ACTA OECONOMICA UNIVERSITATIS SELYE

International scientific journal

Volume 11.

No. 1

The publication of this issue was funded by the Pallas Athéné Domus Meriti Foundation.

PADME | PALLAS ATHÉNÉ DOMUS MERITI ALAPÍTVÁNY

J. SELYE UNIVERSITY - FACULTY OF ECONOMICS
AND INFORMATICS

ACTA OECONOMICA UNIVERSITATIS SELYE

International scientific journal

Volume 11.
No. 1

2022
KOMÁRNO

EDITORIAL BOARD
ACTA OECONOMICA UNIVERSITATIS SELYE

Acta Oeconomica Universitatis Selye is published twice a year by the J. Selye University, Faculty of Economics and Informatics, Bratislavská cesta 3322, 945 01 Komárno, Slovakia

CONTENS

QUALITY OF LIFE AND ENVIRONMENT IN V4 COUNTRIES – SELECTED PROBLEMS

Pavol ANDREJOVSKÝ

Department of Economy, Faculty of Business Economics with seat in Košice, University of Economics in Bratislava, Slovakia

Zuzana HAJDUOVÁ

Department of Corporate Finance, Faculty of Business Management, University of Economics in Bratislava, Slovakia

Roman LACKO

Department of Services and Tourism, Faculty of Commerce, University of Economics in Bratislava, Slovakia

Received: 17. January 2022 *Reviewed: 29. March 2022* *Accepted: 05. April 2022*

Abstract

The study focuses on evaluating selected research problems related to economic growth and quality of life, objective but the subjective approach to perception and evaluation of the quality of life through selected indicators. Factors such as economic growth and its material and energy intensity, the structure of the economy and its structural changes, or the application of environmental legislation can be classified as economic factors that threaten the quality of the environment. Quality of life is often used in everyday life and scientific and political environments. The aim is to highlight approaches to the perception of evaluation. We will focus on comparing selected indicators that we can consider in part of the comparisons of V4 countries - opinions and controversies from different perspectives on the perception of different aspects of quality of life. We aim to highlight changes in V4 countries in the context of selected economic and environmental indicators.

Keywords: *Quality of life, environment, economy, indicators, multi-criteria analysis*

JEL Classification: Q52, B23, A14

Introduction and theoretical background

Increased economic activity impacts the quality of the environment and, thus, the quality of life. A positive impact arises when economic activity manifests

itself in economic growth, but at the same time not at the expense of an excessive burden on the environment, which is achieved by, for example, economic – environmentally sound technologies. On the contrary, the negative effect arises when, together with economic growth, the burden on the environment increases and thus negatively affects the quality of life. The author's opinions on the relationship between environmental quality and economic factors vary (Koišová et al., 2019). On the one hand, there are opinions of authors dealing with current environmental, health care, human health and economic development issues, but the possibilities for long-term economic growth without knowing the causes and consequences are questioned (Bravo, 2014). On the other hand, the COVID-19 pandemic, changes in consumer behaviour, the current issues of tackling domestic energy sources as well as rising energy prices, and the development of economies in EU countries (Burström & Tao, 2020), especially in post-socialist economies, are significantly exacerbated (Moretti et al., 2017). Therefore, diversification of sources and authors' views on economic growth in the context of the development of the world economy while respecting environmental problems vary (Slottje, 2019).

On the other hand, the authors show that economic growth can reduce environmental pollution. To this end, it is necessary to set up an environmental policy promoting environmental education, education, and environmentally sound technologies (Stofkova et al., 2021). This requires the objectivity of impact measurement and the search for sustainable, balanced social and economic development to which a mature and conscious society contributes. The positive examples of the Nordic countries are apparent. Quality of life is a multidimensional concept based on the causality of relations between selected problems and their associated indicators. According to (Murgaš & Klobučník, 2016), quality of life lacks standardized uniform methodology and terminology.

Quality of life is a broad term that refers to overall well-being in society. However, there is no agreed definition of this term in academic and political discourse (Băndoi et al., 2020). The concept of quality of life has three main characteristics: it reflects the life situations of individuals and their perceptions rather than the quality of life in the country; it is a multidimensional concept covering several areas of life, such as housing conditions, access to and interaction between institutions and public services; it combines objective information about living conditions with subjective opinions and attitudes in order to provide an image of overall well-being in society (Hadad et al., 2013).

