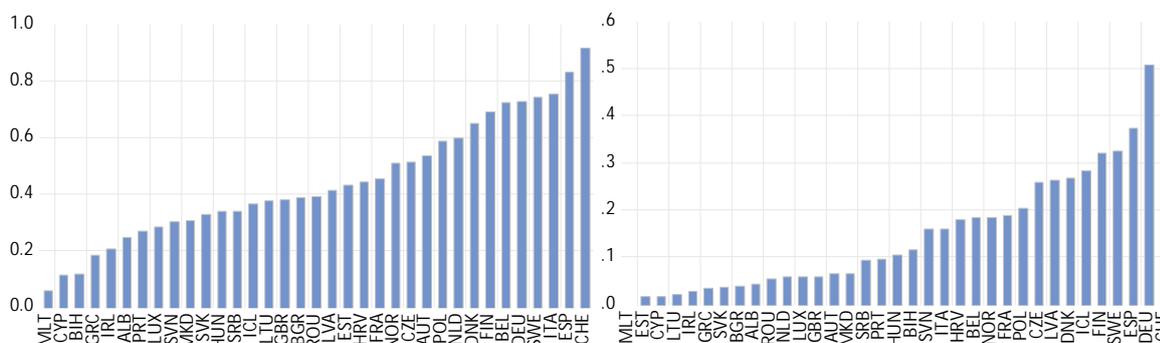
3 Research results

Before the econometric estimation of the model, a short overview of the data is appropriate.

3.1 Stylized data

There is a high variability of expenses on the use of goods and services decentralization (USG) to subnational governments among European countries (Figure 1). Since revenue, especially tax decentralization, should follow expenditure decentralization, a similar picture can be expected on the revenue side.

Figure 1 Use of goods and services decentralization (left) and tax decentralization ratios (right)



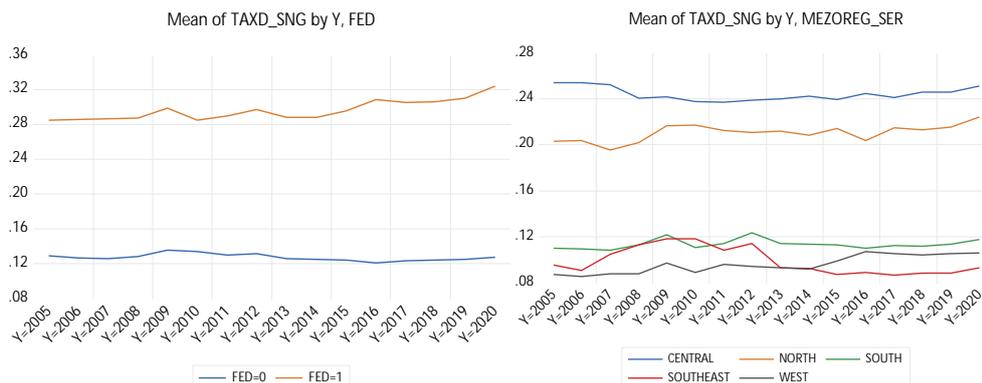
Government sector use of goods and services decentralization to subnational governments (left),

Tax revenue decentralization ratio to subnational governments (right).

Mean values 2005 to 2020. Source: IMF GFS

Higher tax decentralization ratios can be observed in federated countries (Figure 2), and the ratio has much evident positive growth. Central and northern European countries decentralize more taxes than other European mesoregions.

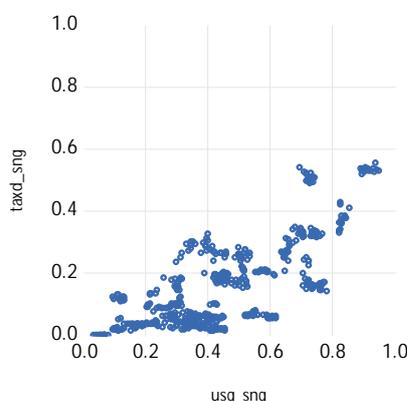
Figure 2 Tax decentralization ratio in federated and unitary countries and in European mesoregions



TAXD_SNG...Tax revenue decentralization ratio to subnational governments. FED...federation dummy. MEZOREG...mesoregions classification (Anděl et al., 2019). Source: IMF GFS

The tax decentralization lags behind the expenditure decentralization (Figure 3). This suggests a relatively high reliance on intergovernmental transfers to finance subnational governments.

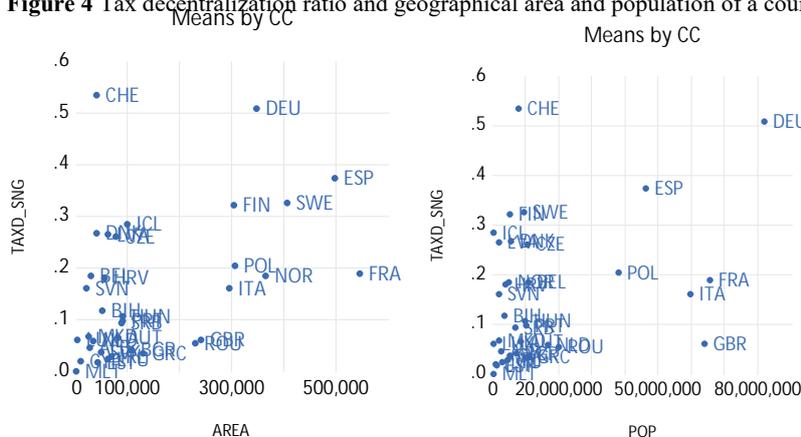
Figure 3 Tax decentralization ratio (TAXD) and use of goods and services decentralization (USG)



USG_SNG...Government sector use of goods and services decentralization to subnational governments, TAXD_SNG...Tax revenue decentralization ratio to subnational governments, 2005 to 2020. Source: IMF GFS

Some small countries (especially federated Switzerland and Belgium), but also unitary Denmark and the Netherlands, decentralized far more tax revenue than the linear relationship would suggest (figure 4).

Figure 4 Tax decentralization ratio and geographical area and population of a country



TAXD_SNG...Tax revenue decentralization ratio to subnational governments, Mean values from 2005 to 2020. AREA in sq. km. Source: IMF GFS, WB Development indicators.

3.2 Estimation results

The model is estimated with various specifications (Table 2). It consistently shows a high statistical significance of tax burden in all specifications, with the expected negative sign. The last specification (11) uses difference-in-difference estimation of the relationship between tax burden (explanatory variable, TAX) and tax decentralization (dependent variable, TAXD). From the variables controlling for other usual factors of decentralization, the population size and federalization dummy turned out to be highly statistically significant with the expected coefficient sign. The heterogeneity of population (LANG) was not statistically significant, but close to that. In European countries, the language heterogeneity is probably better captured by the federalization dummy. The population size was not statistically significant in the last specification (11). It was an expected result because there is no reason why the changes in the tax decentralization ratio should respond to the size of the population. The lagged general government budget balance to GDP ratio (BB) is highly statistically significant in all specifications except 11th, where the p-value is 0,15.

Table 2 Results of TAXD dependent variable model estimation

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
TAX	-0,003*** (0,000)	-0,002*** (0,000)	-0,002*** (0,000)	-0,003*** (0,000)	-0,003*** (0,000)	-0,003*** (0,000)	-0,002*** (0,000)	-0,002*** (0,000)	-0,002*** (0,000)	-0,002*** (0,001)	-0,004*** (0,000)
LOG(POP)		0,050*** (0,000)	0,049*** (0,014)		0,049*** (0,012)	0,041*** (0,011)	0,049*** (0,012)	0,037*** (0,000)	0,039*** (0,011)	0,039*** (0,012)	0,000 (0,000)
LOG(AREA)			0,003 (0,107)								
URBPOP				0,001** (0,001)							
LOG(GDPPCPPP)					-0,013* (0,007)	-0,013* (0,007)	-0,006 (0,006)	-0,004 (0,008)	-0,003 (0,008)	-0,003 (0,008)	0,000 (0,000)
FED						0,131** (0,053)		0,161*** (0,057)	0,156*** (0,058)	0,156*** (0,058)	0,002 (0,002)
LANG							0,116 (0,111)				
BB(-1)								-0,001*** (0,000)	-0,001*** (0,002)	-0,001*** (0,000)	0,000 (0,000)
GR									-0,001 (0,001)	-0,001 (0,001)	-0,000 (0,000)
C	0,219*** (0,026)	-0,575*** (0,190)	-0,588*** (0,201)	0,142*** (0,046)	-0,419** (0,207)	-0,321 (0,200)	-0,519** (0,207)	-0,358* (0,206)	-0,385* (0,206)	-0,396* (0,202)	-0,002 (0,016)
Adj. R-squared	0,053	0,081	0,079	0,058	0,084	0,090	0,081	0,106	0,108	0,098	0,189
No. of observations	546	546	546	546	546	546	532	530	530	530	526
No. of periods	16	16	16	16	16	16	16	16	16	16	16
No. of countries	35	35	35	35	35	35	34	34	34	34	34

Note: p-values ***...1%, **...5%, *...10%. Std. errors in brackets.

Specification 11 shows results of difference-in-differences estimation of TAX and TAXD

Source: Author's computation based on data (GFS IMF, AMECO, WB WDI)

4 Conclusions

The paper aimed to evaluate a mutual relationship between tax decentralization and overall tax burden and discuss the economic background of the relationship. From the geographical point of view, the study covered 35 European countries for the period 2005 to 2020. First, stylized data on fiscal decentralization in European countries and its relation to geographical mezzo-regions of Europe were presented, showing amazing variability of fiscal decentralization schemes. The central focus was on the reaction of the tax decentralization ratio as the dependent variable on the overall tax burden changes while controlling for major and mostly consensual factors of fiscal decentralization covered by cited works. While there is such a high variability among European countries, is there similar behaviour of central governments in response to tax burden changes? The study also controlled for the amount of intergovernmental grants provided from central to subnational governments as an alternative way of tax sharing. The hypothesis was that the central government, responsible for fiscal sustainability and executing most of the taxing power in European countries, would prefer increasing the tax-to-GDP ratio without increasing the tax decentralization ratio. Such behaviour, in fact, should even decrease the tax decentralization ratio, i.e. the regression coefficient should have a negative sign. The negative impact on the tax decentralization ratio should be stronger with the size of general government fiscal deficits. The result confirmed the preference for increasing the overall tax burden without sharing it with the subnational governments, especially when the fiscal deficits of the previous year were high. Finally, as expected, the estimation confirmed the positive impact of the population size and federalization on the tax decentralization ratio.

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Analysis of bankruptcy models for predicting the future state of the company

Lucie Klištincová¹

Abstract: This paper deals with the issue of corporate financial health. In theoretical and practical terms, it works with selected bankruptcy models on which the financial analysis of enterprises can be shown. The paper includes a search of financial health from the perspective of various authors of important theoretical publications. Among other things, the paper aims to compare whether the selected bankruptcy models have sufficient predictive power, which is done in the later parts of the thesis. In the first part, it mentions specific bankruptcy models that are widely used in mainstream economics. The Altman model, Douch's balance sheet analysis, the Springate model, and the Index IN05 are discussed. In the practical phase of the paper, the reliability of the selected bankruptcy models is evaluated on a sample of about 6,000 firms from the manufacturing industry. The thesis concludes that the selected models are suitable for the evaluation and overall prediction of the future financial situation of companies. However, the thesis also concludes that the selected models have different predictive abilities in practical terms. Thus, the selection of specific models depends, among other things, on the needs of the chosen analysis. To determine the reliability of the prediction of the future state of the company will be used descriptive statistics. The thesis also concludes that the selected models are suitable as a complement to the needs of financial analysis, as they provide good information on the overall assessment of the financial and economic situation of the enterprise and provide the necessary entities with early warning.

Keywords: financial health, bankruptcy models, financial analysis, Altman model, Douch's balance sheet analysis, Springate model, Index IN05

JEL Classification: G33, G01, G10

1 Introduction

Financial health

First of all, it is necessary to define what a financially healthy firm is. In this context, it should be stated that it is a firm that can achieve a certain level of appreciation of the capital invested at a given point in time, and one that is proportional to the level of risk of the business (Růčková, 2011).

The study by Sayidah says, that that the SOEs that have good asset capability tend to have better financial health, especially because efficient opportunities are supported by the control of resources and a more economical business scale because the subsidy is significant and negatively affects financial health, which means that the financial health of the SOEs is getting down when funding is still maintaining subsidy every year (Sayidah, 2019).

Baglan says, that there is a positive and significant relationship between financial health and the intensive margin of trade. The magnitude of this positive relationship is shown to depend on several firm characteristics, where the effects of financial health on firm-level exports are larger for firms with higher levels of export, bigger size (measured by assets), higher productivity (measured by value added per worker), and moderate levels of financial health (measured by cash flow over total assets) (Baglan, 2018).

The financial health of businesses and their continued profitability and competitiveness in the market are significantly affected by higher profits achieved. Businesses are forced to show the best possible results to demonstrate financial strength and competitiveness and to provide good accounting to investors and creditors, which can lead to profit manipulation (Valaskova, 2022).

The financial health hypothesis argues that the valuation multiple of the book value of equity (earnings) increases (decreases) as financial health decreases (Ertugrul, 2021).

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Bankruptcy models

Bankruptcy models are purposeful selections of indicators, they are constructed based on comparative-analytical or mathematical-statistical methods. The aim is to compile such a selection of indicators that could qualitatively diagnose the financial situation of the company, i.e. its financial health, or predict its financial distress.

Bankruptcy, or prediction, models represent early warning systems, as they indicate a possible threat to financial health according to the behavior of the selected indicators (Kubíčková a Jindřichovská, 2015).

These models have been derived based on real data for companies that have gone bankrupt or, on the contrary, have prospered in the past. They are based on the assumption that certain anomalies occur in a firm several years before bankruptcy, which are symptoms of future problems and are characteristic of firms at risk. They are useful not only for current but also for future decision-making, allowing management to isolate and correctly interpret indicators of possible future problems and to identify and adjust them in time before serious problems or even bankruptcy occur (Vochozka, 2021).

Bankruptcy models belong to ex-ante analysis and aim to prolong the current situation into the future, to predict how the company will develop in the next 3 to 5 years, and to point out in advance any potential threats to financial health (Růčková, 2011).

The following models were used for the article: IN index 05, Balance analysis of Rudolf Douch, Altman's model for s.r.o. and Springate's model.

The models used were selected based on several criteria. The first of them was the simplicity of the calculation and subsequently the usability of the models in practice (e.g. Altman's model is one of the most basic models). Getting to know the wider public. Applicability of models for most business entities.

IN index 05

Mrs. Inka and Mr. Ivan Neumaier have compiled the IN Credibility Index based on a set of 100 Czech companies verified by selected statistical and mathematical methods. This index reflects the peculiarities of Czech financial statements and the economic situation in the Czech Republic. The IN Credibility Index contains standard ratios of activity, profitability, indebtedness, and liquidity. Over time, four variants of the credibility index have been developed, but only the most recent one, the IN index 05, is included in this paper.

The IN05 index is the last known index of Inka and Ivan Neumaier so far. This index is an update of the IN01 index based on tests on industry data from 2004.

$$IN05 = 0,13 * A + 0,04 * B + 3,97 * C + 0,21 * D + 0,09 * E \quad (1)$$

Where:

A = assets / foreign capital

B = EBIT / interest expense

C = EBIT / total assets

D = total / total assets

E = current assets / current liabilities

If:

IN05 > 1,6, then the enterprise forms a value

IN05 < 0,9, then the enterprise does not create value (destroys)

IN05 between 0,9 and 1,6, then the so-called "grey zone" (the financial situation of the company cannot be assessed)

Balance analysis of Rudolf Douch

The system of balance sheet analyses was compiled in the 1990s by the Czech financial analyst Rudolf Douch. Its construction in the conditions of the Czech Republic should lead to reliable results without being distorted by other economic environments. The model can be used in any company, regardless of its business sector or size.

The balance sheet analysis I provides the analyst with an indicative view of the situation of the enterprise, therefore it is not suitable for fundamental decisions and comparisons in space. This level of analysis consists of four ratio indicators and one overall indicator.

$$C = \frac{2*S+1*A+5*R+4*L}{12} \quad (2)$$

Where:

Stability ratio (S) = equity / fixed assets

Activity indicator (A) = performances / (2 * total liabilities)

Profitability ratio (R) = (8 * EAT) / equity

Liquidity ratio (L) = (financial assets + receivables) / (2.17 * short-term liabilities)

If:

$C > 1,0$, then the enterprise forms a value

$0,5 < C < 1,0$, then the so-called "grey zone" (the financial situation of the company cannot be assessed)

$C < 0,5$, then the enterprise does not create value (destroys)

Altman's model for s.r.o.

Altman's model is a typical example of a summary rating index. It is extremely popular in the Czech Republic, probably due to its simplicity of calculation. It is the sum of the values of five common ratios, which are assigned different weights. The profitability of total capital has the highest weight.

This model was invented in 1968 by Edward Altman, a professor of finance at the New York University School of Business. For his analysis, Professor Altman used a direct statistical method (discriminant analysis) to estimate the weights in a linear combination of individual ratios, which he included in his model as variable variables. He developed this model on an empirical basis, based on a sample of data from companies, half of which were bankrupt. However, in addition to quantitative indicators, he also included in his methodology the so-called financial philosophy, i.e. the attitudes, approaches, and consistency of management behavior with the financial capabilities of the company (Mrkvíčka & Kolář, 2006).

In the original 1968 study, he used data from 33 bankrupts and an equal number of non-bankrupt industrial publicly traded companies in the U.S. Initially, Altman selected 22 indicators, but after repeated testing, he narrowed this selection to five indicators that best characterized the financial distress of the firm.

$$Z = 0,717 * X_1 + 0,847 * X_2 + 3,107 * X_3 + 0,42 * X_4 + 0,998 * X_5 \quad (3)$$

Where:

X_1 = (current assets - short-term liabilities) / sum of assets

X_2 = retained earnings / total assets

X_3 = profit before tax and interest / sum of assets

X_4 = equity / (long-term liabilities + short-term liabilities + bank loans and assistance)

X_5 = sales / sum of assets

If:

$Z > 2,9$, then the enterprise forms a value

$1,2 < Z < 2,9$, then the so-called "grey zone" (the financial situation of the company cannot be assessed)

$Z < 1,2$, then the enterprise does not create value (destroys)

Springate's model

The model was developed and published in 1978 by Gordon L. V. Springate in his doctoral thesis. Springate used discriminant analysis to design the model. He worked with a sample of forty companies from two classes, each containing twenty companies, one bankrupt and the other non-bankrupt. He used the companies not only for model development but also as the first test set. All of the companies were Canadian and predominantly in the manufacturing sector. Companies with comparable amounts of assets were represented in both groups, with the average amount being C\$30.8 million for the failed companies and C\$35.6 million for the successful ones. The classes of businesses also had analogous representations of industry sectors. For example, they included companies in the apparel, food, and foundry sectors.

$$S = 1,03 * A + 3,07 * B + 0,66 * C + 0,4 * D \quad (4)$$

Where:

A = net working capital / total assets

B = EBIT / total assets

C = EBT / current liabilities

D = sales / total assets

If:

$S < 0,862$, then problems can be expected in the company.

2 Methods

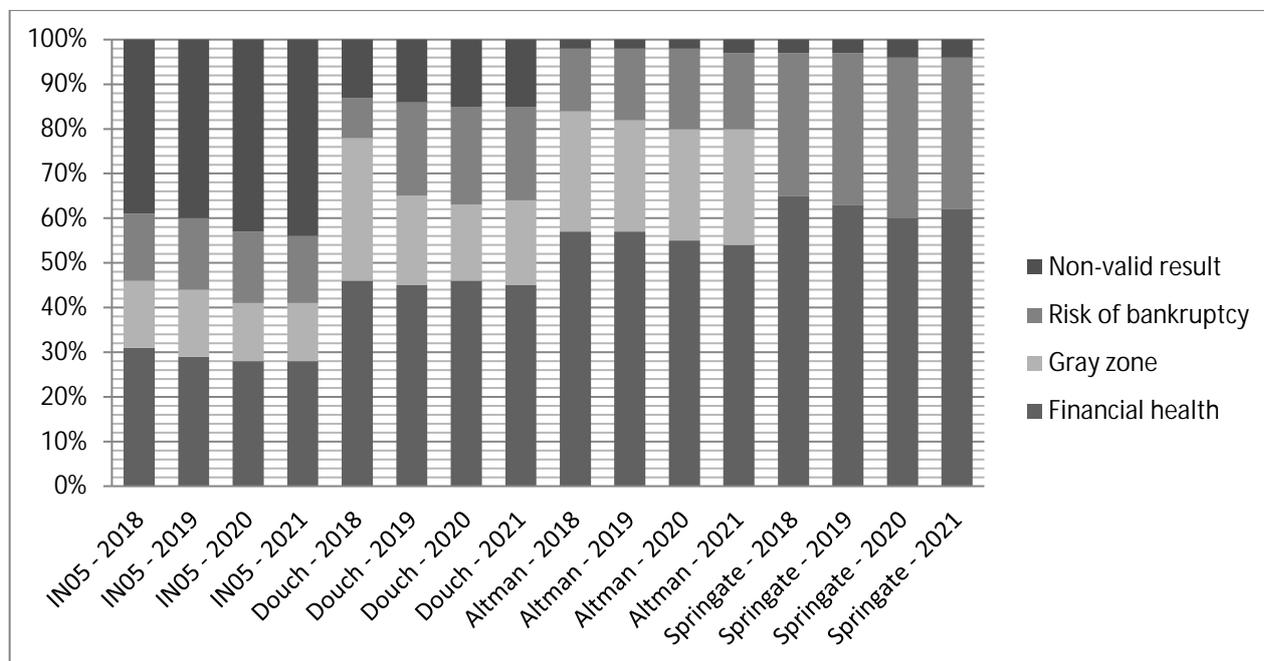
The main aim of the presented paper is to evaluate the financial health of manufacturing firms. Within the theoretical part, this thesis presents different perspectives of key authors on this topic. It describes the different bankruptcy models and provides a sufficient theoretical basis for the practical part of the thesis.

The practical part of the thesis focuses on measuring the reliability of bankruptcy models and determines whether individual firms can be classified as financially sound or financially unsound. It examines a sample of 6,000 firms from the database Albertina.

3 Research results

To determine the reliability of the prediction of the future state of the company will be used descriptive statistics. Previous models were applied to approximately 6,000 companies for the years 2018-2021. For each year, the proportion of companies that are financially healthy according to the given model, that are in the so-called gray zone, that are at risk of bankruptcy, and for which we could not obtain information because the formula contained division by zero was calculated. The following graph shows the calculations for 2018 - 2021. Sub-calculations of the monitored indices in the monitored sample were carried out, and then there was a percentage redistribution and the creation of the offered chart.

Figure.1 Breakdown of businesses by financial health for the period 2018-2021



Source: own processing

If we compare the previous graph over time, we will see that the number of companies at risk of bankruptcy practically does not change. But if we compare the bankruptcy models with each other, we will see that each model indicates a relatively different proportion of companies that are at risk of bankruptcy and that are financially sound.

Tab.1 Statistical values

	N valid	Average	Median	Standard deviation	Variance
IN05	3642	20,60	1,60	273,47	74787,52
Douch	5509	2,14	1,08	38,99	1520,59
Altman	6350	6,17	3,18	119,09	14181,88
Springate	6282	0,23	1,25	36,12	1304,98

Source: own processing

Now we will proceed to the analysis of the calculated values. First of all, it should be noted that the data will be evaluated through two lenses. The first of them is the arithmetic mean, which will be used for the primary assessment of the financial health of the observed sample.

The second way of evaluation will be through medians, as the middle value of this set. This lens will provide a theoretical value for the classification of financially healthy and unhealthy businesses in the observed sample.

Based on the calculated average in the monitored sample for the period 2018-2021, we can say that the companies are financially healthy because the average of the IN05 index is 20,6. However, based on the calculated median in the observed sample for the period 2018-2021, we can say that half of the enterprises are financially healthy and half are below the threshold because the median of the IN05 index is 1,6 (If $IN05 > 1,6$, then the enterprise forms a value).

Based on the calculated average in the monitored sample, we can say that the companies are financially healthy because the average of the balance analysis of Rudolf Douch is 2,14. However based on the calculated median in the observed sample, we can say that half of the enterprises are financially healthy and half are below the threshold because the median of the balance analysis of Rudolf Douch is 1,08 (If $C > 1,0$, then the enterprise forms a value).

Based on the calculated average in the monitored sample, we can say that the companies are financially healthy because the average of Altman's model is 6,17. However, based on the calculated median in the observed sample, we can say that more than half of the enterprises are financially healthy and less than half are below the threshold because the median of the Altman's model index is 3,18 (If $Z > 2,9$, then the enterprise forms a value).

Based on the calculated average in the monitored sample, we can say that the companies are not financially healthy because the average of the Springate's model is 0,23. However, based on the calculated median in the observed sample, we can say that more than half of the enterprises are financially healthy and less than half are below the threshold because the median of Springate's model index is 1,25 (If $S < 0,862$, then problems can be expected in the company).

Based on all the medians of the observed indices, we can say that the monitored sample is more than 50% healthy on which all bankruptcy models agree.

Due to the high dispersion of the data, it is necessary to verify the arithmetic mean with the Wilcoxon reliability test.

Tab. 2 Wilcoxon test

Model	Statistic	p	Note. $H_0: \mu \neq$
IN05	3.92e+6	<0,001	1,6
Altman	9.00e+6	<0,001	1,0
Douch	1.20e+7	<0,001	2,9
Springate	1.33e+7	<0,001	0,862

Source: own processing

It has been statistically proven that we cannot work with average calculated values.

The main conclusion is based on the median, because the average methodically takes into account outliers and thus distorts them.

4 Conclusions

In conclusion, the paper has succeeded in meeting the necessary objective. A comparison of the different models has been made on the example of the selected 6,000 firms. It has been possible to distinguish the different bankruptcy models from each other, both in theory and in practice. The history, their reliability, and the discussion between the authors were presented. The represented firms were ranked from the side of each model.

Based on all the medians of the observed indices, we can say that the monitored sample is more than 50% healthy on which all bankruptcy models agree.

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Optimal investment strategies of conservative investor – reinsurer

Martin Kocúrek¹

Abstract: The aim of this paper is to evaluate investment strategies of conservative investor – reinsurer and assess their performance. In addition, risk exposure is assessed as well. The ultimate goal is to recommend optimal investment strategy for a given investor's risk profile which is influenced by reinsurer's underwriting risk sourced from its core business activities, i.e. sale of reinsurance products to various business segments with various risk exposures. Considering risk pool of particular liability (i.e. from its multiple business segments) and underlying investment portfolio, reinsurer's portfolio managers seeks to choose suitable investment strategy that matches risk profile of given portfolio. For the purpose of study of this specific investor's risk profile, reinsurer's investment process is further analysed with focus on Asset Liability Matching (ALM) framework. Core business activities of reinsurer source significant stream of liquidity which makes reinsurer alongside pension funds and insurance companies significant subject on financial market in terms of investing, however its investment strategies are limited predominantly to conservative strategies due to government regulations, i.e. Solvency which portfolio manager has to consider. We modelled and analysed reinsurer's three investment strategies: (i) North American Equity USD Strategy, (ii) Structured Credit North American USD Strategy and (iii) Corporate Credit North American USD Strategy. Bloomberg Terminal and BlackRock Aladdin platform were used to source securities, construct portfolios and assess their performance on a 5 year period. The length of the assessed period was chosen due to period of macroeconomic stability without disturbing events, e.g. shocks and contractual life of underlying underwriting products.

Keywords: reinsurer, investment strategies, portfolio management

JEL Classification: G22, G11, C32

1 Introduction

Business subjects from various industries, but predominantly retail insurers seek ways to reduce risks. The issue of risk management has become critical for the tenure of managers. Particular type of such risk insurees aim to minimise is characterised by high-variance risks of their insurance portfolios. Insurers and businesses intend to transfer risks fully or at least partially on a second party by buying reinsurance protection from reinsurance companies in order to cover losses they do intend to fully retain. Reinsurance can be defined as process where reinsurer (entity A) issues insurance contract to compensate the reinsure (entity B). For retail insurers, reinsurance reduces underwriting and solvency risks and enables insurers to sell additional insurance products, i.e. underwriting. Such transfer of risk imposes additional cost on risk transferor, i.e. reinsuree in form of reinsurance premium payable to reinsurer. In perfect market, reinsurance premium for catastrophic events should be similar to expected losses as catastrophic events are uncorrelated with financial markets (Froot, 2000 and Gall, Nguyen, Cutter, 2015). In general terms however, the higher magnitude of the expected risk transfer to a reinsurer, the more expensive the reinsurance premium is (MacGregor, Nanthakumaran and Orr, 2012; Wu and Olson, 2017; Porth, Pai and Boid, 2014). There are many reasons why businesses seek reinsurance protection (Venter, 2006; Mankař and Belgacem, 2016). Risk transfer from retail insurer to reinsurer is expensive. There are multiple methodologies for estimating its cost (Froot, 2001; Gall, Nguyen, Cutter, 2015; Porth, Tan, and Weng, 2013; Porth, Pai and Boid, 2014; Porth, 2011). It is important to emphasize that the cost of reinsurance cover has been increasing due to increase of catastrophe events in the world in recent years (AON, 2023; Munich Re, 2021; Swiss Re, 2022). As reinsurer's objective is to determine the shareholder value created by the company, reinsurer uses valuation framework referred to as Harmonised Valuation Methodology (HVM) and asset liability matching (ALM). The most recognised model of ALM and value creation in reinsurance is provided by Bingham (2000) and Bingham (2004), which led to development of individual HVMs of global mayor reinsurers and the most lately to formulation and implementation of IFRS 17 (IFRS, 2023) for reinsurers. Reinsurer generates profit from underwriting business by achieving total return which exceeds the cost of raising the funds from underwriting and future claims being lower than expected or nil. These premiums are

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subsequently handed over asset management which buys and manages investment portfolios, thus are converted into assets. Such investment portfolios are matched by underlying liabilities by asset liability matching framework. This approach enables to split economic balance sheet into investment and underwriting balance sheet, thus separate underwriting risk from market risk and enable to earn profit on the top of underwriting activities, from investment activities, thus create additional added value. Considering risk pool of particular liability, reinsurer chooses appropriate investment strategy. The result of the chosen investment strategy is the portfolio performance itself, which is measured against the respective benchmark (Prather, Bertin, and Henker, 2013). Reinsurer, however does not necessarily aim to beat the respective benchmark as many benchmarks used in reinsurance are used in relation to ALM. Such benchmarks are easy to beat as portfolios with significant weightings in equities tends to exceed the growth rate of liabilities (Blake and Timmermann, 2013, 2011; Korkie, 2002; Tonks, 2002). The challenge for investors, is not limited to the choice of asset class, but to how to construct a portfolio that best suits their risk profile (Massa and Patgiri, 2009).

1.2 Research Aim and Hypotheses

The aim of this paper is to assess three investment strategies of conservative investor, i.e. reinsurance corporation, in particular: (i) North American USD Equity Strategy, (ii) Structured Credit North American USD Strategy and (iii) Corporate Credit North American USD Strategy and to recommend optimal USD investment strategy for a given investor's risk profile which is influenced by reinsurer's underwriting liability profile, considering also portfolio size. Secondly, we are interested in investment performance of each strategy, in particular if each strategy beats the selected benchmark (MSCI or tailored) and risk, volatility and duration of each strategy. Furthermore, we suppose that North American Equity Strategy will provide the highest return and outperform all strategies in accordance with the Modern Portfolio Theory. This paper also aims to provide general recommendation for optimal investment strategies for conservative type of investors, especially those which are subject to strict regulation, e.g. Solvency, Solvency II, Basel I – III, liability-driven investment regulations, etc.

2 Methods

Reinsurer makes profit on their core business activities, i.e. underwriting by earning a total return that exceeds the cost of raising funds from underwriting activities and future claims that are lower than expected or zero. These premiums are then passed to asset management where underlying liabilities are matched to assets within ALM process by investing them on global financial markets. Based on core business profile of modelled reinsurer, i.e. underwriting activities, 70% of its income is sourced in USD due to the domicile of its customers, e.g. retail insurers, global corporations in USA or contractual currency of its international customers. When making investment decision, reinsurer constructs asset portfolios comprising of a variety of asset classes, depending on risk profile of underlying liabilities and considers trade-off between its expected return and conservative risk profile influenced by risk profile of underlying underwriting contracts. The choice of asset class should match the risk profile of the underlying liability from underwriting. Conservative investor what reinsurer is, tries to minimize all types of risks within ALM. Due to the significant currency exposure of its underwriting part is sourced in USD, i.e. 70%, reinsurer's asset management invests into securities denominated in USD. This eliminated potential foreign exchange risk which is incurred by investing into non-USD denominated assets.

Due to the risk pooling, i.e. consolidation of income from underwriting activities based on their business and risk profile on a global level under specific groups, reinsurer allocates 15 bil. USD to be invested to particular portfolios (Table 1). Reinsurer's asset management applies three investment strategies constructed based on underlying asset classes of particular portfolios. Reinsurer applies (i) North American USD Equity Strategy, (ii) Structured Credit USD Strategy and (iii) Corporate Credit USD Strategy. For each investment strategy a unique investment portfolio is constructed based on specific criteria:

(i) North American Equity USD Portfolio,

The objective is to outperform broad equity market, as well as selected MSCI benchmark while retaining a defined level of portfolio diversification and liquidity. Focus should be on fundamental value with the primary driver of returns related to security selection. The portfolio is to be managed with the goal to achieve a total return in excess of the benchmark. Currency mismatch is not permitted, portfolio must be constructed of USD denominated securities. The use of leverage, borrowing, securities lending, and short selling is not allowed. The assets are to be managed on a long-term basis due to 20 year duration of underlying underwriting liability. Permitted are equity and ETF instruments and investment in diversified portfolio of high quality bonds issued for environmentally friendly purposes in accordance with ESG framework and providing attractive returns.

(ii) Structured Credit North American USD Portfolio,

The objective is to actively manage portfolio to earn a reasonably high and stable level of income and achieve a total return in excess of the selected benchmark. Permitted portfolio securities are securitised bonds rated A- or higher (S&P and Fitch) or A3 or higher (Moody's). Furthermore, portfolio can be constructed by selecting agency residential mortgage backed securities (RMBS) and Commercial Mortgage Backed Security (CMBS) with a focus on fixed rate, asset backed securities (ABS), Collateralized Bond Obligation (CBO), Collateralized Loan Obligation (CLO), Auto ABS, Subprime Auto ABS, Credit Cards ABS, Bank ABS, US Student Loans (securitized FFELP) and cash securities. All investments must be denominated in USD. Use of leverage, borrowing, securities lending, and short selling is not allowed. All investment income and capital gains, if achieved, will be added to the assets of the portfolio and reinvested.

(iii) Corporate Credit North American USD Portfolio

The portfolio is to be actively managed to achieve a total return in excess of the selected benchmark. Permitted are fixed income and debt instruments issued or guaranteed by sovereigns or corporations, US plain-vanilla treasuries and agency direct debt (including short-term instruments and cash on deposit. Permitted investments must be rated at least BBB- or higher (S&P and Fitch) or Baa3 or higher (Moody's). Taxable municipal bonds, rated A- or higher (S&P and Fitch) or A3 or higher (Moody's). U.S. plain-vanilla treasuries and U.S. agency direct debt obligations (including short-term instruments and approved money market funds). All investments must be denominated in USD.

Aladdin BlackRock portfolio management software and Bloomberg Terminal are used to construct portfolios, source data, evaluate investment portfolio performance and assess portfolio risk profile. In particular, Bloomberg PORT function was used which allows to assess and measure the portfolio risk exposure, to perform risk metrics to evaluate the portfolio risk profile, e.g. standard deviation, beta and to measure inception to date (ItD) absolute return. PORT enables users to evaluate and modify the allocation of assets within their portfolios. It provides tools to assess the distribution of investments across asset classes, sectors, geographical regions and other parameters, helping to improve portfolio diversification and risk management. In addition, PORT can perform scenario analysis by simulating different market conditions and measuring their impact on portfolio performance. It facilitates a deeper understanding of the potential outcomes and risks associated with different market scenarios through access to real-time market data, news updates, research reports and fundamental data, thereby enriching portfolio analysis and the decision-making process.

Table 1. Investment Strategies Fund Allocation Size

Investment Strategy/Portfolio	Allocated capital from underlying liability pool (millions USD)	Percentage of total from underlying liability pool
North American Equity USD	3,750.00	25.00%
Structured Credit North American USD	9,000.00	60.00%
Corporate Credit North American USD	2,250.00	15.00%
<i>TOTAL</i>	<i>15,000.00</i>	<i>100.00%</i>

Source: Own processing

Investment strategies and portfolios are assessed between 2010-2015 timeframe. The reason for the choice of given timeframe is due to confidentiality and the data availability only for closed and inactive underwriting contracts at the time of writing this paper. In addition, 2010-2015 has been characterised by recovery after 2008 financial crisis with significant returns among almost every asset class, no significant macroeconomic shocks (European Debt Crisis terminated in 2010 which is the default year for portfolio assessment). Stimulus by world's major central banks boosted performance of multiple asset classes.

3 Research results

We constructed and analysed reinsurer's three investment strategies, i.e. portfolios during 2010 -2015: (i) North American USD Equity Portfolio, (ii) Structured Credit USD Portfolio and (iii) Corporate Credit USD Portfolio.

3.1 North American USD Equity Portfolio

To this investment strategy was allocated 25% of total NAV raised from underwriting activities which based on Table 2 and Figure 1 provided 102.6% inception to date return (ItD) which bet the respective benchmark (S&P 500 TR) and doubled the originally allocated NAV which significantly created value for reinsurer from its investment activities.

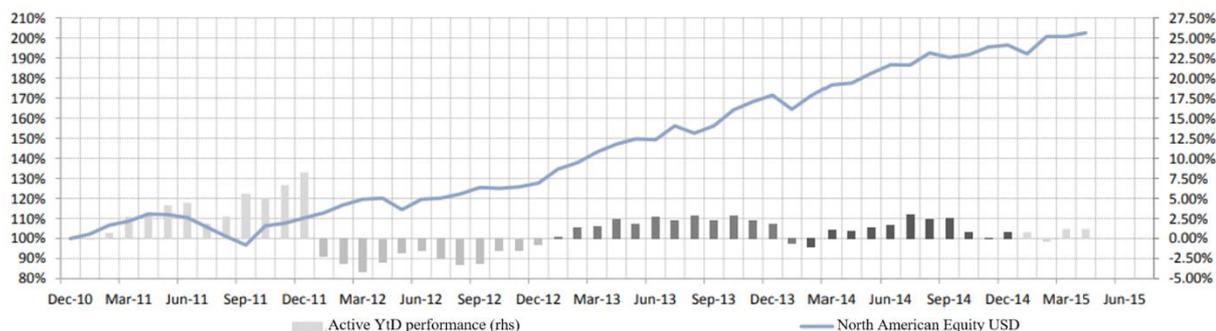
Table 2. North American USD Equity Portfolio Performance Overview

Portfolio	NAV (mil USD)	% allocated NAV on total NAV	ItD Return (%)	Benchmark	Beta	Sharpe Ratio
North American Equity USD	3,750.00	25.00%	102.6%	S&P 500 TR ²	2.102	0.42

Source: Own processing, based on Aladdin BlackRock (2023) and Bloomberg Terminal data (2023).

North American USD Equity Strategy invests into large cap companies with geographic focus on the USA only. Strong performance was driven by its strategic asset allocation into growth industries: 17.7% of NAV was invested into healthcare, 15.6% of NAV into energy, 14.8% into IT, 12.2% into financial services, 11.9% into consumer goods industry, 6.2% into telecommunications, 8.4% into industry and 13.2% into cash, utilities and other. In terms of assessing risk-adjusted performance by Sharpe Ratio of 0.42 we follow the logic, the greater a portfolio's Sharpe ratio is, the better its risk-adjusted performance is. Portfolio's volatility in measured period by Beta was 2.102 which indicates that Portfolio's price activity is more volatile than the market with magnitude of volatility twice as strong as the market expressed by selected benchmark. Beta of measured investment security is a quantitative risk statistic metrics that measures historical volatility relative to the market as measured by a relevant index. Portfolio with values of Beta > 1 indicates the portfolio is more volatile than the market in a given time frame. On the contrary, portfolio with values of Beta < 1 is less volatile than the market. Beta = 1 indicate movement similar to the index, i.e. the market.

Figure 1 North American USD Equity Portfolio Performance (Value Added Monthly Index) 2010-2015



Source: Own processing, based on Bloomberg Terminal Data (2023).

3.2 Structured Credit North American USD Portfolio

Structured credit portfolio is the total amount of funds allocated by reinsurer into structured credit products which are created via securitisation process which involves pooling similar debt obligations into interest-bearing securities by those assets and issued and sold to investors. This pooling relocates risk and return potential in the underlying loan (Oaktree Capital, 2023). 60% of total NAV raised from underwriting activities was invested into Structured Credit USD Strategy and provided ItD return of 12.9% which bet the selected MSCI Composite Benchmark.

² Total Return

Table 3. Structured Credit North American USD Portfolio Performance Overview

Portfolio	NAV (mil USD)	% allocated NAV on total NAV	ItD Return (%)	Benchmark	Beta	Volatility	Sharpe Ratio
Structured Credit North America USD	9,000.00	60.00%	12.9 %	MSCI Composite Benchmark	0.99	2.03%	0.62

Source: Own processing, based on Aladdin BlackRock (2023) and Bloomberg Terminal data (2023).

Risk-adjusted performance measured by Sharpe Ratio is 0.62. Portfolio's volatility in measured period was 2.03% or if measured by Beta 0.99 which indicates that Portfolio's price movement is similar to the market and is strongly correlated with the market.

3.3 Corporate Credit North American USD Portfolio

Reinsurer's investments into Corporate Credit USD Portfolio represent the lowest allocation of its NAV for investment of just 15%, which based on Table 4 provided ItD return of 20% and bet the MSCI Composite Benchmark. This is the second best performing portfolio after North American USD Equity Portfolio.

Table 4. Corporate Credit North American USD Portfolio Performance Overview

Portfolio	NAV (mil USD)	% allocated NAV on total NAV	ItD Return (%)	Benchmark	Beta	Volatility	Sharpe Ratio
Corporate Credit North American USD	2,250.00	15.00%	20.0 %	MSCI Composite Benchmark	0.90	2.85%	0.51

Source: Own processing, based on Aladdin BlackRock (2023) and Bloomberg Terminal data (2023).

In terms of volatility, Corporate Credit USD Portfolio's volatility in measured period was 2.85% or if measured by Beta 0.90, i.e. it is less volatile than the market measured by MSCI Composite Benchmark In comparison to Structured Credit USD portfolio, it is less volatile. In terms of assessing risk-adjusted performance by Sharpe Ratio of 0.51, this portfolio has worse risk-adjusted performance than Structured Credit USD Portfolio.

Conclusions and discussion

The aim of this paper is to evaluate three investment strategies of conservative type of investor, a reinsurance corporation whose investments are limited by its specific business profile due to asset-liability matching process and liability-driven investments and at the same time, being subject to strong regulations, i.e. Solvency I and Solvency II. It was assessed whether analysed investment strategies bet the market as expressed by selected benchmarks. In addition we recommend the optimal investment strategy with suggested optimal allocation of NAV of total NAV by considering high opportunity costs of allocating them into other strategy with given investor's risk profile.

70% of reinsurer's income from underwriting activities is sourced in USD due to the domicile of its main customers in the US or majority of its international customers with USD as contractual currency. Due to this fact, all three portfolios are constructed of USD denominated securities in order to eliminate possible foreign exchange risk which for conservative type of investor - reinsurer, would be an additional source of risk. Due to the pooling of underlying underwriting liabilities, three investment strategies, i.e. portfolios were constructed and assessed: (i) North American Equity USD Strategy, (ii) Structured Credit North American USD Strategy and (iii) Corporate Credit North American USD Strategy.