Many definitions of quality of life include cognitive assessments of individuals' own standards of living; however, the literature includes research examining the quality of life in two dimensions (Costa et al., 2021). Accordingly, quality of life can be considered both subjective and objective. Subjective quality of life refers to satisfaction and appreciation of their living conditions. For example, opinions about the personal security of income, the degree to which an individual feels safe on the street, and the degree of satisfaction with education and health are the subjective quality of life (Veenhoven, 2006). Objective quality of life refers to whether observable criteria of the good life are met. Criteria include, for example, ensuring personal income, the safety of the street and the environment in which a person lives, good health care and education. Thus, the general, subjective quality of life deals with the personal assessment of living conditions and the objective quality of life concerns the impartial assessment of living conditions (Rusche, 2010).

Quality of life is usually determined by two indicators: a subjective dimension and an objective dimension. However, most researchers focused on indicators of

the objective dimension of quality of life. They included a set of observable indicators and direct measurements such as working conditions, income levels, social and economic status and the amount of support available from the network social relations. Research findings show that focusing on the quality of life indicators is only a tiny fraction of the dispersion in overall quality of life estimates. Therefore two dimensions of quality of life are determined. The first is the subdimension, which means the extent of personal satisfaction in life, the feeling of happiness of a person. The second is the objective dimension, which includes physical and mental health, social relationships, community activities, work, life philosophy, leisure, the standard of living, family relationships and education (Lee & Park, 2017).

In 2015, 193 member states approved the 2030 Agenda for Sustainable Development. It is an ambitious plan that aims to achieve prosperity that respects the planet and its inhabitants. This agenda consists of 17 Sustainable Development Goals (SDGs) and is further developed into 169 targets to be met by 2030. The 2030 Agenda is a continuation of the UN Millennium Development Goals (2000-2015), which were the first international consensus to address global challenges such as eradicating extreme poverty and hunger and promoting improved access to education (Suganthi, 2020)

Environmental performance is considered a multidimensional construct that includes not only the results and impacts of the company on stakeholders and the environment but also the principles of environmental responsibility and the processes of environmental sensitivity of the company that determine future results and impacts (Henchoz et al., 2015).

The analysis of the levels and types of quality of life revealed that the essence of the concept of quality of life could be more precisely determined not by seeking to define the concept but by a more detailed analysis of the factors and their groups affecting the quality of life. Many authors agree that the internal and external environment determines the quality of life. The country's level of development and the political and socio-economic environment allows people to live well and seek a quality of life (Murray et al., 2017). On the other hand, individuals can use the external environment and strive for higher physical and personal development and material and social well-being, which is determined by the internal environment (Abdul Mohit, 2018). On this basis, two groups of factors determining the quality of life can be identified. The first group includes factors that may not be regulated by public policy measures (climate conditions and their indicators, the geographical position of the country) and those affected by public policy activities (political stability, social security, corruption, economic growth). The second group of factors consists of those factors that a person as a holder of rights and freedoms can exercise significant control over himself (health status, educational attainment, family, leisure) (Sachs, 2015).

Material and methods

For the needs of this work, it is necessary to determine the objects of examination in our case selected countries: Slovakia, the Czech Republic, Poland and Hungary. Therefore, we used multi-criteria analysis for analysis (Ardielli, 2019).

The multi-criteria analysis takes place in two basic steps:

1. Determine the weighting of the criteria against which alternatives are evaluated.
2. Choose the correct decision method to evaluate variants/alternatives.

Weights of criteria can be determined in different ways. The choice of the appropriate method depends on whether or not the criteria preferences are known

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

and whether the assessment should be objective or subjective and thus tailored to the tasking authority (Baltussen et al., 2019).

The TOPSIS method uses cardinal information to identify a compromise variant as close as possible to the positive-ideal solution and as far away from the negative-ideal solution as possible. If there is a positive-ideal solution and it is possible to achieve it, then the positive-ideal solution and compromise variant match. The positive-ideal solution acquires the best values with respect to all specified criteria and is represented by a vector $h_1, h_2, ..., h_n$. The negative-ideal solution acquires the worst possible values in all criteria and is represented by a vector $(d_1, d_2, ..., d_n)$ where n indicates the number of criteria that are taken into account in the analysis (Feneri et al., 2015).

The TOPSIS method can be described in the following steps:

- Construct the criteria matrix $Y=(y_{ij})$ created of the input data:

$$Y = \begin{pmatrix} y_{11} & y_{12} & \cdots & y_{1n} \\ y_{21} & y_{22} & \cdots & y_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ y_{m1} & y_{m2} & \cdots & y_{mn} \end{pmatrix}$$

The element y_{ij} of the matrix Y represents the value of the i-th alternative according to the j-th criterion.