Having considered partial results for each investment strategies as seen in Tables 1-4, it can be concluded that the best performing strategy in form of ItD return is North American Equity USD Strategy (102.6% ItD) with the highest volatility expressed by beta of 2.102, i.e. is moving twice as much as the broader market. Due to the reinsurer's profile as conservative investor, only 25% of NAV of income sourced from underwriting activities is allocated to it. Due to underlying underwriting risk profile, it is undesired for this type of investor to have opened highly volatile positions with significant exposure both, either upside or downside. Especially, the case of adverse exposure and need to provide sufficient cash to fulfil contracted underwriting obligations, i.e. compensation of reinsures could result into inability to liquidate negatively exposed positions not only with profit or zero profit, but with loss, which results into loss and depending on the size of exposure a possibility of bankruptcy of reinsurer.

The second best-performing strategy is Corporate Credit North American USD Strategy (20.0% ItD), however with the lowest NAV of all strategies allocated to it of just 15%. Although the highest amount of NAV invested of all strategies (60%) was invested into Structured Credit North America USD Strategy, this portfolio provided the lowest return of just 20.0% ItD.

In terms of volatility measured by beta, a quantitative risk statistic metrics that measures historical volatility of portfolio relative to the market, the most volatile strategy is North American USD Equity Portfolio (2.102) being twice as volatile as the market, followed by Structured Credit North America USD Portfolio (0.99) being similarly volatile as the market and least volatile Corporate Credit North American USD (0.9) being less volatile than the market measured by the selected benchmark. In terms of assessing risk-adjusted performance by Sharpe Ratio, the greater a portfolio's Sharpe ratio is, the better its risk-adjusted performance is. Structured Credit North America USD Portfolio (0.62) provides better risk-adjusted performance than Corporate Credit North American USD Portfolio (0.51). The lowest risk-adjusted performance is offered by North American Equity USD Portfolio (0.42)

Following the redistribution of funds (in NAV) sourced from underwriting activities as seen in Table 1, it can be concluded that reinsurer applies strictly conservative policy of preferring strategy with the best risk-adjusted performance and not considering solely ItD return. The opportunity costs of this investment allocating decision is high. By considering underlying underwriting liabilities' risk profile and reinsurer's profile, we recommend to reduce allocation into Structured Credit North America USD Portfolio from 60% to 30%, increase allocation to Corporate Credit North American USD from, 15% to 35% and increase allocation to Equities from 25% to 35%. As structured and corporate credit have similar risk parameters (Sharper Ratios of 0.62 and 0.51 and betas of 0.99 and 0.90 respectively), but different returns, shift to Corporate Credit materializes high opportunity cost of this strategy (ItD) by keeping similar level of risk. 10% increase of allocation to Equity Strategy does not increase risk significantly and partially enables utilisation of the highest opportunity costs which this strategy offers.

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Activation of entrepreneurship among vulnerable groups of the population under martial law: Organization and taxation

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Abstract: In 2022, the Russian Federation's troops invaded the territory of independent Ukraine full-scale. Since then, Ukraine's economy has been operating under martial law, which imposes certain restrictions on business activities. In addition, due to the hostilities, businesses, infrastructure, and housing were destroyed, leaving many people without homes and sources of income. To boost entrepreneurial activity, the government has introduced many grant programs. This study examines one of these programs. The intensification of entrepreneurship should ensure that citizens receive new sources of income, create new jobs in the country, and fill the state budget.

Keywords: business, entrepreneurial activity, entrepreneurship, martial law, taxation, Ukraine

JEL Classification: G51, H71, L26

1 Introduction

The full-scale invasion of the territory of Ukraine by the Russian Federation in 2022 caused many economic problems. In particular, in 2022, Ukraine's economy contracted by 30%³, the unemployment rate was 21.1%⁴, and the number of Ukrainians who left the country is estimated to be between 8 and 10 million (approximately one-fifth of the population of Ukraine). Ukraine's budget is financed by 19.16% from foreign countries and international organizations, 44.89% from tax revenues, and 35.95% from other sources⁵. Given that the hostilities continue, businesses, housing, and infrastructure are being destroyed, and a large part of the population is unemployed, without housing, and without sufficient funds to cover basic needs. Investments in restoring economic potential and infrastructure are risky, as newly created businesses, roads, and residential buildings can be destroyed at any time.

To prevent emigration and provide people with livelihoods, Ukraine has created many grant programs aimed at restoring, creating, and developing small businesses, funded by various countries and international organizations. Such grant programs provide financial support for business development in the amount of \$2,000 to 10,000 on a non-refundable basis. The government, in turn, supports the development of small and medium-sized businesses in Ukraine by introducing a simplified taxation system. The legal form of business activity in Ukraine is the individual business entity (IBE). IBEs are divided into groups depending on the types and scope of activities and the number of employees. Each group of IBEs has equal single tax rates. The use of a single tax is more beneficial for entrepreneurs than paying taxes under the general scheme. However, grant support and the introduction of a simplified taxation system are not enough to support and restore Ukraine's economy during martial law.

Despite the state's desire to boost entrepreneurship in Ukraine and the difficult, non-alternative conditions in which Ukrainians find themselves, other factors affect entrepreneurial activity and may cause its inefficiency. In particular, Mujahid et al. (2017) and Nguyen (2018) argue that self-confidence affects the ability to conduct entrepreneurial activity. A self-confident person has the following qualities: determination, adaptability, determination, communication skills, stress resistance, and positive thinking. An important factor influencing entrepreneurial activity is social support, which is confirmed by Neneh (2022) and Usadha et al. (2020). The purpose of the study is to establish a list of factors that affect the ability of citizens belonging to vulnerable groups to carry out entrepreneurial activities under martial law.

2 Methods

The research authors had the opportunity to work on an international project that provides grant support for USD 4,000. The project was aimed at providing \$4,000 in grant support to Ukrainians affected by the armed aggression of the Russian Federation against Ukraine or residing in Ukraine but belonging to low-income groups (single mothers or fathers, large

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³ Official website of the Ministry of Economy of Ukraine. URL: <https://www.me.gov.ua/>

⁴ Official website of the National Bank of Ukraine. URL: <https://bank.gov.ua/>

⁵ Official website of the Ministry of Finance of Ukraine. URL: <https://index.minfin.com.ua/ua/finance/budget/gov/income/>

families, disabled people or families raising disabled children) to restore or scale up small and medium-sized businesses. As part of this program, participants received training (24 hours), individual consultations on writing a business plan (5 hours), and defended their business plans in front of the commission and other project participants. During the meeting and communication with the participants, a questionnaire was conducted to find out what helps and hinders them in starting and running their own business.

For processing and initial analysis of the input information, the simple grouping method was used, which includes a set of procedures related to determining the main characteristics of the data set to be grouped. The following characteristics were selected for grouping the data: gender, age, presence of dependent minor children, level of education, previous experience of earning active income, attitude to business as a source of income, and type of activity in which it is planned to establish (conduct) business. In our opinion, the selected characteristics directly affect a person's willingness and ability to engage in entrepreneurial activity. Within the groups, we have identified structure indicators that provide additional information about the set of data under study according to the selected characteristics. Average values were used to determine generalizable indicators within individual populations. The arithmetic mean was used to determine the average age of project participants. To determine the most frequently occurring attribute in the selected population, we identified modes based on such characteristics as level of education, previous experience of earning active income, and type of business activity. 427 project participants completed the survey, and their main characteristics are shown in Table 1.

Table 1 Key characteristics of project participants

Characteristics	Group	Specific gravity, %	Average indicators
Gender	Men	5,39	-
	Women	94,61	
Age	up to 25 years old	18,27	38 years - the average age of a project participant
	25-40 years old	74,94	
	over 40 years old	6,79	
Presence of young dependent children	without children	12,41	-
	1-2	83,37	
	3 and more	4,22	
Level of education	Secondary school education	5,85	Most of the project participants have higher degrees
	Junior bachelor's degree (and equivalent levels)	11,24	
	Bachelor, Master (and equivalent levels)	82,90	
Previous experience of receiving active income	not available	11,48	Most of the project participants have no entrepreneurial experience, as they were employees
	Employee	67,68	
	Entrepreneur (current or former)	20,84	
Attitude to business as a source of income	Permanent basic income	71,90	-
	Temporary basic income	24,59	
	Non-basic income	3,51	
Type of activity in which you plan to start (run) a business	Production	5,85	The service sector is the most desirable for project participants to start and continue their business
	Agriculture	5,39	
	Service sector	88,76	

Source: Own processing

An interview was conducted with 36 randomly selected project participants, the results of which were used in the study. According to the authors of the study, the quantitative indicator that characterizes the participants' interest in starting and running their own business is the amount of funds that they are willing to invest in the project over the grant amount. The need to invest their funds is because \$4,000 that can be provided to participants as support can be used according to a certain formula: no more than 10% of the grant amount for advertising; no more than 30% of the grant amount for current assets; 100% of the grant amount for fixed assets. However, many participants had to cover the costs of rent, utilities, and salaries for their employees to implement their business plans. Therefore, despite the participation of vulnerable people in the project, investing their own money in the business project was a prerequisite for its implementation. During the interviews, the researchers hypothesized that the amount of personal funds that a person is willing to invest in their own business is influenced by the respondent's age, which they decided to test using correlation analysis.

3 Research results

Correlation and regression analysis is carried out to establish the relationship between the outcome and factor indicators. In this case, the outcome indicator was the amount of funds that the project participant was willing to invest in their own business. The resultant indicator is displayed in US dollars based on the exchange rate of the National Bank of Ukraine

as of 09 October 2023. The age of the participant was chosen as a factor indicator, measured in the full number of years of the project participant. Microsoft Excel for Data Analysis was used to calculate and visually display the results of the correlation and regression analysis.

The calculations included the following steps:

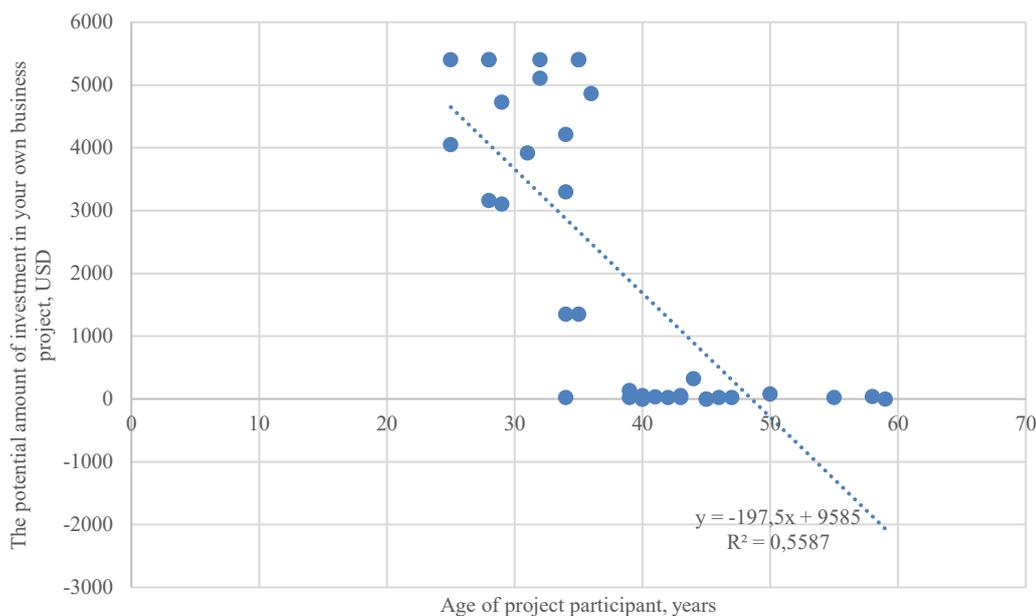
$$\sum X = 1380, \sum Y = 72504, \sum X \cdot Y = 2255177, \sum X^2 = 55554$$

$$a = \frac{\sum Y \cdot \sum X^2 - \sum X \cdot \sum XY}{n \cdot \sum X^2 - (\sum X)^2} = \frac{72504 \cdot 55554 - 1380 \cdot 2255177}{36 \cdot 55554 - 1380^2} \approx 9585$$

$$b = \frac{n \cdot \sum XY - \sum X \cdot \sum Y}{n \cdot \sum X^2 - (\sum X)^2} = \frac{36 \cdot 2255177 - 1380 \cdot 72504}{36 \cdot 55554 - 1380^2} \approx -197.5$$

The equation of the regression line is: $y = 9585 - 197.5 x$. Correlation is characterized by direction, strength of connection, probability, and form. As a result of the calculations, it was determined that there is a moderate relationship between the selected indicators. This is evidenced by the value of the calculated correlation coefficient. The dynamic of the parameters is multidirectional, i.e. an increase in one parameter leads to a decrease in the other. This is illustrated by the minus sign in the regression equation. The graph of the regression line is: $y = 9585 - 197.5 x$ (Figure 1).

Figure 1 Correlation and regression analysis



Source: Own processing

4 Conclusions

The results of the analysis show that older project participants do not have the ability or desire to invest in the development of their businesses. This can be due to various reasons: 1) lack of savings; 2) lack of confidence in the profitability of future business; 3) unwillingness to take entrepreneurial risks or many others that may be the subject of further research. However, it can be unequivocally stated that boosting entrepreneurship in Ukraine among vulnerable populations cannot be achieved only by providing non-repayable financial assistance for business development (Meng et al., 2023), tax cuts (Arulampalam et al., 2021), and educational projects (Santana Vega et al., 2016; Karimi et al., 2012). Strategic entrepreneurship should be applied and managed at the macro and micro levels (Dogan, 2015; Olutuase et al., 2018). The study also shows that participants over the age of 35, who still have to be involved in the economy for the next 30 years before reaching retirement age, have low motivation to engage in entrepreneurial activities and do not have sufficient resources to run a business. At the same time, the age of future entrepreneurs cannot be the only factor that influences the desire to start a business. Psychological factors (Wu et al., 2022; Audretsch & Lehmann, 2023), geographical factors

(Wach, 2015), socio-cultural factors (Stam et al., 2008), and the level of digitalization of the economy (Shen et al., 2018) should be taken into account.

The limitations of the study are that most of the project participants were women, while the gender ratio of individual entrepreneurs in Ukraine as of the end of 2021 was 53.4% men and 46.6% women⁶. Other features that indicate that the project participants belong to vulnerable groups of the population are, in our opinion, representative of this type of research.

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⁶ Opendatobot. URL: <https://opendatobot.ua/open/foconomics>

The transfer pricing: The full-fledged manufacturer case study

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Abstract: The transfer pricing is now not only a topic for multinational companies, but also for every company cooperating in multi-companies networks. The activity of tax administrators in the tax audit focused on transfer prices is increasing, and this issue becomes an almost standard part of a regular tax audit focused on corporate income tax.

This paper deals with the issue of transfer pricing in a company evaluated as a full-fledged manufacturer, that is, a part of a multinational company. The concerned company is currently working to improve the quality of transfer pricing documentation. The purpose of this article is to demonstrate, in a brief case study, the basic procedure used to evaluate the differences between prices for independent companies and for associated companies. The evaluated transactions are compared with the data available from companies operating in the same industry. It was found that the profitability of the company is comparable to the expected profitability based on the calculated market profit range. According to the risk analysis, the main risks to the company resulting from the market environment and the poorly established transfer pricing policy.

Keywords: transaction prices, arm's-length principle, comparative analysis, related parties

JEL Classification: K34, H25

1 Introduction

The transfer prices literature delves into various topics related to transfer pricing. This includes studies on the economic effects of transfer pricing, such as its impact on tax revenues (Clausing, 2003), multinational firm behaviour (Apriyanti et al., 2023), and economic efficiency (Barker et al., 2017). Furthermore, the literature explores the legal and regulatory aspects of transfer pricing, including the role of tax authorities and international guidelines for transfer pricing practices. Furthermore, there are contributions that focus on transfer pricing strategies (Clempner & Poznyak, 2017), intercompany pricing methods, and transfer pricing adjustments. Topics like digitalisation in transfer pricing or management accounting (Poyda-Nosyk et al., 2023; Hemling et al., 2022) occur in last years. As transfer pricing continues to be a crucial issue for multinational corporations and tax authorities, researchers have recognised the importance of studying and understanding this area. Consequently, the number of published articles, research papers, and books on transfer pricing has increased, reflecting the growing interest and significance of this topic in both academia and practice. Although Czech companies' awareness of this issue has increased significantly since its implementation, precisely processed transfer pricing documentation is still not common, and the arm's-length principle compliance can sometimes be difficult to prove.

The OECD Transfer Pricing Guidelines "provide guidance on the application of the arm's length principle, which is the international consensus on the valuation of cross-border transactions between associated enterprises" (OECD, 2022). According to the OECD guide, companies (multinationals) can apply one of five basic methods for transfer pricing: "the comparable uncontrolled price method (CUP), the resale price method (RPM), the cost plus method (CPM), the net transaction margin method (TNMM) and the transaction profit split method (TPSM)" (OECD, 2022). The most important criterion when choosing the appropriate OECD transfer pricing valuation methods is its suitability for a specific case (based on the nature of the controlled transaction or company profile, and so on). The specific case contains many variables from which a complex picture needs to be assembled (Solilová & Nerudová, 2019).

Sometimes it is difficult to determine whether companies are related parties or associated parties at all. The exact definition of the term "related parties" is missing in the Czech accounting regulations. Act No. 563/1991 Coll. on Accounting, does not deal with this one or a similar term at all, only Decree no. 500/2002 Coll., for entrepreneurs refers in §39a and §39b to international accounting standards regulated by European Union law. In this context, the accounting entity is obliged to provide (to the financial statements) information about transactions carried out with a related parties that were not concluded under normal market conditions, including the volume of transactions, the nature of relations with a related party, and other information necessary for understanding the financial situation of the accounting entity. A related party transaction is a transfer of services, resources, or obligations between related parties, regardless of whether a price is charged. International Accounting Standard 24 - Related Party Disclosures requires disclosures about

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transactions and outstanding balances with an entity's related parties. The standard defines various classes of entities and people as related parties and sets out the disclosures required with respect to these parties, including the compensation of key management personnel (IAS 24).

2 Methods

The purpose of this article is to demonstrate, in a brief case study, the basic procedure used to evaluate the differences between prices for independent companies and for associated companies.

A) Methods Used:

Analysis of transactions: The analysed transactions are possible to consider as a sale of own products. With respect to the characteristics of the sold products, the cost plus method (CPM) was chosen as a method for setting the appropriate transfer price.

Comparative analysis: This case study deals with two methods for determining the appropriate intercompany price. The first one used a comparable method for calculating the interquartile market range, and the second one is a method used in the case when a comparable transaction or company is not available.

This **interquartile market range** for comparable transactions is calculated based on the profit margins of 8 comparable companies (dataset from TP Catalyst) during the period 2018 – 2022. Basic descriptive statistics are used: minimum, maximum, median, spread, and interquartile range (IQR). The IQR represents the difference between the upper (Q3) and lower (Q1) quartiles and describes the middle 50% of the values when ordered from lowest to highest.

When a comparable transaction is missing, the CPM method allows one to calculate the interquartile range from the transactions that the given company deals with independent companies. Operating margin was used as a profit indicator. The only condition for this solution is a volume of transactions for related parties comparable to those with transactions with independent companies.

B) The data sources:

- Financial statements of the ABC company from 2018 to 2022.
- Internal accounting data from the ABC company, that describe the nature and the amount of transactions between related parties and the ABC company.
- Internal accounting data from the ABC company, which describes the nature and amount of transactions between non related parties.
- Financial statements used for the comparative analysis (8 companies with identical or similar production and amount of transactions) describing the same period. The data set for comparative analysis comes from the TP Catalyst Database.
- Basic characteristics of eight compared companies.

3 Research results and discussion

The term 'transfer price' is used to determine the cost of charging another division, subsidiary, or holding company for the services rendered. Typically, transfer prices reflect the price on the market for that good or service. A very important term regarding the transfer pricing is related parties. The transfer pricing practice extends to both cross-border and domestic transactions. In case the customer and supplier are independent companies, the transaction price is determined strictly by market. But in the case of a parent company and its subsidiary, the construction of the price is not always clear. Sometimes, the service or product sold between parent company and subsidiary differs from one that is sold to an independent business partner. To justify such a difference in price, transfer pricing documentation is provided.

The ABC company is a subsidiary with parent company based in Europe. Some details are modified so that the analysed company would be difficult to identify. The five-year period from 2018 to 2022 is used for the analysis.

3.1 Full-Fledged Manufacturer

The ABC company operates in the field of gaming machine manufacturing. Although this industry may seem to be infrequent in terms of the number of operating companies and perhaps even controversial in certain aspects, its importance to the economy is not negligible. In our case, the Czech subsidiary of the German parent company is responsible for providing the space, goods, or material necessary for production, as well as all machinery and staff. This manufacturer assumes almost all the risks associated with selling the products and has rights to intangible assets. The analysed enterprise corresponds exactly to the full definition of the manufacturer, which was also confirmed by the functional and risk

analyses performed. The risk and functional analyses are not included; they serve as a starting position for the presented case study only.

3.2 Appropriate intercompany price and comparative analysis

In this analysis, it is necessary to identify the transaction the company carries out with independent parties, with related parties, and obtain external data for comparison, i.e., transactions from comparable companies. According to the nature of the analysed transaction, the method for determining the transfer price is chosen. External data come from the TP Catalyst database. During the identification process of suitable companies for comparative analysis, it is necessary to take into account the comparability of economic circumstances and market conditions. Furthermore, no relevant external data from the database can be found. In such a case the controlled transactions of the company with related parties shall be about equal to the volume of transactions with independent persons (part of the CPM). The case study also takes this possibility into account in the last year monitored.

Comparative analysis

The obtained sample consists of only eight relevant companies. The names of the companies in Table 1 have been replaced by capital letters that do not have relation to the original names of the companies. The companies analysed are from several European countries. Table 1 describes the profit margin development of these companies in the monitored period. Some of the companies show only moderate profit represented by low operating profit margin, while others show higher operating profit margin. A negative value of the operating profit margin is also presented in the analysed sample, but only exceptionally and in a short time. The evaluated period was chosen according to the OECD recommendation, which states that the latest available data should be considered. At the same time, a sufficiently long period was established, thus avoiding the distortion that stems from lower production and reported profits by companies in the gaming equipment industry due to the outbreak of the Covid 19 pandemic.

Table 1 - Profit margins in companies used for comparative analysis.

	2018	2019	2020	2021	2022
A	40,2 %	36,73 %	33,07 %	25,62 %	26,73 %
B	15,50 %	12,41 %	11,70 %	14,52 %	23,28 %
C	14,52 %	12,45 %	10,27 %	15,98 %	16,27 %
D	27,57 %	21,89 %	16,90 %	15,71 %	13,98 %
E	16,52 %	15,07 %	10,32 %	15,73 %	18,27 %
F	18,2 %	- 0,3 %	12,29 %	12,87 %	13,98 %
G	21,74 %	22,14 %	18,56 %	19,76 %	22,05 %
H	9,32 %	7,19 %	7,11 %	11,03 %	19,32 %

Source: Data set from TP Catalyst database, own processing

Table 2 shows the calculated interquartile market range of companies for individual years and the final interquartile market range. The analysis is in accordance with the D-34 GFR, 2019. In addition, spread values are given, which are very low. This means that profit margins do not differ significantly within the entities analysed. Since 2019, the difference between the first and third quartiles is decreasing. This situation can be explained by the fact that the number of competitors in the market is increasing. The interquartile market range is in the interval 13.71% - 20.35 with a median value of 15.6%.

For the price of transactions carried out with related parties to be called the independent market price, its value must be within a given range. The calculated interquartile market range should be compared to the profitability that the company achieves by selling products to related parties. If this profitability of related parties transactions, and thus the interquartile market range is higher, it is necessary to make an adjustment so that the profit margin of the company fits into the interquartile market range.

Table 2 The interquartile market range in the period 2018 - 2022 in %

years analysed	2018	2019	2020	2021	2022	Average values
Minimum	9,32	-0,3	7,11	11,03	13,98	8,23
1 st quartile	15,255	11,16	10,31	14,11	17,77	13,71
Median	17,36	13,76	12,00	15,72	19,15	15,60
Third quartile	23,2	21,95	17,32	16,925	22,36	20,35
Maximum	40,2	36,73	33,07	25,62	26,73	32,47
Spread	0,0119	0,0109	0,0058	0,0018	0,0014	

Source: TP Catalyst database data source, own processing

Appropriate intercompany price

If company ABC sells products to distributors, whether associated with individuals or independent distributors, the price for such companies is generally set at the "List price" level for that market less a 35% gross margin for the distributor. Price negotiations between the distributor and another entity in the chain are then the responsibility of the given distributor. On the basis of operating revenues and costs, that is, the operational profit for the period monitored from 2018-2022, the profit margin related to the transactions taking place in the group is determined (see Table 3).

Table 3 Profit margin construction – related parties in CZK

	2018	2019	2020	2021	2022
Operating income	122 499	195 066	103 948	108 087	466 375
Operating costs	105 543	160 245	84 408	89 170	373 201
operating profit	16 956	34 821	19 539	18 917	93 174
Profit margin	13,84 %	17,85 %	18,80 %	17,50 %	19,98 %

Source: ABC internal accounting records, s.r.o. (own processing)

During the test period (years 2018-2022), the profitability of the ABC company for transactions with related parties was calculated in the range of 13.48% - 19.98%. The interquartile market range of comparable companies was calculated to be 13.71% - 20.35%. This fact confirms that the prices with related parties correspond to market prices and are in accordance with the arm's length principle.

Appropriate intercompany price when the comparable transaction or company is not available.

The ABC company manufactures products for which there are only a few substitutes in the market. From this follows the fact that few companies can be compared with the analysed company ABC. One of the requirements of the financial administration is the same geographical location of the compared companies; therefore, it may happen that the analysed company cannot be compared with a sufficient number of other companies, or there will not be a sufficient number of companies to calculate the interquartile market range.

In this case, the cost plus method (CMP) proposes another solution, the interquartile range is calculated from the transactions that the given company makes with independent persons, i.e. from transactions outside the group. The only condition for this solution is a volume of transactions outside the group that is comparable with those within the group. This fact was achieved by ABC Company in 2022, the volume of transactions with connected persons exceeded CZK 55.9 million (corresponding to 53% of the total volume of transactions), and with independent persons in the amount of CZK 49.57 million (47% of the volume of transactions). When comparing transactions with related persons and transactions with independent persons, we see that the ratio of transactions carried out is comparable.

After identifying the transactions, it is necessary to proceed to the analysis of the profitability indicator of the selected controlled transactions with independent persons. In this case, we used the net operating margin as the profitability indicator. To determine the interquartile range for the margin of profit, all sales of products by a given company to independent persons are intended. In this case, the interval is 10.54% -13.68% (with minimum 5.32%, maximum 22.78% and median 12.93%).

According to this method, the company ABC would not comply with the arm's-length principle because the profitability is higher than the interquartile range of the profit margin. This calculation implies that the company sells its own products to related parties in the group more cheaply than to independent parties. This statement should be confirmed by analysing the margins.

Margin analysis compares margins on transactions with related persons with margins on transactions with independent persons. If the margins for independent transactions are higher than those made with related parties, it will be confirmed that Company ABC is selling its products cheaper to the group than outside the group. The margin with related persons is on average 18%, from about 9% to almost 40%, and the values are for the year 2022. The margins for countries in North and South America reach maximum values in the analysed sample, whereas the margins for countries in the South and East of Europe reach minimum values. The margins for transactions with the rest of Europe are around average.

ABC sells products outside its group at an average profit margin of 22% and within its group at an average profit margin of 18%. The ABC company sells its products to related parties at a lower price than to independent parties outside the group. However, this fact is caused by the policy of the ABC Company, when the ABC Company sells its products with different margins according to the geographical location of the states, i.e., it sells its products with different margins according to the requirements of a certain market. The increase in product sales to the group that occurred in 2022 may distort ABC's profitability.

It is important for company ABC that its profitability in the entire examined period corresponds to the calculated interquartile market range, and it can therefore be stated that the arm's-length principle is preserved. For the Company, it follows a recommendation to avoid increasing the volume of transactions within the group or to equalise the amount of the profit margin between related parties and independent parties.

4 Conclusions

The paper deals with a brief case study that demonstrates the basic procedure used to evaluate the differences between prices for independent companies and associated companies (related parties). The cost plus method (CPM) is applicable to the transactions of the full-fledged manufacturer. Due to the use of two methods to calculate the interquartile profit margin, it has been proven that not all methods can correctly determine it. The issue of transfer pricing has not only concerned multinational companies and cross-border transactions but is also increasingly encountered by small and medium-sized enterprises, which until now did not have to deal with it. The presented study can be used as a basic guide for such enterprises.

During the tax audit, the presentation of well-executed documentation on transfer prices means a certain assumption on the representatives of the tax office that the given company deals with the issue of transfer prices, and they are set in accordance with the arm's-length principle. This documentation can serve as a very valuable aid for explaining and defending the price setting strategy of the company. The lack of or poorly prepared transfer pricing documentation, on the other hand, exposes the company to several risks: increase in the tax base and increase in tax and its accessories is only one of many other (risk of supply chain interruption, loss of consumers or legislative risks). It also often happens that the subsidiary takes over the transfer pricing documentation from the parent company and implements it without tailoring it not only to the company parameters but also to the market and economic conditions in which it operates. Such inadequate documentation is more likely to be an obstacle in the smooth course of the tax audit than to serve as significant evidence. One of the most basic prerequisites for a well-developed transfer price documentation is the help of a qualified expert who, with the help of a database, will collect quality data and determine the most appropriate method to calculate the interquartile range and the transfer price that will correspond to market conditions.

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Taxation of still wine in the Czech Republic and other member states of the European Union

Rybová Jarmila¹

Abstract: The article focuses on the comparison of wine taxation indicators in the Czech Republic and other member states of the European Union. The author wants to contribute to the discussion on the introduction of a higher than zero rate on still wines in the Czech Republic. When introducing the taxation of still wine in the Czech Republic, it is necessary to proceed in accordance with the applicable directives of the European Union. These are Council Directive (EU) 2020/1151 and Directive 92/83/EEC. The 2020 Directive regulates the conditions for the application of reduced rates for wines and amends Directive 92/83/EEC, which sets a rate of zero for still wines. The source of data for comparing indicators applicable in the area of wine taxation are European Commission and Eurostat documents.

Cluster analysis ranked the states of the European Union according to their similarity of the observed characteristics. The clustering objects have made up of 27 member states and their characteristics are indicators of taxation in the field of still wine. It is evident that states with high production prefer lower taxation of still wine and consumption is usually at a higher level in these states. In contrast, states with lower or no production more often choose higher taxation and consumption is rather low here. France with higher taxation of still wine and Italy with no consumption taxes appear to be specific.

Keywords: still wine, excise duties, consumption taxes, EU member states, Czech Republic
JEL Classification: H20, H23, H25

1 Introduction

Taxation or non-taxation of still wine is currently a very topical topic for the government and Parliament of the Czech Republic. Although it had already been decided that the rate of consumption tax on still wine is continue to be zero in the Czech Republic, the discussion on this topic is still alive. Currently, wines for taxation has divided according to the harmonized customs tariff into two groups, namely still and sparkling wines. Still wines have a zero tax rate, but sparkling wines and intermediate products (i.e. wine musts, vermouth) have a rate of CZK 2,340 per 100 litres of product.

The European Union (also EU) harmonizes the excise duty on wine similarly to other excise duties and consumption taxes. Excise taxes have a more detailed harmonization than income taxes. The reason for the harmonization of taxation is the establishment of common rules for taxation of products that reach the internal market of the European Union. In the field of consumption taxes, minimum rates have also set by the directives. All member states must comply with these rates. This minimum threshold may affect the amount of the tax rate in the Member State. The upper limit of taxation is not set. At the same time, leaving tax issues in the hands of national governments is essential. This is stated, for example, by Rybová (2017), Nerudová (2005), Kubátová (2005), Kubátová (2018). Still wine, sparkling wine and intermediate products have a minimum tax rate of zero in the European Union directive.

Wine growers in the Czech Republic are concerned about the increase in the wine tax rate and the related decreasing competitiveness of domestic wine companies. The contribution compares the tax burden on wine in the Czech Republic and other member states of the European Union. States do not compete directly with taxation, but ultimately with market prices. The amount of taxation and the market price may be related.

The European Union is a major player in the global wine market. Eurostat (2022) reports that in 2020 it accounted for 64% of global production, 48% of consumption and 45% of the world's wine-growing regions. The main producers of wine are Italy, Spain, France, Portugal, Germany and Hungary. The biggest exporters are Italy, France and Spain. The main importers of wine in the European Union are Germany, the Netherlands, Denmark, Sweden, Belgium, France and Ireland. The Directorate-General for Agriculture and Rural Development (2023) states that there is an imbalance in the wine market in different regions of the European Union. In some areas of the European Union, there have been surpluses of wine due to the increase in production, but at the same time, the consumption of wine is decreasing, probably in connection with higher price increases, and the volume of exported wine is decreasing. The region of France, Spain and

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Portugal is the most affected. The European Commission adopted temporary market measures, the so-called "Crisis Distillation Measures". They include support programs for wine. Distilled wine is off the market, and alcohol is for non-food purposes. This is to prevent distortion of competition.

The World Health Organization (2022) published the annual consumption of wine in litres of pure alcohol per person. Another source, Landgeist (2022), lists wine consumption according to WHO at 12% ABV. According to these sources, Southern Europe is one of the largest producers and consumers of wine in the world. The biggest consumer of wine in Europe according to Landgeist (2022) is France with 54 litres of wine. Right behind France is Portugal with 50 litres. Slovenia is third with 44 litres. We see that Southern Europe is clearly the biggest consumer of wine. Although various Western European countries also have a decent consumption of wine. The largest global consumer of wine in 2018, Moldova, consumed significantly less in 2019, at just 30 litres per capita. Spain is also an interesting case. Although the Spanish are known for their wine (and produce a lot of it), they drink far more beer than wine.

The export of wine from the member states of the European Union may be associated with difficulties outside the European Union in the form of higher taxation in the country of consumption. For example, Dickinson (2023) reports that China imposed an import tax on wines imported from the European Union. According to the author, this move is a retaliatory measure for the imposition of tariffs on solar panels from China.

2 Literature and Legislative Review and Methods

The area of taxation of still wine is subject to harmonization similar to other alcoholic beverages, tobacco products, raw tobacco and fuel. The reason for harmonization is the trading of products on the internal market of the European Union. Kubátová (2005) and Nerudová (2005) explain the concept of harmonization as an approximation of the mechanism of collection of taxes, rates or structure between selected states.

There should be no tax competition between member states. In practice, however, we encounter it on a smaller scale. Nerudová (2005) deals with the advantages and disadvantages of both tax harmonization and tax competition. According to the author, the current tax competition prevailing in the European communities is not intentional. It is only the result of the failure of the harmonization process.

Excise taxes take away funds from consumers of taxed products with no direct relationship to the consumer's income. The impact of these taxes on consumers is largely regressive. For a regressive tax, the average tax burden decreases with the growth of income, and at the same time, the marginal tax burden (the share of tax in the last unit of income) is smaller than the average. Excise taxes, the rates of which are fixed, the degree of progression depends exclusively on the level of consumption of the taxed product by different income groups of taxpayers. (Kubátová, 2015, p. 31)

Due to their nature, consumption taxes can act as automatic or controlled stabilizers in fiscal policy. Appropriate application and flexible adjustment of taxes can contribute to economic growth. Taxes on consumption (including VAT) increased significantly in states with a below-average consumption burden and vice versa in the period 2008-2010. Research shows that indirect taxes, including consumption taxes, typically limit economic growth less, do not interfere with savings, and are generally less progressive than direct taxes. The disadvantage of tax systems based on indirect taxation is a lower redistributive capacity than in the case of direct taxes. However, there are effective tools to correct these distributional effects when moving towards indirect taxes. (Eurostat, 2011)

Kubátová & Vitek (1997, pages 96-98) state that the stabilizing function of taxes generally depends on two factors: the elasticity of the tax with respect to its tax base and the elasticity of the tax base on the gross domestic product. Consumption taxes directly affect aggregate demand, which indicates their possible application as a suitable fiscal policy stabilizer.

The application of consumption taxes can have an effect on the market of goods and services primarily on the economic variables, which are consumption and inflation. The effect of consumption taxes on inflation results from their character as unit taxes. As the price increases, the amount of tax paid does not change, the tax rate has determined by the absolute amount per unit of taxed product, the relative amount of the tax decreases. According to Kubátová and Vitek (1997, p. 108), an adjustment process can occur, when a decrease in the real value of the tax will lead to a decrease in the relative price of goods, and therefore to an increase in consumption. Subsequently, the consumption tax revenue will increase. The authors do not consider selective consumption taxes, imposed as a unit, to be dangerous from the point of view of inflation. As prices rise, they remain nominally constant, acting against inflation, unlike ad valorem taxes, where inflationary growth also affects the tax.

Svátková et al. (2007, p. 15) state that the argument in favor of the use of selective consumption taxes is their significant revenue, especially from taxation of goods such as gasoline, alcohol or cigarettes. On the other hand, the

disadvantage of selective taxes is their distortion of action, which leads to the substitution of taxed goods and thus to inefficiency (if it is not a Pigou tax).

2.1 Legislation in the area of excise taxes

Council Directive 92/83/EEC of 19 October 1992 on the harmonization of the structure of excise duties on alcohol and alcoholic beverages still wine includes all products of CN codes 2204 and 2205, with the exception of sparkling wine. The directive divides still wines into two groups. The first group of products contains more than 1.2% alcohol by volume, but does not exceed 15% by volume. This applies if the alcohol contained in the finished product is of fully fermented origin. The second group of products are products with an alcohol content above 15% by volume, but not exceeding 18% by volume, if they have been produced without any enrichment and if the alcohol contained in the finished product is of fully fermented origin;

Council Directive (EU) 2020/1151 of 29 July 2020 amends Directive 92/83/EEC on the harmonization of the structure of excise duties on alcohol and alcoholic beverages. The directive recommends that the Republic of Malta use a higher reduced rate limit for small independent wine producers. The special situation in the wine sector in Malta has caused this exception.

Directive 92/84/EEC precisely defines the subject of the tax, the conditions of taxation and the minimum rates for wine. It distinguishes between still and sparkling wines. The directive further divides still wines into two groups according to alcohol content. Member States may tax still wines with a higher alcohol content at a higher tax rate. It defines sparkling wines as wines with an alcohol content of 1.2-15%. The minimum tax rates for both groups of wines are zero. We call products with an alcohol content between 1.2-22%, which we cannot classify as beer, wine or other fermented products, intermediate products. The minimum rate is 45 Euro/hl. Here, too, it is possible to apply a reduced rate to intermediate products with an alcohol content of up to 15%.

Table 1 The minimum rate of excise duty on wine and intermediate products according to the directive of the European Union

Product	EU currency (EUR) per quantity unit	Minimum rates with validity from 1/1/1993	
Intermediate product	EUR/1 hl of product	45	-
Still wine	EUR/1 hl of product	0	-
Sparkling wine	EUR/1 hl of product	0	-

Source: Council Directive 92/84/EEC of 19 October 1992 on the approximation of the rates of excise duty on alcohol and alcoholic beverages

2.2 Excise tax rates on wine in all member states of the European Union

The European Commission provides information on indirect taxes. Here we can find consumption tax rates, value added tax rates for the mentioned products and tax revenues. The following table 2 and table 3 contains this data for 2021. This is the most recent information. The clustering process uses this data in the next section. Information on the amount of income from still wine in the area of VAT is not available. Self-estimations could reduce the reporting ability of the results. The first fifteen states in the table use an excise duty rate of zero on still wines. The value added tax rate ranked these states in Table 2.

Table 2 States with zero excise duty on still wine

Member States (abbreviation)	Standard Rate for Still Wine (EUR per hectolitre of product, Article 8.1 of Directive 92/83/EEC)	Value Added Tax for Still Wine (%)	Revenues from taxes on consumption (excise duties and similar charges) other Value Added Tax (million EUR) (Forecast for 2021)
Italy (IT)	0	-	0
Portugal (PT)	0	13	0
Luxembourg (LU)	0	17	0
Cyprus (CY)	0	19	0
Germany (DE)	0	19	0
Romania (RO)	0	19	0
Austria (AT)	0	20	0
Bulgaria (BG)	0	20	0
Slovakia (SK)	0	20	0
Czech Republic (CZ)	0	21	0
Spain (ES)	0	21	0
Slovenia (SI)	0	22	0
Greece (EL)	0	24	0
Croatia (HR)	0	25	0
Hungary (HU)	0	27	0

Note: Italy does not state the VAT rate in the European Commission (2023).

Source: European Commission (2021), European Commission (2023)

Value added tax is the only consumption tax on still wine in these states. The zero tax rate allows these states to protect their wine producers from lower prices from foreign producers. On the other hand, in states with wine production we can also expect higher wine consumption. The decision to tax wine is in the hands of national governments. Traditions probably also have a big influence.

Table 3 Excise duties and value added tax in the EU member states

Member States (abbreviation)	Standard Rate for Still Wine (EUR per hectolitre of product, Article 8.1 of Directive 92/83/EEC)	Value Added Tax for Still Wine (%)	Revenues from taxes on consumption (excise duties and similar charges) other Value Added Tax (million EUR) (Forecast for 2021)
France (FR)	3.91	20	78.46
Malta (MA)	20.50	18	2.088
Poland (PL)	38.7226	23	101.95 (including intermediate products and sparkling wine)
Belgium (BE)	74.9086	21	180.93
Netherlands (NL)	88.3 (above 8.51 % vol.)	21	351.65
Latvia (LV)	111	21	20.95 (including other alcoholic beverages other than beer)
Estonia (EE)	147.82	20	26.83
Lithuania (LT)	164.67	21	49.07
Denmark	151.3014 (6-15 % vol.) 202.631 (15-22 % vol.)	25	224.55
Sweden (SE)	249.6829 (8.51-14.99 % vol.) 522.5411 (15-18 % vol.)	25	631.46 (including sparkling wine)
Finland (FI)	421 (8-18 % vol.)	24	312.95 (including sparkling wine)
Ireland (IE)	424.84 (5.51-15 % vol.) 616.45 (>15.01 % vol.)	23	354.42

Source: European Commission (2021), European Commission (2023)

The second group of European Union countries contain wine producers as well. For example, we definitely cannot leave out France. In general, taxation in France and the Nordic countries is high. This obviously also applies in the area of wine taxation. Some states also include sparkling wines and intermediates in their wine tax revenue. Unfortunately, this reduces the expressive power of the results.

It is evident that the level of taxation of still wine is very different in EU member states. This tax is part of the taxation of wine, including sparkling wine and intermediate products. In some states, data on tax revenue from still wine separately is not available. In all states with two still wine rates, the higher the alcohol content of the still wine, the higher the rate.

Excise duty on wine in the Czech Republic

Wine and intermediate products for the purposes of the Excise Tax Act in the Czech Republic are subject to wine, fermented beverages and intermediate products listed under nomenclature codes 2204, 2205, 2206, which contain more than 1.2% alcohol by volume, but no more than 22% alcohol by volume.

The basis of excise duty on wine and intermediate products is the amount of wine and intermediate products expressed in hectolitres (hl). From the point of view of determining the rate of excise duty on wine and intermediate products, special attention must be paid to the correct determination of the subject of the tax in accordance with the provisions of § 93 paragraphs 2, 3 and 4 of the Act on Excise Taxes, which distinguishes between:

- Still wines (excise tax rate CZK 0.00/hl);
- Sparkling wines (excise tax rate CZK 2,340/hl);
- Intermediate products (excise tax rate CZK 2,340/hl).

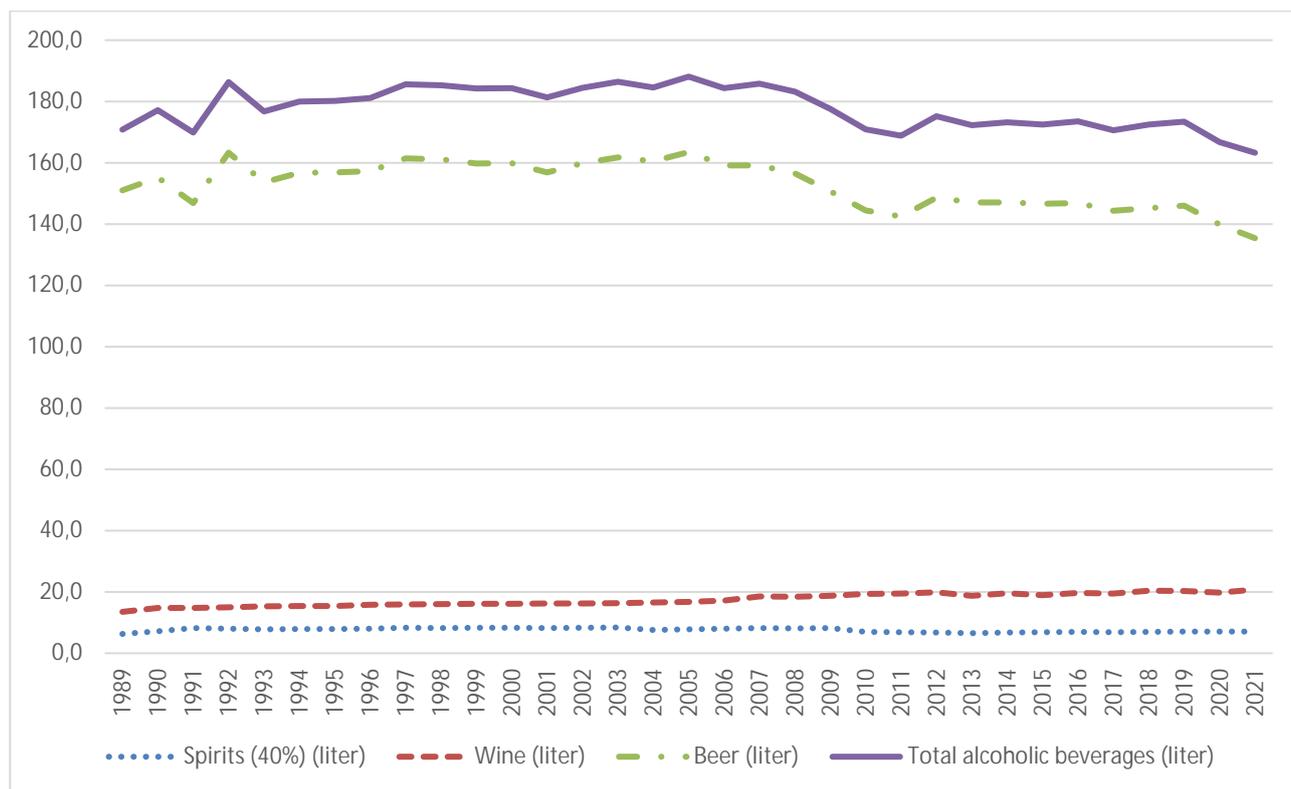
For the transport of still wine under the regime of conditional tax exemption in the tax territory of the Czech Republic and the obligations of a small wine producer, are specified in the provisions of §§ 100, respectively. 100a of the Excise Duties Act (§ 19 paragraph 2 letter a).

2.3 Consumption of wine in the Czech Republic

The price level in the Czech Republic is growing quite significantly between 2022 and 2023, around 7%. Consumer prices of wine accounted for less than 7% of the year-on-year increase in the price level. This is data from the Czech Statistical Office in September 2023.

According to the CZSO (2022), the trend of wine consumption is increasing and beer is decreasing. We can simply state that in ten years there has been an increase in wine consumption by one litre and a decrease in beer consumption by ten litres (l) per person/year. After the methyl scandal in the Czech Republic, interest in quality wine and fruit spirits increased. Regarding the total consumption of all alcoholic beverages, thanks to the decrease in beer consumption, there was an overall decrease in the consumption of alcoholic beverages.

Figure 1 Consumption of alcoholic beverages in the Czech Republic in litres per inhabitant per year



Source: Czech Statistical Office (2022)

The following table 4 shows data on wine consumption. The growing consumption of wines made from grapes and other types is evident here.

Table 4 Consumption of wine in the Czech Republic in litres per inhabitant per year

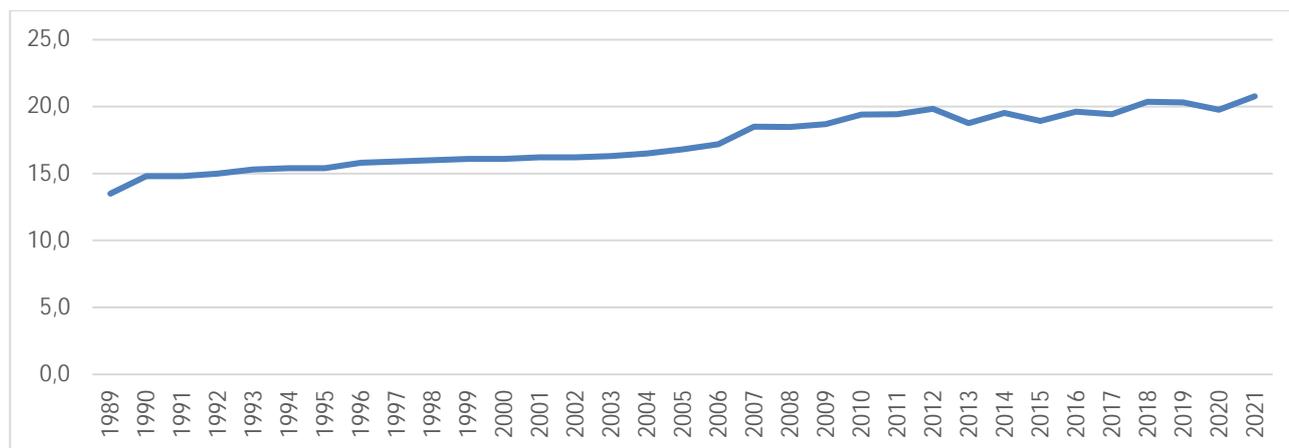
Years	1989	1990	1995	2000	2005	2010	2015	2020	2021	Difference between 2021 and 1989
Wine (in litre)	13.5	14.8	15.4	16.1	16,8	19.4	18.9	19.8	20.8	+ 7.3
Wine worth pure alcohol	1.6	1.7	1.8	2.0	1.9	2.2	2.2	2.3	2.4	+ 0.8
Grape wine	11.3	12.5	13.0	13.5	14.4	17.3	16.4	16.5	17.2	+ 5.9
Wine others	2.2	2.3	2.4	2.6	2.4	2.1	2.5	3.3	3.6	+ 1.4

Source: Czech Statistical Office (2022)

According to CZSO (2022) data, we can see a steady increase in wine consumption. Total wine consumption increased by 7.3 litres between 2021 and 1989. Beer consumption decreased by 15.6 litres. On the contrary, beer consumption

expressed in alcohol value increased by 0.4 litres. The total consumption of alcoholic beverages decreased by 7.5 litres, but the value of pure alcohol is higher by 1.5 litres.

Figure 2 The trend of wine consumption per capita in the Czech Republic (in litres)



Source: Czech Statistical Office (2022)

The government of the Czech Republic is considering taxing still wine with consumption tax. So far, the excise tax rate is zero. Only the 21% value added tax rate taxes still wine. All other alcoholic beverages are subject to an excise duty rate greater than zero. The Czech Republic currently shows higher inflation values.

The Czech Statistical Office (2023) states that wine, among other things, contributed to the year-on-year increase in the price level. Wine prices increased by 6.7% year-on-year.

2.4 Methods

The aim of this survey is to find out the taxation situation of still wine in the Czech Republic and other member states. Taxation of still wine is being prepared in the Czech Republic. I want to contribute to the discussion and summarize information that can help to better estimate the situation of Czech wine producers and traders. I sorted the data on member states in the area of still wine taxation using cluster analysis. I used Ward's Method, Euclidean distance. The formation of clusters during the clustering process depends on the selected clustering method. Ward's method often forms smaller rather equally sized clusters. States have grouped themselves into groups according to the similarity of the observed characters. A tree diagram shows the results of the clustering process.

Objects of the clustering process: twenty-seven member states of European Union: Austria, Belgium, Bulgaria, Cyprus, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden.

Object characters:

- Standard rate for still wine in EUR per hectolitre of product
- Value added tax rate for still wine in percent
- Revenues from taxes on consumption (excise duties and other similar charges) other value added tax in million EUR

The disadvantage is that we cannot consider the data as independent. However, a larger number of mutually independent characters is preferable. I adjusted the data for cluster analysis. I calculated zero Revenues from excise duties in states with zero tax on still wines. In contrast, I cannot adjust the revenues of states with a higher than zero rate for still wines because I do not know the consumption shares of different types of products in tax revenues. Some states list two rates for still wines based on the amount of alcohol in the drink. In these cases, I calculated the arithmetic mean of both rates. This reduces the explanatory power of the results. The data used does not provide detailed information.

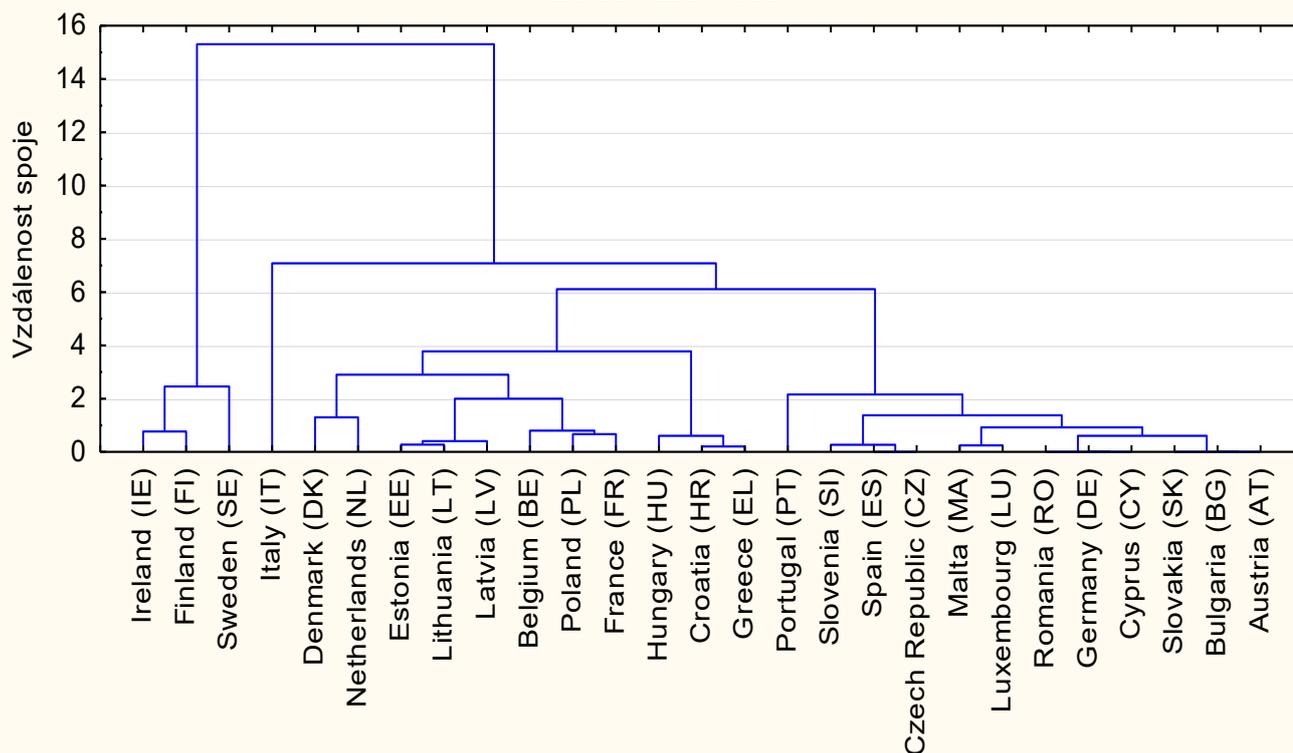
3 Research results

All 27 EU states have joined the clustering process. Figure 4 shows the clustering results. The chosen method makes it possible to divide the states into groups. Five groups of states are sufficient to interpret the results. The data was standardized.

Str. diagram pro 27 případů

Wardova metoda

Euklid. vzdálenosti



Source: own processing in software Statistica 12

Clusters of countries:

- **First cluster:** Ireland, Finland, Sweden
- **Second cluster:** Italy
- **Third cluster:** Denmark, Netherlands, Estonia, Lithuania, Latvia, Belgium, Poland, France
- **Fourth cluster:** Hungary, Croatia, Greece
- **Fifth cluster:** Portugal, Slovenia, Spain, Czech Republic, Malta, Luxembourg, Romania, Germany, Cyprus, Slovakia, Bulgaria, Austria

The states of the first cluster – Finland, Ireland and Sweden - show the highest tax rates. This mainly concerns the rates of excise duty on still wine. The states of the first cluster show the highest tax rates. This mainly concerns the rates of excise duty on still wine. These range from 249.6829 in Sweden to 616.45 EUR in Ireland (above 15% vol.). Ireland has the highest rates of excise duty on still wine. The states of the first cluster show the highest tax rates. This mainly concerns the rates of excise duty on still wine. These range from 249.6829 EUR (8.51-14.99% vol.) in Sweden to 616.45 EUR in Ireland (over 15% vol.). Ireland has both of the highest still wine excise rates of any country. Value added tax rates range from 23-25%. World Health Organisation (2022) shows the following wine consumption per person in litres of pure alcohol in the year 2019: Sweden 3.4 litres, Ireland 2.88 litres and Finland 1.59 litres.

Second cluster belongs to Italy, which has no consumption taxes on still wines. World Health Organisation (2022) shows a higher consumption of wine per person in litres of pure alcohol in 2019, i.e. 4.83 litres. However, according to data from Eurostat (2022), Italy is one of the highest producers and consumers of wine in the European Union. We can understand the low taxation of still wine in Italy as protection of the domestic market.

The third cluster - Belgium, Denmark, Estonia, France, Latvia, Lithuania, Netherlands, Poland - contains only states with a higher than zero rate of excise duty on still wines. France has the lowest rate of excise duty, i.e. 3.91 EUR, and Lithuania the highest, namely 164.67 EUR. Value added tax rates range from 20-25%. France is one of the largest producers and exporters of wine. At the same time, according to World Health Organisation (2022), it has the highest consumption of wine per person in the EU countries in the year 2019 in litres of pure alcohol, i.e. 6.44 litres. Consumption in other countries (from highest to lowest): Denmark 4.08 litres, Belgium 3.41 litres, Netherlands 2.92 litres, Estonia 1.92 litres, Latvia 1.7 litres, Lithuania 0.88 litres and Poland also 0.88 litres. Important importers of wine according to Eurostat (2022) are: Netherlands, Denmark, Belgium and France.

The fourth cluster - Hungary, Croatia, Greece - contains southern EU states with a zero excise duty rate. Value added tax rates range from 24-27%. Hungary is one of the major producers of wine in the European Union. World Health Organisation (2022) shows the following wine consumption per person in litres of pure alcohol in the year 2019: Croatia 3.52 litres, Hungary 3.33 litres, Greece 2.66 litres.

The fifth cluster – Austria, Bulgaria, Cyprus, Czech Republic, Germany, Luxembourg, Malta, Portugal, Romania, Slovakia, Slovenia, Spain - groups twelve states. Malta is the only country with a higher than zero rate of excise duty on still wines (20.5 EUR per hectolitre of product). Value added tax rates range from 13-22%. Portugal is one of the major producers and consumers of wine in the European Union. Portuguese consumers drink 6.04 litres of pure alcohol per person per year. Spain is also an important producer, but also an important exporter. Consumers drink 3.52 litres of pure alcohol in wine per person per year.

World Health Organisation (2022) reports the following wine consumption per person in litres of pure alcohol in the year 2019 (from highest to lowest):

Portugal 6.04 litres (was mentioned); Slovenia 5.26 litres; Luxembourg 4.73 litres; Austria 3.7 litres; Spain 3.52 litres (already been stated); Romania 3.38 litres; Germany 3.02 litres; Czech Republic 2.73 litres; Cyprus 2.72 litres; Malta 2.34 litres; Slovakia 2.01 litres; Bulgaria 1.72 litres.

The results show that states with high production tend to choose lower taxation of still wine and consumption is mostly at a higher level in these states. Italy is the only country that does not tax the consumption of still wine. However, its consumption is not the highest in the European Union. In contrast, states with lower or no production more often choose higher taxation and consumption is rather low here. France is specific because it is among the major producers and exporters of wine with high domestic consumption, while at the same time it has higher wine taxation.

4 Conclusions

The results show that more than half of the European Union states do not tax still wines by excise duty but only value added tax. Most of the large wine producers belong to this group. In essence, it can be argued that wine is subject to low taxation in the European Union, which allows this community to protect its internal market. Italy is the only country that does not tax still wines with excise or value added tax. In contrast, the highest rates of excise duty on still wine are shown by the northern states of the European Union, which are usually neither wine producers nor significant consumers. France is a major player in the wine market, being a major producer, importer and consumer. Still, unlike other producers, it uses an excise duty higher than zero on still wine. Apparently, the tradition of consumption and habits prevails here.

Value added tax is an ad valorem tax and has a stronger pro-inflationary effect than specific excise duties. This effect can cause reduce consumption and thus increase the problem of the European Union with higher production, as mentioned in the introduction. The price level of wine in the Member States is not subject of investigation. However, it could provide another explanation for the tax burden on still wine.

Now a few more notes about the Czech Republic. Wine consumption and prices are increasing in the Czech Republic. The government of this country plans to tax still wine with an excise tax from 2025. We can assume that the excise tax will increase the price and, on the contrary, slow down consumption growth. The question is what prices foreign traders will offer. It is difficult to estimate the situation of Czech wine producers now. The effort to increase the taxation of still wine in the Czech Republic goes against increasing subsidies for wine producers in other regions of the European Union. The increase in subsidies will help producers to bridge the problematic period without significantly reducing production. On the other hand, higher taxation will support the reduction of production and consumption in the Czech Republic. In the future, it is likely that due to climatic changes, there may be an increase in wine production in the Czech Republic as well.

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Digitisation of financial administration in the Slovak Republic

Erika Šoltésová¹

Abstract: This article focuses on the impact of digitalisation on tax administration in the Slovak Republic. We focus on the improvement of digitalization for the finance administration of the Slovak Republic which represents easier access to data and consequently helps to higher tax collection. Modernising tax systems increases resilience to tax fraud and consequently we focus on how tax authorities can make tax audits more efficient. In our article, we also focus on the various digital projects that the tax administration has introduced in recent years. We mention projects such as electronic communication and electronic treasury. In the conclusion of the article, we focus on future developments in the financial administration in the field of digitisation and processes that help to simplify established practices. Our aim in the article is to highlight the fact that digitalization increases the mutual trust between the tax administration and tax entities, leading to voluntary tax compliance.

Keywords: digitalisation, Slovak Republic, tax

JEL Classification: H20

1 Introduction

The basic objective of the Slovak Financial Administration is to modernise and improve the efficiency of processes in the financial administration. It wants to create an environment of modern pro-client oriented financial administration, which will be able to ensure less administration and more performance thanks to the digitalization of processes. It is considered important to simplify the life of reliable taxpayer clients, to achieve greater mutual trust in the financial administration-client relationship and to encourage voluntary compliance with tax obligations.

In relation to the above, the tax administration has a number of important objectives. Among the main ones are the creation of a paperless financial administration, the electronicisation of tax administration, a new client care system, the strengthening of control and analytical activities, client support through a call centre, a massive expansion of mandatory electronic communication, further digitisation and automation of processes.

The main digital projects implemented by the Financial Administration are: Electronic Communication, eKasa, Call Centre and Social Networks, TAXANA. We will look at these projects in the following text.

2 Electronic Communication

The aim of the Financial Administration is to provide fully electrified and digitised services. Electronic communication is constantly expanding. Pursuant to Act No. 563/2009 Coll. on Tax Administration (Tax Code) and on Amendments and Supplements to Certain Acts, as amended, the obligation to deliver submissions by electronic means pursuant to Section 13(5) of Act No. 563/2009 Coll. has been imposed on the financial administration since 1 January 2014:

- a tax entity which is a payer of value added tax,
- a tax advisor for the tax subject he represents in tax administration,
- an attorney for the tax entity he represents in tax administration,
- a representative not mentioned in points 2. and 3. for a tax subject which is a payer of value added tax and which it represents in the administration of taxes.

Since 1 January 2018, the mandatory electronic communication has been extended to all legal entities registered in the Commercial Register and their representatives. From 1 July 2018 also to all natural persons - entrepreneurs and their representatives. For taxpayers not established or not established for business purposes according to Section 12(3) of the Income Tax Act (e.g. civil associations, state-recognised churches and religious societies, communities of owners of flats and non-residential premises, municipalities, higher territorial units, contributory and budgetary organisations, foundations, ...), the electronic communication is voluntary even after the deadline of 1.1.2018, as they are not registered in the Commercial Register.

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A tax subject may send documents to the financial administration electronically in three ways:

- activating an eID card (ID card with a chip),
- activating a qualified electronic signature (QES),
- via an electronic delivery agreement.

As of January 2022, the amendment to the Accountancy Act allows documents to be processed in a more modern way, by electronisation. The electronicisation of accounting is still only an option for companies, not an obligation. Special software with the help of artificial intelligence retrieves and transcribes the relevant data such as invoice number, business partner, amount or variable symbol from the relevant documents into a file that can be imported into the accounting software. Another advantage of electronic bookkeeping is the possibility to store accounting documents electronically for a legally defined period.

2.1 eKasa

The Financial Administration launched the project of online connection of all cash registers to the eKasa portal of the Financial Administration on 1 April 2019, when the obligation to connect to this system arose for all newly established operations that will start recording sales for the first time after this date. The electronic cash registers (ERP) became online cash registers (ORP). From 1 April 2019, all newly established establishments and new cash registers had to join the system, all other entities gradually from 1 April 2019 to 30 June 2019. From 1 July 2019, the eKasa system is compulsory for all businesses. All receipts issued for purchases are recorded on the eKasa central repository. The taxpayer no longer needs an electronic cash register, an internet connection, mobile phone, computer or tablet is sufficient. This will significantly reduce the administrative burden on clients.

Table 1 Cost savings associated with eKasa

Cost	Savings
Purchase of ERP/fiscal printer	approx. 400 € for 5 years
Electronic cash register book	1,24 €
Cash register tape	0,50 € for 1 month
Installation by ERP technician	65 € for 5 years
Mandatory ERP service inspection	50 €
ERP defiscalation by ERP technician	50 €

Source: Financial administration of Slovak Republic. 2019. *eKasa (z ERP na ORP)* s. 11. <https://www.financnasprava.sk/24.5.2019>.

The eKasa system will allow entrepreneurs to create reports on services received, which are recorded in the central database of the financial administration.

The introduction of the e-Kasa system gives the financial administration the opportunity to process the obtained data, which can then be used for tax control purposes. By registering the issued document in the central repository, the tax administration has real-time information on each purchase. The legislation has also dealt with the current situation that Slovakia does not yet have one hundred per cent internet coverage. The entrepreneur is obliged to notify this fact and to request that he be allowed to postpone the transmission of data from the online cash register.

Registration in eKasa is compulsory in any case, with the difference that data messages will not be sent online to the eKasa system, but will be sent subsequently from a location covered by an internet signal. This project is part of the measures to combat tax fraud. They have reduced the tax gap from 41% to 26% and brought approximately EUR 3.7 billion more to the Treasury.

2.2 Call Centre and Social Networks

The 2014 was a breakthrough year for communication in financial administration. Together with the introduction of electronic communication of tax entities, the tax administration started to build a fully-fledged centralised call centre. Also thanks to the new portal of the financial administration and the deployment of digital applications, it combined mail and telephone communication and launched online chat. In 2016, we were the first state institution to participate in the evaluation of the quality of services provided by the independent digital application Staffino. The Financial Administration is also active on social media. We have been running our Facebook page since 2012.

Through phone calls, e-mails and online chat, the call centre's expert consultants have helped in 402,125 cases. Last year, questions about legislative changes and customs obligations in connection with the outbreak of the war in Ukraine dominated the agenda.

2.3 TAXANA

To simplify processes, the Financial Administration continues to digitise and electronicise processes. Taxana is one example. The Financial Administration is the first government institution to launch an automated chat with its clients. Any taxpayer who needs advice will thus be able to use not only the services of the Financial Administration's call centre, but also the automated chat. The chatbot of the financial administration has been named Taxana. It was chosen by the employees of the financial administration as a pun on the English word "tax". The use of Taxana is versatile in various promotional events, creating posters, on social networks, leaflets or banners. It accompanies clients with information materials, presents video guides, draws attention to important dates when fulfilling tax obligations. Helps us get information closer to the public. Taxana works on the principle of a pop-up window in the portal of the financial administration, it is also available on the Facebook fanpage of the financial administration. By directly identifying the query or by asking the taxpayer successive questions, they work together to work through the topic of interest to the citizen. From the initial message from the user, it identifies categories or even subcategories of the topic. Identification is based on defined key terms or combinations of key terms

From the initial message from the user it identifies categories or even subcategories of the topic. Identification is based on defined key terms or combinations of key terms. A chatbot is a computer program that mimics a conversation with a human. Chatbot provides a convenient and interactive way to connect with customers online and give them a similar experience to that of talking to a live operator at any time of the day. It is a bot that interacts with users /clients/ and is capable of having various communications with thousands of users in a single second. The current chatbot of the financial administration is also used to collect queries from users, thus forming the basis for machine learning with the help of artificial intelligence. The goal of the financial administration is to create a chatbot using AI based on the collected amount of queries.

The current novelty of the Financial Administration is the possibility of online payment of 15 types of taxes through the portal of the Financial Administration (PFS). It is now possible to pay the tax through the PFS using a payment card, Google Pay, Apple Pay or by transferring the payment data to the internet banking of selected banks. The novelty is also launched thanks to dozens of tax entities that have joined the trial run. The Financial Administration is introducing card payments in cooperation with the State Treasury. The use of the payment gateway by the Financial Administration is an important milestone for the State Treasury in the process of digitalization of state services. It is a priority of the State Treasury to continuously expand the possibilities of electronic payments for public sector services to citizens and legal entities. The State Treasury welcomed the intention of the Financial Administration and together they have prepared, implemented and today put into production for the clients of the Financial Administration the possibility to pay advance payments and taxes through the payment gateway of the State Treasury via the portal of the Financial Administration.

3 Conclusions

Nowadays, the trend is to have the most digitalized processes both on the side of the financial administration and on the side of entrepreneurs. The Financial Administration is working on other forms of digitisation. It is working intensively on the launch of the eInvoice, electronic invoicing information system. If the political will is found, the project will probably be launched from 2025 or 2026. Businesses would now be obliged to produce an invoice for every business transaction where they do not have to record sales via eKasa and send it electronically to the tax administration.

In what form the project will be introduced is still a big unknown. Such a fundamental change, which affects all business entities across the board, requires a detailed analysis of the effectiveness of the use of the data collected and an assessment of whether the state needs to collect additional data.

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External confirmation – the means to obtain audit evidence in audit procedures

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Abstract: Few information systems can generate the documents necessary to reconcile the balances of the receivables and the liabilities. For these purposes, the external confirmation method is suitable, which can be used voluntarily by the accounting units within the framework of the inventorying of the receivables and the liabilities, and by the auditors when auditing the financial statements. The external confirmation, as one of the audit procedures, is the most effective way of the verifying the account balances correctness, the contractual terms, the contracts, or the transactions, for the reason that audit evidence is obtained from independent sources outside the accounting unit. The paper presents the external confirmation and offers the solutions in the problematic areas, such as the "obligation" to send the external confirmation, unreceived response from the confirmation letters, the choice of the sample unit, the question of the prefilling the confirmed amount, the reliability of audit evidence obtained from the confirmation letters, or possible reasons of the unsent external confirmation, etc.

Keywords: external confirmation, audit procedures, receivables and liabilities, sampling unit, audit evidence

JEL Classification: M41, M42

1 Introduction

An external confirmation (or even a confirmation letter) as a method for obtaining audit evidence is not only used by auditors when auditing financial statements but the confirmation method is also used by accounting units, especially when inventorying receivables and liabilities. The accounting units send the confirmation letters to customers to confirm the account balance of the receivables and to suppliers to confirm the account balance of the liabilities because the Act No. 563/1991 Coll., On Accounting, as amended, in Part Five regulates the obligation of the inventorying the receivables and the liabilities. The accounting unit has the state of the liabilities agreed by each of its creditors and the state of the receivables by each of its debtors in the form of the external confirmation. The method of confirming the status of the receivables and the liabilities, as well as the given form, should be specified in an internal directive within the process of the inventorying the receivables and the liabilities, and may differ among accounting units in practice. Act No. 563/1991 Coll., On Accounting, as amended, does not impose the form of the inventorying the receivables and the liabilities through the external confirmation to the accounting units as mandatory but it is true that this form is still the most effective and demonstrable when it comes to documenting the actual state of the receivables and the liabilities, and the resulting recorded differences.

While on the side of the accounting unit, the method of the external confirmation of the receivables and the liabilities is considered as voluntary (Act No. 563/1991 Coll., On Accounting, as amended, not only does not require it for the inventorying, but also does not regulate it), on the side of the auditors, the external confirmation is considered one of the audit procedures necessary to obtain audit evidence regarding with account balances and other facts. Furthermore, the external confirmation is considered a highly valued audit method, it provides audit evidence in the sense of the confirmation of a given fact from an independent source outside the accounting unit.

2 Methods

The International Standard on Auditing 505 (ISA 505) regulates the audit procedures when using the external confirmation to obtain audit evidence. ISA 505 includes the design and performance of the external confirmation procedures to obtain relevant and reliable audit evidence (Kareš, 2014). ISA 505 defines the external confirmation as audit evidence relating to assertions in the financial statements or related disclosures as a direct response to the auditor from a confirming party in paper, electronic or other media. As ISA 505 states, the procedures related to the external confirmations are often performed to confirm or request the information regarding account balances and their components. However, these procedures can also be used to confirm the contractual terms, the contracts or the transactions between

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the accounting entity and other parties. The external confirmation can also be used to confirm the absence of certain conditions, such as the conclusion of an unofficial agreement.

The external confirmation is one of the audit procedures leading to obtain **audit evidence**. Audit evidence, the methods of obtaining it, as well as the auditor's responsibility in obtain audit evidence are regulated by the International Standard on Auditing 500 (ISA 500). ISA 500 states that audit evidence is primarily the result of the audit procedures performed during the audit. The quality of all audit evidence is affected by the relevance and reliability of the information upon which it is based:

- *Relevance of information* – deals with the logical connection with, or bearing upon, the purpose of the audit procedure and may be affected by the direction of the testing.
- *Reliability of information* – is influenced by its source and its nature, and the circumstances under which it is obtained, including the controls over its preparation. ISA 500 uses the following generalization of the reliability of audit evidence relating to the external confirmation audit procedure:
 - the reliability of audit evidence is increased when it is obtained from independent sources outside the entity;
 - audit evidence in documentary form, whether paper, electronic, or other medium, is more reliable than evidence obtained orally;
 - audit evidence provided by original documents is more reliable than audit evidence provided by photocopies or facsimiles, or documents that have been filmed, digitized or otherwise transformed into electronic form, the reliability of which may depend on the controls over their preparation and maintenance.

ISA 500 states that even when information to be used as audit evidence is obtained from the external sources outside the accounting unit, there may be circumstances that affect the reliability of that information. This is because all responses carry some risk of withholding, alteration, or fraud. Such risk exists regardless of the form in which the response is received from the confirming party. When the auditor has doubts about the reliability of information, the auditor must use his professional judgment to decide whether to modify or add the additional audit procedures to resolve the doubts about the reliability of information that he intends to use as audit evidence. However, if the auditor concludes, based on his professional judgment, that the response to the confirmation letter is not reliable and therefore cannot be used as audit evidence, the auditor must reassess the assessed risks of the material misstatement at the assertion level, including the risk of the fraud, and adjust the planned audit procedures, in particular their extent and timing.

In the case of the unreceived response, the auditor shall perform **alternative audit procedures** to obtain relevant and reliable audit evidence. The nature and extent of the alternative procedures is influenced by the relevant account and assertion and is entirely dependent on the professional judgment of the auditor. ISA 505 provides examples of the alternative audit procedures only for receivable a liabilities accounts balance:

- *receivable accounts balances* – testing of selected subsequent cash payments, delivery documentation and sales revenues near the end of the accounting period;
- *liabilities accounts balances* – testing subsequent cash payments or correspondence from third parties and other records such as receipts.

ISA 505 does not prescribe the alternative audit procedures for other accounts balances. The auditor should proceed according to his professional judgment in this case.

ISA 505 also addresses the situation where the **auditor does not receive the response from the confirmation letter due to management's refusal** to send the confirmation letter. In this case, according to ISA 505, the auditor is obliged to inquire as to management's reasons for the refusal and seek audit evidence as to their validity and reasonableness and perform alternative audit procedures designed to obtain relevant and reliable audit evidence. If the auditor is unable to obtain relevant and reliable audit evidence from the alternative audit procedures, the auditor shall communicate with those charged with governance and determine the implications for the audit and the auditor's opinion.

In relation to external confirmation, ISA 505 requires to auditors to **maintain control over the external confirmation requests** – i.e., determining the information to be confirmed or requested, selecting the appropriate confirming party, designing, and sending the confirmation request.

The auditor selects the sample from the entire set of the receivables and the liabilities. The selection of the samples for performing audit procedures is governed by ISA 530 which deals with the auditor's use of the statistical and the non-

statistical sampling when designing and selecting the audit sample, performing tests of controls and tests of details, and evaluating the results from the sample. As ISA 530 states, with the statistical sampling, sample items are selected in a way that each sampling unit has a known probability of being selected. With the non-statistical sampling, judgment is used to select sample items. Because the purpose of the sampling is to provide a reasonable basis for the auditor to draw conclusions about the population from which the sample is selected, it is important that the auditor selects a representative sample, so that bias is avoided, by choosing sample items which have characteristics typical of the population. As Ricchiute (1994) adds, each method has its advantages and disadvantages. The choice of the method should always be based on the expert knowledge, the professional judgment, and the fact whether the auditor has already performed the audit procedures in the company in previous years. Therefore, each auditor can choose a different way of the sample size quantification. However, the number of the tested samples depends on the determined level of significance, the amount of the tested population of the receivables and the liabilities, and the amount of the sampling risk that the auditor is willing to accept. If the auditor has quantified the number of samples that must be tested, the selection of the sample itself follows, where one sample can correspond to one subscriber, supplier (i.e., one sample is equal to one customer balance account), or one sample can correspond to one accounting document.

The external confirmation, which is one of the tests of detail, is a source of information on the completeness, existence, correctness, including the valuation of the item, and is used to collect audit evidence to substantiate the amount stated in the financial statements. They provide audit evidence about whether the amount was accounted correctly and to the period with which it is temporally and materially related (Müllerová & Králíček, 2014). As Štěpán (2012) adds, the International Standards on Auditing basically only inform what the auditor should deal with. And it is no different in case of ISA 505. The auditor has to collect enough quality information then analyze this information thoroughly and only then draw the conclusion. However, the resulting method of the performance is left to the professional judgment, subjective opinion, and experience interspersed with the intuition of each auditor. For that reason, the whole process of the external confirmation as one of the audit procedures can be considered completely variable.

3 Research results

Research results chapter analyzes the process of the external confirmation as one of the possible audit procedures to obtain relevant and reliable audit evidence, and furthermore it presents the most common problem areas associated with the external confirmation and it proposes possible procedures in practice.

3.1 The obligation of the external confirmation

Although ISA 505 regulates proposals and procedures for the external confirmation, no International Standard on Auditing determines the auditor's obligation to perform these external confirmations. The only comment on the obligation of the external confirmation is given by ISA 330 which determines the auditor's obligation to assess whether he should also perform the external confirmation. It is therefore only up to the auditor's professional judgment whether to continue with the external confirmations or not. However, we must not neglect the fact that the external confirmations are considered the most reliable source of audit evidence because they are obtained from an independent source (confirming party) outside the accounting unit.

The auditor also has the right to decide not to send the external confirmation too. At the same time, the auditor should properly justify the given fact in the auditor's file where he should also state by which other audit procedures, he obtains necessary audit evidence. In cases where the auditor identifies a significant risk in each area, it is not desirable to back off from sending the external confirmations because the obtaining of audit evidence by other (alternative) methods is impossible in this case.

Otherwise, when the auditor decides to send the confirmation letters, he should always keep in mind that the entire process with the external confirmation should be under his control, as described in ISA 505. Only in this way the auditor maintains a high level of the reliability of obtained audit evidence. However, the sending the confirmation letter may not yet provide necessary audit evidence to the auditor, as there is no legal way to compel the response to the confirmation letter from the confirming party.

3.2 Unreceived external confirmation

The auditor may not receive the confirmation response if the confirming party refuses to send the response to the confirmation letter – i.e., an obstacle on the part of the confirming party (customer). This phenomenon is a frequent reality in practice for any number of reasons and, as already stated, there is no legally enforceable obligation to respond from the confirming party. The auditor may still try to urge the confirming party to send the reply to the confirmation letter. In the second case, there may arise the situation when the manager of the audited company refuses to send the confirmation letter, for example, to the bank institution due to a low balance of the funds in the bank account. Now the obstacle is on the side of the audited company. In any case, the auditor has the obligation according to ISA 505 to perform the alternative

audit procedures leading to obtaining relevant and reliable audit evidence. ISA 505 provides the alternative audit procedures for the receivable and the liabilities balances, but not for the bank account balances. There are suggested the alternative audit procedures for the receivable, the liabilities, and the bank accounts balances below:

- **Area of the receivables** – the auditor performs the alternative procedures in accordance with ISA 505 in case of the unreceived replies to the confirmation letters (i.e., unconfirmed receivables). The auditor collects the supporting documents that confirm the origination of the receivables, such as delivery notes or other documentation (e.g., contracts, handover protocols, correspondence with the customer, etc.). The auditor must assess the amount of the accounted receivables through the tests of details on the invoice, the delivery notes or other documentation. Since the audit is carried out only after the end of the accounting period, it is likely that some of the receivables will have already been paid at the time of the audit. This is therefore a situation of the unconfirmed receivable that has already been paid. In this case, it is advisable for the auditor to request the documentation of the subsequent payments – i.e., the bank statement where he must assess its originality and whether the data could have been altered or otherwise manipulated. The amount of the paid receivables at the time of the audit depends both on the payment conditions of the audited company and on the time gap between the end of the year and the date of the audit. This method of the receivables testing is in most cases quickly feasible, and it has a high informative value despite the fact of the unreceived reply to the confirmation letter. Furthermore, there is no need to request information about the paid receivables from outside the audited company, as it is the case with the confirmations, and above all, all documents are easy to find for the auditor. During the audit of the receivables, however, there may arise the fact when the amount of the receivable is also unconfirmed and at the same time is unpaid too (i.e., unconfirmed, and unpaid receivables). The auditor proceeds similarly to the previous case, with the difference that he does not assess the subsequent payment. Testing of the unconfirmed receivables, whether paid or not, is influenced by how the auditor chose the sample for the sent external confirmations. It should be noted that it depends on the structure of the customers and, of course, on the auditor's professional judgment and knowledge of the audited company in the case of choosing the sample of the receivables for testing. It is not always a rule to focus exclusively on the highest items of the receivables. This option would only be possible when the rest of the tested set of the receivables would be insignificant, i.e., the sum of the untested unconfirmed receivables would not exceed the implementation materiality. Otherwise, the sample of the tested unconfirmed receivables should consist of the entire portfolio of the receivables so that the selected sample is representative. In general, the extent of the testing is also influenced by what the auditor considers as a sample unit (see below). The way in which the auditor selects the sample for the receivables testing is always influenced by his professional judgement.
- **Area of the liabilities** – the alternative procedures for the unconfirmed liabilities are like those in the case of the receivables. However, in the case of the liabilities, there may be a higher risk that the audited company will not have the liability listed at all in the accounting, for that reason it is advisable to consider the total turnover of the individual suppliers when selecting a sample of the liabilities for testing.
- **Area of the bank accounts** – the bank confirmation is not only about the confirming balances on the bank accounts, but also provides the auditor information about other facts, such as other contractual relationships concluded with the bank, i.e., derivatives, bank guarantees, pledges, etc., which are often significant for the presentation in the financial statements. For that reason, the bank statement is not enough to obtain audit evidence. Similarly, legal confirmations can also serve the auditor if the audited company cooperates with lawyers. If the auditor did not receive the response from the confirmation letter or the executive of the audited company refused to send the letter, the auditor performs the alternative procedures which would consist of the cost testing whether the audited company cooperates with any lawyers. Finding the alternative procedures for the bank and the legal confirmation is, however, difficult in practice.

The choice of the sample unit in the case of the receivables and the liabilities can also have an influence on the unreceived confirmation. The sample unit can be equal to one tested unpaid invoice (i.e., one accounting document), or the sample unit can be the entire balance account of one customer which can contain hundreds of the invoices that the auditor must test individually then. The method of the sample unit selecting depends on the auditor's knowledge of the audited company, the industry in which the company operates and the relationship between the audited company and the confirming party. The basic requirement is efficiency. Many companies mutually confirm the amount of their receivables and liabilities in the inventorying without regard to the need for the audit, so it is natural to take advantage of this situation. However, if the sample unit corresponds to the account balance of one customer, there may be a risk that the customer (the confirming party) will not be willing to trace, prepare, and confirm the total amount of the account balance on a certain date. On the other hand, the indisputable advantage of this method, when the receivable is confirmed, is the smaller

number of tested samples, in contrast to the second method of the sample selection where the sample unit is equal to one accounting document.

Another disputed area is the fact whether the confirmation letter should contain the pre-filled required confirmed amount. It is undisputed that if the confirming party fills in the confirmed amount, the auditor has greater confidence in the reliability of audit evidence. The question is whether the confirming amount is the amount of the single accounting document or the amount of the customer's entire balance account. In the case of the confirmed single document, there is a higher probability of the completion than in the case of the confirmed amount of the customer's entire balance account. Here, it is likely that the customer does not need to fill in the amount, because he will not want to deal with the area at all and will not be willing to verify all the necessary data.

3.3 Unsent external confirmation

As there was already stated in chapter 3.1 The obligation of the external confirmation, the auditor has the obligation to assess whether he will use the confirmation procedure to obtain audit evidence. Therefore, the auditor can also decide not to use the external confirmation procedure for the receivables or the liabilities. His decision may, for example, be based on the fact that the confirmation letters sent during the previous audits were not returned, or that the confirming party does not provide credible confirmation, as it repeatedly confirms other account balances, and the audited company has the correct balances of the documents in the subsequent verification. In this case, the sending of the confirmation letters is completely inefficient to the auditor and time-consuming. The auditor does not use the external confirmations in case when the auditor is able to obtain relevant and reliable information from the alternative procedures, possibly less time consuming.

3.4 Reliability of information from the external confirmations

All responses from the external confirmations carry some risk of withholding, alteration or fraud. This risk exists regardless of the form in which the response is obtained (i.e., paper or electronic form).

The answer in paper form obtained by the auditor directly is one of the most reliable answers when the confirming party fills in the required confirmed amount. The unfilled amount will "force" the confirming party to verify the necessary documents. Confirming the pre-filled amount can be tempting to facilitate the work and to the risk that the confirming party will just sign the document without much checking and send it back. The auditor incurs a higher risk if the answer in paper form is received indirectly, i.e., the answer is addressed to the audited company, which forwards the confirmation to the auditor then. In this case, the auditor may request the confirming party to resend the confirmation directly to him.

The electronic form of the external confirmations (e.g., e-mail, fax) brings a multifold higher risk because the auditor cannot always to obtain audit evidence of the source and the authority (competence) of the individual who performed the external confirmation. The telephone verification is one possibility where the auditor can contact the confirming party by phone and make sure that the confirming party has access to the relevant documents by asking the confirming party questions. The auditor provides a minimum of information about the required document. The auditor chooses the telephone verification when it is necessary to find out information in a short period of time. Currently, the electronic form of the external confirmation includes techniques such as encryption or the very frequently used electronic digital signature which can reduce this risk.

4 Conclusions

The external confirmation method is used voluntarily by the accounting units within the framework of the inventorying of the receivables and the liabilities and, of course, by the auditors, as one of the auditing methods to obtain relevant and reliable audit evidence during the audit of the financial statements.

The auditors use the external confirmations not only to confirm the balances of the receivables, the liabilities, and the bank accounts, but also to confirm the contractual terms and the contracts. The receivables represent an important area of the financial statements because they are always tested for the risk of overvaluation due to artificially increasing of the economic result of the audited company, which is why the confirmation procedure is often used here. The testing of the confirmed liabilities is also specific because some liabilities may not be entered in the audited company's accounting, as well as the testing of the bank account balances where the bank confirms other important facts together with bank account balances.

A significant problem with the confirmation letters is not their preparation and sending, this area is regulated by ISA 505 but the receipt of the responses from the confirming party to the auditors. Furthermore, also the fact of the sample unit which the auditor requests to confirm. The fact that the amount to be confirmed by the confirming party is pre-filled can also have the certain influence. Since the auditor cannot demand that the confirming party fill out and send back the answer, for that reason this external confirmation process is based on a good relationship between the audited company

and the business partner (confirming party). In certain cases, the auditor may completely waive the procedure for the receivables and the liabilities confirming, the given fact must be properly documented in the auditor's file. The reliability of information from the external confirmations also plays its role here.

The auditor performs the alternative procedures based on his professional and expert judgement in the case of the unconfirmed receivables, the liabilities, and the bank accounts. The auditor is always fully dependent on the documents presented to him by the audited accounting unit, regardless of what the confirmation refers when obtaining audit evidence from alternative procedures.

The verifying process of the receivables, the liabilities and the bank accounts are not an automatic process that are repeated in the same way for all companies. The individual procedures, including the external confirmations, must be adapted to the given audited company based on the auditor's professional judgment and knowledge of the audited company. For that reason, the entire process of the external confirmation can be considered variable, as well as the flexible use of the audit procedures so that they are meaningful considering the size and the nature of the audited company. Despite all the problems that the external confirmation could bring, this way of audit evidence obtaining is still considered an effective method of the testing, regarding the total time spent by the company and the auditor verifying the given account.

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Asset evaluation in companies with implemented controlling

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Abstract: Controlling is becoming an increasingly significant component of modern business management. Controlling tools enable businesses to monitor and manage their assets more effectively. As part of the analysis, it has been found that there is a statistically significant difference between certain asset items and implemented operational and strategic controlling tools. This means that businesses with effective controlling have a better awareness of the status of their assets and are better equipped to respond to risks and opportunities. The analysis was divided into four parts in the same way as the assets are divided in the balance sheet. The Mann-Whitney U test was used, and it was tested at the significance level of 0,05. A statistically significant difference was found for the total assets item, then for the items of fixed assets and long-term tangible assets. In the area of current assets, there was a significant difference in the items current assets, short-term receivables and trade receivables. For the other assets, there was not find any statistically significant difference.

Keywords: controlling, assets evaluation, operational and strategic tools

JEL Classification: G30, O20, M41

1 Introduction

Controlling is becoming an important part of modern business management, and its importance is constantly growing. The implementation of controlling provides businesses with the ability to better plan and allocate resources, which ultimately increases their competitiveness and profitability. Controlling plays a key role in the effective management of businesses and its importance is particularly evident in the monitoring and management of financial indicators (Horváth, 2003). Financial indicators are a tool with which a company communicates about its management. As part of controlling, various aspects of financial data are monitored and analysed with the aim not only to identify the current state, but also to predict and plan future developments.

Controlling plays a crucial role in ensuring alignment with the organization's plans, guidelines, and established policies. This process involves coordinating activities to efficiently utilize organizational resources for the fulfilment of established plans (Safar et al., 2018). It assesses the deviations between actual performance and predetermined standards, pinpointing the reasons behind these variations. Additionally, controlling aids in implementing corrective measures to address any discrepancies (Cornel & Lavinia-Maria, 2012). This systematic approach not only monitors adherence to organizational directives but also facilitates the proactive management of deviations for sustained organizational effectiveness (Christoffersen et al., 2023).

Controlling guarantees the efficient and effective utilization of the organization's resources to attain established objectives. Various factors, such as the company's size, workforce, industry, and financial metrics like assets and liabilities, liquidity value, profitability, and funding methods, can impact the integration of controlling elements.

The central objective of controlling is to synchronize management systems to encompass information and foster harmonization both internally and externally within the company. Managers necessitate an information system capable of recognizing and resolving challenges, including potential cost overruns or impediments in executing future plans (Drury, 2020). This entails creating a cohesive framework that not only addresses immediate issues but also strategically aligns information systems to proactively navigate potential obstacles and enhance overall operational efficiency.

Controlling can be approached from various perspectives and domains. Simkin (2010) explores the challenges associated with implementing marketing plans within the realm of controlling, drawing insights from years of analysis in the field of marketing planning. This examination extends to controlling activities aimed at surmounting these challenges, leading to additional advantages. Moreover, research conducted by Bui, Tu Le, & Nguyen (2020) indicates that the extent

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and nature of controlling practices vary based on factors such as company size, tenure in the business, and industry. Smaller enterprises often rely on conventional financial accounting methods, while larger corporations employ advanced management accounting techniques, including activity-based costing, activity-based budgeting, decision analysis, target costing, and strategic planning.

Controlling advocates for the methodical surveillance of the potential of enterprise resources such as assets and liabilities, extending beyond real-time monitoring and becoming an integral component of the comprehensive management system through strategic (predictive) management. This approach aims to pinpoint prospective business capabilities and effectively govern the potential inherent in business resources (Čebukina, et al., 2013). In essence, it seeks not only to observe the current state of resources but to strategically anticipate and harness their capabilities for optimal business performance.

As part of monitoring assets in a selected period, controlling processes can identify trends and changes in values, which enables a dynamic response to new business challenges. Established controlling is then a key partner for management and strategic planning, while its influence penetrates from daily operations to decision-making processes at the top of the company's hierarchy. Assets provide a tool that can be used at the managerial and organizational level in controlling. Janik & Ryszko (2019) analyse selected indicators in terms of controlling and evaluate their role in decision-making processes.

The aim of this paper is to carry out a comprehensive assessment of assets in companies with implemented controlling, with an emphasis on management efficiency and achieving long-term sustainability. As part of the research, the hypothesis was established that companies that have implemented controlling achieve higher values of asset's items than companies that do not have implemented controlling.

This research is needed because it deals with the growing importance of controlling in modern business management. It must be emphasized that controlling allows companies to monitor and manage their assets more effectively. Effective controlling makes it possible to react quickly to changes in the market, to plan and allocate resources more efficiently, which ultimately increases the competitiveness and profitability of companies (Safar et al., 2018).

2 Methods

The data for the analysis were gathered from two sources. In the initial phase, it was necessary to determine whether the companies under study had implemented elements of the controlling or not. This information was collected through questionnaire surveys, creating a proportional sample of over 12,500 enterprises to match the distribution in the Czech Republic. A questionnaire was specially created for this study, which was then distributed to companies. In this way, the acquisition of relevant data from companies that have implemented controlling as part of their corporate management was ensured. Sending out questionnaires made it possible to get direct and specific answers from companies that are directly involved in the practical application of controlling. The process of distributing the questionnaires was managed systematically and purposefully to ensure the representativeness of the sample. This increased the chance of obtaining complex and relevant data that could be used for a deeper analysis of the relationship between controlling and individual asset items. In 2023, data were obtained from 197 companies, representing an almost 2% response rate. The companies were then classified based on their engagement with the controlling. Out of the total 147 analysed enterprises, it was found that 89 had implemented elements of controlling, while 58 had not.

In the subsequent steps, the accounting data values were determined for these classified companies using the Albertina Gold Edition database. However, financial data from balance sheets could only be obtained from 98 out of the 147 companies. The relationship between these factors was then analysed using a statistical Mann-Whitney U test., a method designed for assessing unpaired experiments when comparing two distinct samples. This test is specifically applied to examine the hypothesis that two variables share the same probability distribution. Importantly, these variables are not necessarily required to follow a Gaussian normal distribution; it is adequate to assume their continuity. The test involves calculating a statistic, and the distribution of this statistic under the null hypothesis is well-established. The null hypothesis posits that the medians of the two samples are identical, as outlined by Freund, Wilson, and Mohr (2010) and Budíková, Králová, and Maroš (2010).

Statistically, it has always been tested at a significance level of 0.05 where zero hypothesis $H_0: \mu_1 - \mu_2 = 0$ against alternative hypothesis $H_A: \mu_1 - \mu_2 \neq 0$. U is then given by:

$$U_1 = R_1 - \frac{n_1(n_1+1)}{2}, \quad (1)$$

Where:

n_1 the sample size for sample 1,
 R_1 the sum of the ranks in sample 1.

An equally valid formula for U is:

$$U_2 = R_2 - \frac{n_2(n_2+1)}{2} \quad (2)$$

The smaller value of U_1 and U_2 is the one used when consulting significance tables. The sum of the two values is given by:

$$U_1 + U_2 = R_1 - \frac{n_1(n_1+1)}{2} + R_2 - \frac{n_2(n_2+1)}{2} \quad (3)$$

Knowing that $R_1 + R_2 = \frac{N(N+1)}{2}$ and $N = n_1 + n_2$, and doing some algebra, we find that the sum is $U_1 + U_2 = n_1 n_2$.

3 Research results

As part of the statistical analysis, the statistical dependence between the amount of assets and the implementation of controlling tools in enterprises was investigated. As described above, the data was obtained from the balance sheets of individual companies and based on a questionnaire survey. The analysis was divided into four parts in the same way as the assets in the balance sheet are broken down:

1. Analysis of total assets.
2. Analysis of fixed assets.
3. Analysis of current assets.
4. Analysis of other assets.

The author assumes a dependence between the implementation of controlling and the amount of assets in companies based on the theoretical foundations of corporate management and logical arguments (Horváth, 2003; Safar et al., 2018). Overall, the implementation of controlling is expected to have the potential to positively impact the value and management of corporate assets.

3.1 Dependency analysis in the total assets

As part of the first analysis, the value of total assets was examined in relation to the implemented elements of controlling. The hypotheses $H_0 = x_{0,50} - y_{0,50} = 0$ were tested, where it is assumed that the influence of implementation of controlling in these enterprises is the same in both groups and the hypothesis $H_A = x_{0,50} > y_{0,50}$, which assumes that the enterprises without implementation of controlling will have lower assets. As shown in table 1, at the significance level of 0,05, the null hypothesis in favour of the alternative was rejected based on a p-value very close to zero. Therefore, we can argue that companies with implementation of controlling have a higher value of total assets. The differences you can see in the figure 1 (on the left).

Table 1 Dependence of total assets on the implementation of controlling tools

	Controlling YES	Controlling NO	U	Z	P-value	N YES	N NO
Total assets	3488	1363	697	3,08404	0,00204	62	36

Source: Own processing

The existence of differences in the area of total assets in connection with the implemented controlling can be caused by several factors. One of the key elements can be more efficient allocation of resources and better management of assets in enterprises with implemented controlling. This way, these businesses can achieve optimal results and use their resources more efficiently. Furthermore, established controlling can contribute to better strategic planning and decision-making, which can be reflected in an increased value of total assets. The ability to respond to changing market conditions

and adequately manage risk can be factors that contribute to a better performance profile and higher asset values. Improved tracking and transparency of financial information that controlling allows could also play a role. This can lead to greater confidence on the part of investors and other stakeholders, which could positively affect the financial situation of the company.

3.2 Dependency analysis in the fixed assets

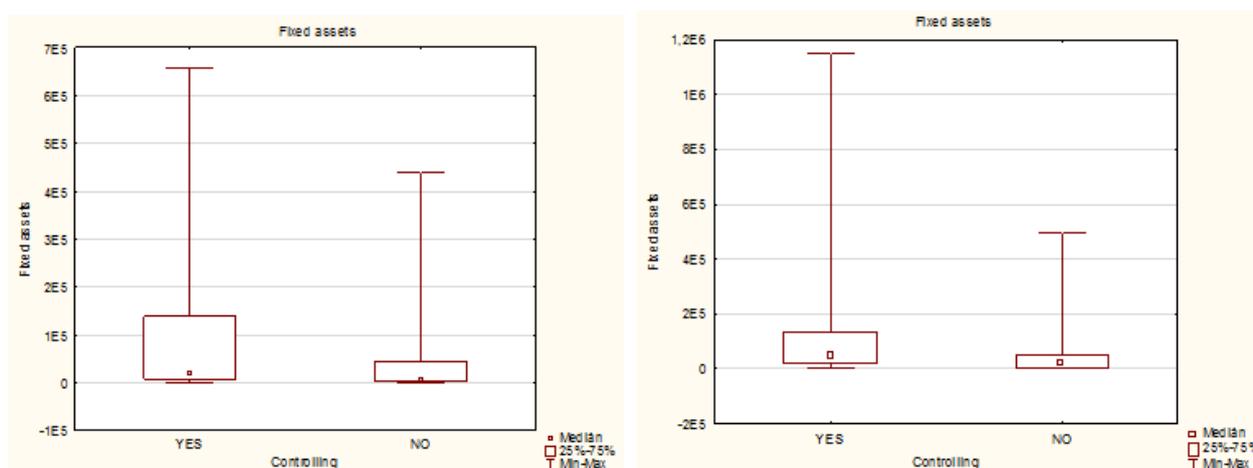
The second analysis examined the value of total fixed assets in relation to the established controlling elements. Fixed assets were further divided into long-term intangible assets, long-term tangible assets and long-term financial assets. The hypothesis was established as in the first analysis. As shown in table 2, at the significance level of 0,05, the null hypothesis in favour of the alternative was rejected based on a p-value very close to zero. Therefore, we can argue that companies with implementation of controlling have a higher value of long-term tangible assets and fixed assets. The differences you can see in the figure 1 (on the right).

Table 2 Dependence of fixed assets on the implementation of controlling tools

	Controlling YES	Controlling NO	U	Z	P-value	N YES	N NO
Long-term intangible assets	955	320	184	1,81976	0,06879	34	16
Long-term tangible assets	3182	1378	783	1,96801	0,04906	61	34
Long-term financial assets	547	194	103	1,81538	0,06946	25	13
Fixed assets	3325	1331	736	2,43227	0,01500	62	34

Source: Own processing

Figure 1 Total assets (on the left) and fixed assets (on the right) in the companies with and without implementation of controlling



Source: Own processing

The existence of this difference in tangible fixed assets can be interpreted in several ways. One possibility is that controlling businesses better optimize their tangible fixed assets, which may include better management, maintenance, and investment in these assets. This efficiency could be reflected in a statistically significant difference. Conversely, the absence of a statistically significant difference for long-term intangible assets and long-term financial assets could be due to the specific characteristics of these categories. For example, long-term intangible assets may be more associated with intellectual property and may not be as influenced by operational processes and management. For long-term financial assets, the influencing factors can be complex and can include external investment strategies.

3.3 Dependency analysis in the current assets

As part of the third analysis, the value of current assets was examined in relation to the implementation elements of controlling. Current assets were further divided into stocks, long-term receivables, short-term receivables, trade receivables and short-term financial assets. The hypothesis was established as in previous analyses. As shown in table 3, at the significance level of 0,05, the null hypothesis in favour of the alternative was rejected based on a p-value very close

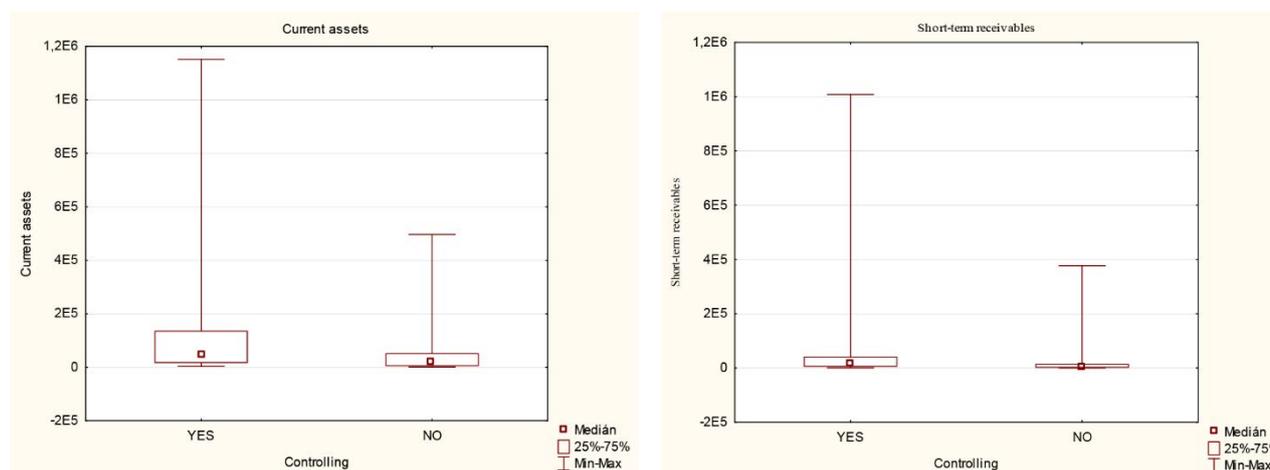
to zero. Therefore, we can argue that companies with implementation of controlling have a higher value of current assets, short-term receivables, and trade receivables. Some differences you can see in the figure 2.

Table 3 Dependence of current assets on the implementation of controlling tools

	Controlling YES	Controlling NO	U	Z	P-value	N YES	N NO
Current assets	3471	1380	714	2,95877	0,00308	62	36
Stocks	2750	1255	759	1,20129	0,22963	58	31
Long-term receivables	1149,5	503,5	293,5	1,27079	0,20380	37	20
Short-term receivables	3353	1207	612	3,29555	0,00098	61	34
Trade receivables	2302	779	344	3,78408	0,00015	49	29
Short-term financial assets	3328	1523	857	1,90496	0,05678	62	36

Source: Own processing

Figure 2 Current assets (on the left) and Short-term receivables (on the right) in the companies with and without implementation of controlling



Source: Own processing

The existence of a difference in these items could be interpreted in several ways. In the case of current assets, the controlling in place can lead to more efficient management and use of these assets, which may include better storage and inventory management. Differences in short-term and trade receivables may be the result of better management and monitoring of collection processes, which may lead to a reduction in receivables and an increase in liquidity. Conversely, the non-appearance of a difference in long-term receivables may be due to the fact that these may be influenced by long-term business relationships and more complex factors that are not as straightforward as short-term receivables. Short-term financial assets can be affected by complex investment strategy factors and market conditions.

3.4 Dependency analysis in the other assets

As part of the last analysis, the value of other assets was examined in relation to the implemented controlling elements. The hypothesis was established in the same way as in the previous analyses. Unfortunately, at the significance level of 0.05, no significant difference was found in this analysis between companies that have implemented controlling elements and those that have not.

The analysis showed that there is a statistically significant difference between certain asset items, thanks to the operational and strategic controlling tools. This shows that companies with effective controlling have a detailed awareness of the state of their assets and are able to respond better to risks and opportunities.

In the context of the increasing complexity of the business environment and increasing demands for risk management, asset valuation is increasingly essential for business success. Investments in the introduction of controlling thus become a strategic decision that can significantly affect the long-term prosperity of the company. Overall, it can be said that controlling in today's business world cannot be attributed only to the role of monitoring accounting data, but rather as a key partner in achieving strategic goals and sustainable growth.

Urbinati et al. (2020) scrutinize and define distinct controlling methodologies designed to generate and seize value within business models. They underscore the imperative nature of establishing comprehensive data and providing recommendations for the effective execution of these methodologies. In essence, the study delves into specialized controlling approaches tailored to enhance value creation in the context of circular business models, emphasizing the significance of actionable insights and guidance for successful implementation.

It is important to remember that controlling is not just a numbers game. Its impact on the assets of the business can permeate various areas, including human resources, processes and technology. Effective controlling can, for example, support innovation and modernization, which is key in an environment of constantly evolving technologies.

Furthermore, at a time when global markets are experiencing turbulent events, the ability to respond quickly and flexibly to change is a key element of staying competitive. Controlling enables businesses to achieve this goal through flexible asset management and dynamic planning.

Most studies to date have focused more on general trends or areas, but this paper contributes to the development of knowledge by focusing in more detail on specific asset items and their relationship to implemented controlling tools. In this way, it brings a new perspective to a hitherto neglected area. The paper provides valuable information on how different aspects of assets respond to controlling, which can lead to a deeper understanding of the importance of controlling in corporate governance.

Further research will be carried out on liability items and further analysis of data from profit and loss statements, namely costs, revenues and profit and loss. This research will be followed by an analysis of financial indicators, such as profitability, liquidity, etc., in relation to companies that have introduced controlling elements and those that do not.

4 Conclusions

The role of controlling in modern business is not static, but dynamic and adaptable. His ability to adapt and deliver value at different levels of the business makes him an integral part of strategic leadership. Controlling tools allow companies to monitor and effectively manage their assets. In this way, they can identify weaknesses in the asset portfolio and quickly respond to dynamic changes in the market. As part of the research, the impact of the implementation of controlling elements on total assets and sub-items of assets was evaluated. The analysis was divided into four parts in the same way as the assets are divided in the balance sheet, namely: analysis of total assets, analysis of fixed assets, analysis of current assets and analysis of other assets. A statistically significant difference was found for the total assets item. The existence of differences in total assets in relation to implemented controlling can be caused by more efficient allocation of resources and better management of assets in enterprises with implemented controlling. Furthermore, implemented controlling can contribute to better strategic planning and decision-making, which can be reflected in an increased value of total assets. Another significant difference was found in the items of fixed assets and long-term tangible assets. This may be because companies with implemented controlling better optimize their tangible fixed assets, which may include better management, maintenance and investment in these assets and thus total fixed assets are also affected. In the area of current assets, there was a significant difference in the items current assets, short-term receivables and trade receivables. For current assets, implemented controlling can lead to more efficient management and use of these assets, including optimized storage and inventory management. Differences in short-term receivables and trade receivables may be due to better management and monitoring of collection processes, which may lead to improved liquidity.

Overall, it can be said that the combination of controlling and financial indicators, especially assets reported on the balance sheet, creates a robust tool for effective business management. Thanks to the regular analysis and interpretation of this data, the company can better plan and make decisions and achieve its goals more effectively.

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Effect of social media messages on cryptocurrency market efficiency: An event study approach

Petr Zeman¹, Petr Štastný²

Abstract: This paper contributes to empirical evidence of semi-strong market efficiency focused on cryptocurrency market, specifically examines the persistence of random walk in the Bitcoin and Dogecoin exchange rates. Using an event study approach and abnormal returns methodology authors verify the reaction of selected cryptocurrency exchange rates to the statements releases through social media platform during the time-period from 2020 to 2022. The results show that celebrity statements on social media can influence investor behaviour, which is especially reflected in the increased volatility of cryptocurrency rates.

Keywords: cryptocurrency, social media, market efficiency, event study

JEL Classification: G14

1 Introduction

Cryptocurrency is a decentralized digital currency stored in an online form designed to be not under the control of third parties and created to replace classic fiat currency. Cryptocurrencies are used not only as a medium of exchange, but also as an investment asset, which has recently seen rapid growth and increased popularity among investors, who try to use the high volatility of cryptocurrency prices to achieve above-average returns. However, these above-average returns contradict the efficient market theory (Fama, (1970)). Fama's study suggests that changes in the prices of financial assets are random and unpredictable and achieving the above-average returns in the long term is unrealistic.

The question of the efficiency of the crypto-bitcoin market has been addressed by many studies in the past, but their conclusions are contradictory. Studies published by Nadarajah & Chu (2017), Bartos (2015) or Vidal-Tomás & Ibañez, (2018) confirm the existence at least weak form market efficiency. However, most authors are inclined to the opinion that Bitcoin and other cryptocurrencies does not follow a random walk and reject the efficient market hypothesis (by Kuriara & Fukushima (2017), Wei (2018), Bundi & Wildi (2019) or Hu et al. (2019)). Other studies even point to the susceptibility of cryptocurrencies (Bitcoin, Ethereum) to the formation of speculative bubbles (Hayes (2019), Cretarola & Figà-Talamanca, (2020)). Herd behaviour is believed to be the source of speculative bubbles in the cryptocurrency markets (Kallinterakis & Wang (2019)).

Lack of fundamentals and sentiment trading can be listed among the main sources of irrational behaviour of investors, which is additionally amplified by information published in social media and social platforms. The importance of social media in investment decision-making is confirmed, for example, by studies by Polasik et al. (2015), Panagiotidis et al. (2018) or Chuffart (2022), who identified growth in the volume of Google Trends or Google Search as one of the most important variables explaining Bitcoin returns and consider this search to be a good predictor of the cryptocurrency market. Social platforms as Twitter, Facebook or Reddit are also a popular place for investors to discuss and share their views on future developments in the cryptocurrency market, as well as being an important source of information for their investment decisions. For example, Shen et al. (2019) found that the number of tweets is a significant driver of next-day trading volume. Furthermore, there is also evidence that Twitter message volume is also a price predictor of cryptocurrency returns (Kraaijeveld and De Smedt (2020)).

This contribution follows up on the above-mentioned papers and examines the impact of short posts, published on the social platform Twitter (X), on the future price development and market efficiency of Bitcoin and Dogecoin. During the monitored period from 2020 to 2022, the impact of six short messages that had the potential to significantly influence investor behaviour and disrupt the effectiveness of the cryptocurrency market was examined. Five of these six messages were published by E. Mask, who ranks among the richest people today, the last one was posted by N. Bukele, the President of El Salvador. Event study approach and abnormal-return methodology was used for testing of semi-strong form market efficiency.

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2 Methodology and data

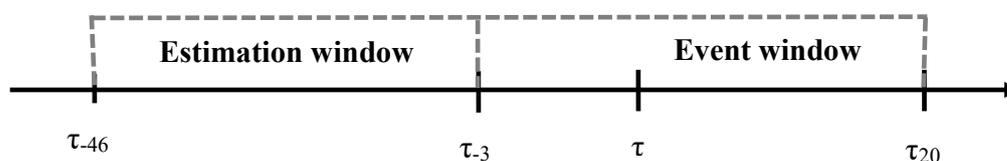
2.1 Data

This study investigates the impact of six short messages related to two cryptocurrencies - Bitcoin and Dogecoin, posted on the social media platform Twitter during the years 2020, 2021, and 2022. To assess the influence of these messages, authors utilize the daily spot exchange rates for Bitcoin and Dogecoin. For calculation both the above-average and cumulative average returns was used the six distinct periods, each covering the timeframe from 46 days prior to the message publication to 20 days following its publication. Cryptocurrency spot prices were downloaded from Yahoo.finance.com website.

2.2 Methods

The Event study methodology is used to test semi-strong market efficiency, which examines the reaction of the market price of an investment instrument due to the specific observed event. The first step in the application of this method is to define the investigated investment instrument and the event that should affect the market price. In this article, short messages published on the social platform Twitter (so-called tweets) containing comments about Bitcoin and Dogecoin represent the monitored event. In the second step of the analysis, the day of the event, the estimated window and the event window must be defined. The day of the event indicates the time when the event occurred. In this study, the event day represents the day the tweet was posted. Subsequently, the development of the cryptocurrency market price before and after posting the tweet will be analysed. The period preceding the event day is referred to as the estimated window. In our case, it starts 46 days before and ends 3 days before the event day. This chosen length of the estimation window should ensure a stable estimate of the normal behaviour of market prices for selected cryptocurrencies. The length of second period, called the event window, can vary depending on the nature of the event being studied and the expected time it takes for the market to fully incorporate the information. In this study, the event window starts 3 days before and ends 20 days after the event day. The event window period also includes the 3 days preceding the published information for the purpose of capturing the influence of yet unpublished news on the cryptocurrency spot price and thus revealing the possible existence of insider trading. The time structure of the entire monitored period is shown in Figure No. 1.

Figure 1 Time structure of the observed period



2.2.1 Abnormal returns

Generally, the calculation of abnormal returns is based on comparing the actual achieved returns with the expected returns that would have been achieved if the price-setting information had not been published. In the next step of the analysis, it is necessary to determine the actual and expected returns. Abnormal return can be determined in several different ways. In this study the abnormal return are calculated using Mean adjusted model (MAR) and Market adjusted model (MKAR).

Mean-adjusted model (MAR)

This model is based on the difference between the expected return and the actual return. The expected return of an investment instrument is calculated as the average daily return $\varnothing R_j$ over the period of the estimated window.

Mathematically, this relationship can be written using the following formula:

$$MAR_t = R_t - \varnothing R_j \quad (1)$$

Where:

- MAR_t abnormal returns at time t
- R_t actual return of an investment instrument at time t
- $\varnothing R_j$ average return over the estimated window

The actual return R_t is calculated as daily log return during the event window period as follows:

$$R_t = \ln\left(\frac{P_t}{P_{t-1}}\right) \quad (2)$$

Where:

P_t market price at time t
 P_{t-1} market price at time $t-1$

Market-adjusted model (MKAR)

Another way to determine abnormal returns is the Market-adjusted model, which is based on the difference between the actual return R_t and the market return R_{mt} . The calculation of market-adjusted returns can be written as follows:

$$MKAR_t = R_t - R_{mt} \quad (3)$$

Where:

$MKAR_t$ abnormal returns at time t
 R_t actual return of an investment instrument at time t
 R_{mt} market return at time t

Unlike the previous model, here the average return \bar{R}_j is replaced by the market return R_{mt} . The market return at time t is calculated as the daily relative change of the market index during the event window. The market index (IT) is calculated as a simple arithmetic average of the market prices of 10 major tradable cryptocurrencies. Namely the market index consists of Bitcoin, Binance Coin, Bitcoin Cash, Cardano, Dogecoin, Ethereum, Litecoin, Polkadot, Uniswap and Ripple. The calculation of the cryptocurrency market index can be written as follows:

$$IT = \frac{\sum_{i=1}^N P_{i,t}}{N} \quad (4)$$

Where:

IT_t market index
 N number of cryptocurrencies in index
 $P_{i,t}$ the price of the cryptocurrency i at the time t

Cumulative abnormal return (CAR)

Cumulative abnormal return allows to monitor the impact of the overall effect of the event during the event window. In this study, the cumulative abnormal return derived from the abnormal returns calculated by the Mean adjusted model.

The cumulative abnormal return is calculated as the sum of abnormal returns.

$$CAR_{(t_1, t_2)} = \sum_{t_1}^{t_2} AR_t \quad (6)$$

Where:

$CAR_{(t_1, t_2)}$ sum of abnormal return between dates t_1 and t_2
 AR_t abnormal returns at time t

3 Research results

This study examines the price reaction of Bitcoin and Dogecoin to statements published during the period from 2020 to 2022 on the social platform Twitter (X), in which these cryptocurrencies were explicitly mentioned. The investigated tweets are listed in Table 1. This table also contains the cryptocurrency to which the statement refers, the name of the author and the date of the statement's publication. The posts are further supplemented with information containing the expected reaction of cryptocurrency price.

Table 1 Statements published on social platform

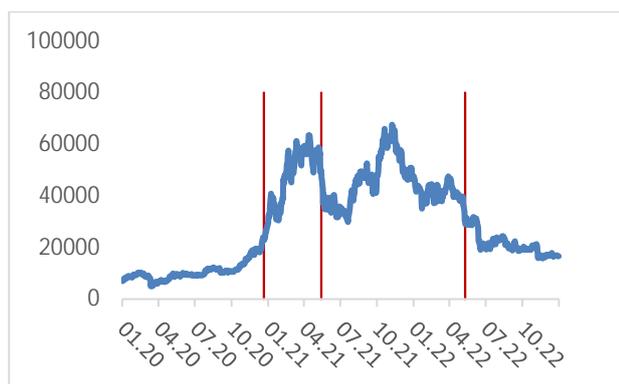
No.	Time	Autor	Currency	Exp. reaction	Content
1.	20.12.2020	E. Musk	Bitcoin	Neutral	„Bitcoin is my safe word “
2.	20.12.2020	E. Musk	Dogecoin	Neutral	„One word: Doge “
3.	15.04.2021	E. Musk	Dogecoin	Neutral	„Doge Barking at the Moon“
4.	13.05.2021	E. Musk	Bitcoin	Negative	„Tesla has suspended vehicle purchases using Bitcoin, we are concerned about rapidly increasing use of fossil fuels for Bitcoin mining and transactions, especially coal, which has the worst emissions of any fuel. “ „Tesla will not be selling any Bitcoin and we intend to use it for transactions as soon as mining transitions to more sustainable energy. We are also looking at other cryptocurrencies that use <1% of Bitcoin’s energy transactions. “
5.	09.05.2022	N. Bukele	Bitcoin	Positive	„El Salvador just bought the dip! 500 coins at an average USD price of \$30 744“
6.	27.05.2022	E. Musk	Dogecoin	Positive	„Tesla merch can be bought with Doge, soon SpaceX merch too“

Source: Own processing

Five of six investigated tweets included in table 1 were posted by E. Musk. Two of these statements refer to Bitcoin and three to Dogecoin. Furthermore, three of these statements have no rational basis and are evaluated as neutral with no influence on the future development of the market price. The fourth post is associated with negative sentiment and refers to the high carbon footprint associated with Bitcoin mining and the end of Tesla stores accepting payments in this currency. E. Musk's fifth statement can be evaluated positively. In this statement, he admits the possibility of payments for the Tesla and Space X brands. The author of the sixth rated statement is the president of El Salvador N. Bukele, who announces the purchase of 500 bitcoin coins, which should serve as the country's official currency. This statement should be associated with positive expectations of investors.

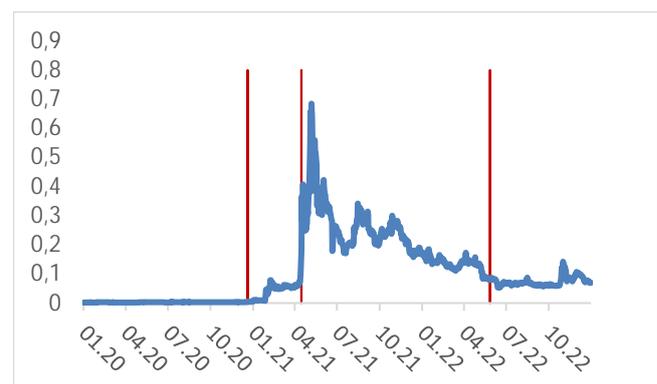
For greater clarity, the published statements were plotted in charts 2 and 3, which show the price development of Bitcoin and Dogecoin cryptocurrencies during the years 2020 to 2022. It can be seen from the graphs that the reports were published at a time of high volatility on the cryptocurrency market. The market price of Bitcoin in the monitored period ranged between the minimum value of 4 971 BTC/USD recorded on 12.03.2020 and the maximum value of 67 567 BTC/USD on 08.11.2021. The Dogecoin cryptocurrency market was similarly volatile, reaching its minimum of 0.00154 DOGE/USD on 12.03.2020. The maximum market price in the monitored period was 0.68478 DOGE/USD and was recorded on 05.07.2021. Tweets were posted in both rising and falling phases of the market.

Figure 2 Bitcoin price development in the period 2020 -2022



Source: Own processing

Figure 3 Dogecoin price development in the period 2020 - 2022



Source: Own processing

3.1.1 Bitcoin – abnormal return

Mean-adjusted model (MAR) and Market-adjusted model (MKAR) were used to calculate abnormal returns. A basic overview of the development on the Bitcoin market at the time of publication of individual tweets is summarized in Table 2.

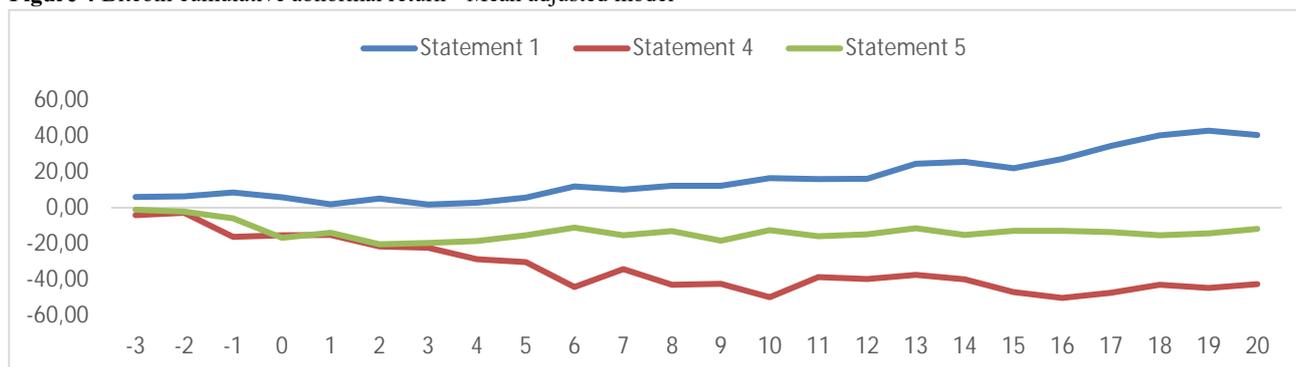
Table 2 Bitcoin – Abnormal return

	Avg. real return (%)	Avg. expected return (%)		Avg. abnormal return (%)	
		MAR	MKAR (Ø Rmt)	MAR	MKAR
Statement 1	2,75	1,05	2,75	1,69	0,00
Statement 4	-1,62	0,15	-1,61	-1,77	-0,01
Statement 5	-0,83	-0,33	-0,88	-0,50	0,06

Source: Own processing

The highest average real daily returns were achieved by Bitcoin after the first neutral post (2,75 %). Conversely, the lowest return was found for negative contribution No. 4 (-1,62 %). Post No. 5 published by N. Bukele, despite its positive tone, was accompanied by a decline in the market associated with a negative average return (-0,83 %). A more detailed picture of market dynamics is obtained when we compare the actual returns with the expected returns. In the case of the Mean adjusted model, actual returns observed during the event window period are compared to the average return identified during the estimation window period. This comparison confirms the positive impact of the first contribution and the negative influence of the fourth and fifth contributions on the price of Bitcoin. This was also reflected in the values of average abnormal returns, which amounted to 1,69 %, -1.77%, and -0,50 %. The Market adjusted model calculates abnormal returns as the difference between actual returns and market returns during the event window period. In this case, the results are inconclusive, and the average abnormal returns for all contributions approach 0. This outcome is influenced by the market return calculation. Since the market portfolio also includes Bitcoin and the other cryptocurrencies included in the market index show a high correlation with Bitcoin, the market's returns are very similar to Bitcoin's returns. A more detailed insight into the dynamics of Bitcoin price development after the release of individual statements is provided by Figure 4, which displays the evolution of cumulative returns during the event window. The cumulative returns were determined using the Mean adjusted model.

Figure 4 Bitcoin cumulative abnormal return - Mean adjusted model



Source: Own processing

The cumulative abnormal return for the first 3 days of the event window captures the market trend without the influence of the released statement, which is disclosed at time 0. In the subsequent 3 to 4 days following the release of the statement, cumulative returns remain approximately at the same level as on the event day. For posts No. 1 and No. 4, cumulative returns continue in the pre-event day trend, suggesting that these statements merely reinforced the existing market price trend. The negative returns before the event day for contribution No. 5 indicate that it was released during a market downturn. After the contribution's release, cumulative returns show approximately the same value, indicating a halt to the bearish market. The question remains whether the contribution caused the cessation of the price decline or was released when the market had already reached its lowest point, as suggested by the contribution's content.

3.1.2 Dogecoin – Abnormal return

As in the previous chapter, for evaluating the impact of published statements on the price of Dogecoin, abnormal returns were calculated using both the Mean-adjusted model and Market-adjusted model. The market price of Dogecoin showed a lower degree of correlation with the market index and therefore in this case the Market-adjusted model has a higher explanatory power than it was for Bitcoin. An overview of the results is presented in Table No. 3.

Table 3 Dogecoin – Abnormal return

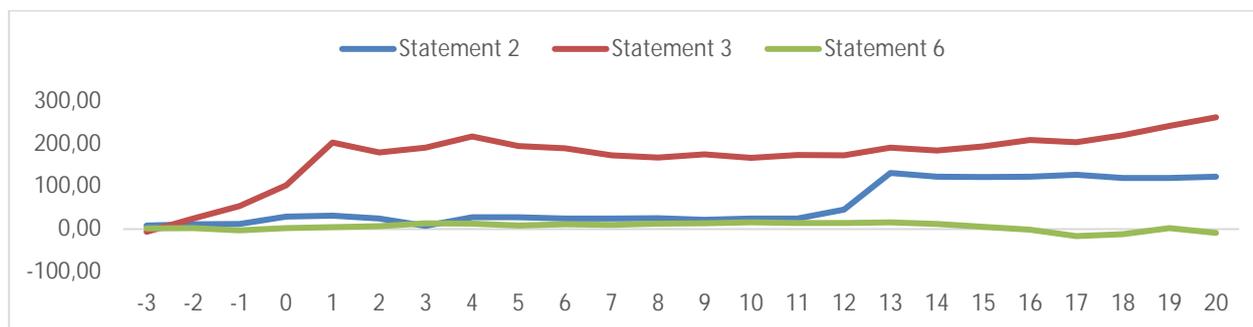
	Avg. real return (%)	Avg. expected return (%)		Avg. abnormal return (%)	
		MAR	MKAR (∅ Rmt)	MAR	MKAR
Statement 2	5,92	0,84	2,75	5,08	3,18
Statement 3	11,97	1,10	0,06	10,88	11,91
Statement 6	-1,53	-1,15	-1,42	-0,38	-0,10

Source: Own processing

The price of Dogecoin showed a sharp growth after the publication of statements No. 2 and No. 3, which was also reflected in the high values of actual returns (5,92 % and 11,97 %) measured during the event window. These actual returns exceeded the expected returns calculated by both the Mean-adjusted model and the Market-adjusted model, indicating a strong positive response to posted tweets regardless of their non-specific content. Abnormal returns after the publication of statement No. 6, which was the only one containing specific information, showed negative values both in the case of the Mean-adjusted model (-0.38) the Market-adjusted model (-0.10).

Positive cumulative return for statements No. 2 and No. 3 at time 0 indicate positive sentiment even before these statements were published. After publication of statement No. 2, there was a slight increase in cumulative return, and in post No. 3, a sharp increase cumulative return. The sharp increase in cumulative return on the 12th day after the release of statement No. 2 may suggest a delayed response to the statement or a reaction to other undisclosed information. The release of statement No. 6 was accompanied by a mild increase in prices, resulting in positive cumulative return; however, by the end of the observed period, these returns began to decline. The dynamics of the cumulative return for individual contributions during the event window is shown in Figure 5.

Figure 5 Dogecoin cumulative abnormal return- Mean adjusted model



Source: Own processing

4 Conclusions

This paper, using event study methodology, investigates the responses of Bitcoin and Dogecoin prices to statements published on the social media platform Twitter (X) during the period from 2020 to 2022. A total of 6 statements were examined. Three of these statements were about Bitcoin and another three mentioned Dogecoin. The impact of statements commenting on Bitcoin is not entirely clear, but it seems that statements published on the social media platform Twitter (X) have the potential to influence the market price of Bitcoin, especially when their content aligns with market sentiment. Statements commenting on Dogecoin have a more significant impact on the market price of this cryptocurrency compared to Bitcoin. This fact is confirmed by the higher abnormal returns and by the cumulative return dynamics, which consistently increase, especially in the four days following the statement's publication. The content of the posts seems to be unimportant for the development of market prices and the strength of the reaction is mainly influenced by the market sentiment at the time of publication of the post. Dogecoin's sharp market price reactions to the published posts can be explained by Dogecoin's approximately 60x lower market capitalization compared to Bitcoin. High abnormal returns and the gradual reaction of the exchange rate for the examined statements indicate a delayed reaction of the cryptocurrency exchange rate and contradicts the hypothesis of market efficiency in its semi-strong form, at least in the case of Dogecoin. In further research, the authors want to focus on analysing the influence of different types of social media on the market price of cryptocurrencies and the possibility of market manipulation through social media posts.

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