- Construct the normalized matrix $R=(r_{ij})$ as follows:

$$r_{ij} = \frac{y_{ij}}{\sqrt{\sum_{i=1}^{m} y_{ij}^2}} ; i = 1, 2, \ldots, m;\ j = 1, 2, \ldots, n.$$

- Construct the weighted normalized matrix $Z=(z_{ij})$ by using the formula:

$$z_{ij} = w_j r_{ij}; i = 1, 2, ..., m; j = 1, 2, ..., m$$

Determine the positive-ideal solution $h = (h_1, h_2, ..., h_n)$ and the negative-ideal solution $d = (d_1, d_2, ..., d_n)$, where:

$$h_j = \max_i z_{ij} ; j = 1, 2, \ldots, n$$

$$d_j = \min_i z_{ij} ; j = 1, 2, \ldots, n$$

- Calculate the distance between each alternative and the positive-ideal and the negative-ideal solution as follows:

$$d_i^+ = \sqrt{\sum_{j=1}^{n} (z_{ij} - h_j)^2} ;\ i = 1, 2, \ldots, m$$

$$d_i^- = \sqrt{\sum_{j=1}^{n} (z_{ij} - d_j)^2} ;\ i = 1, 2, \ldots, m$$

- Finally, the variants are ranked according to the values of the relative indicators (the higher value the better alternative) (Triantaphyllou, 2000).

Results and discussion

In economics, the Human Development Index (HDI) is used as a basic quantitative assessment of human capital. The Human Development Index (HDI) is a comprehensive index that characterizes the level of human development in countries and regions. This index is an integral part of measuring a country's health and longevity performance, education and the real incomes of its citizens. The HDI should indicate the level of human development achieved in the country and thus assist policymakers in shaping policies enabling the country's socio-economic progress.

The Environmental Performance Index (EPI) is an index of quantification of the environmental performance of policies developed by the University of Yale (EPI Yale Index). It provides access to relevant environmental data in an organized manner that is easy to understand, useful and encourages intense competition. It also allows countries to compare their performance in selected groupings. Furthermore, thanks to time series, countries can see changes in their performance and look for ways to solve societal problems and public funding priorities for environmental activities (Cerenio Adriatico et al., 2019).

EPI uses the best global environmental performance datasets available, but data quality and availability are alarmingly low. The absence of widely collected and methodologically consistent indicators for even the most fundamental problems, such as soil quality, and the complete lack of time series data for most countries hamper efforts to shift pollution control and management of natural resources to more empirical foundations. Policymakers should invest in monitoring environmental data, indicators and reporting to address these gaps. They should set clear policy lines for essential issues and environmental protection efforts with performance metrics at global, regional, national, state/provincial, local and corporate levels.

The Environmental Performance Index (EPI) points to the country's efforts to counter environmental pressures. Thus, analyses of the behaviour and influence factors of the EPI will provide a solid basis for practical policy-making. This can help to understand the determinants of environmental progress and maximize the rate of return to ensure environmental sustainability (Stoian et al., 2022).

The Environmental Performance Index (EPI) provides a comprehensive overview of the state of sustainability worldwide based on data. Using 32 performance indicators in 11 problem categories, the EPI assesses 180 countries regarding environmental health and ecosystem vitality. These indicators provide a measure at the national level of how close countries are to the stated environmental policy objectives. In addition, the EPI offers a scoreboard that points environmental leaders backwards and provides practical guidance for countries seeking to move toward a sustainable future (Wendling et al., 2020).

In the theoretical part, we stated that the Environmental Performance Index (EPI Index 2020) measures 180 countries. In our work, we focused specifically on four of them. Table 1 shows our selected countries, the EPI score for the years under review and the ranking of those countries in the EPI index. The reporting years will be 2010, 2016, 2018, and 2020 because the EPI index publishes its results every two years.

Table 1 EPI 2010-2020

Country	2010	Position	2016	Position	2018	Position	2020	Position
Czechia	71,6	22	84,67	27	67,68	33	71	20
Slovakia	74,5	13	85,42	24	70,6	28	68,3	26
Hungary	69,1	33	84,6	28	65,01	43	63,7	33
Poland	63,1	63	81,26	38	64,11	50	60,9	37

Source: own processing

An analysis of the location of our V4 countries, which finished last in comparison with others, shows that lower scores can be caused precisely because of per capita greenhouse gas emissions performance. Slovakia finished in first place among V4 countries. In 2016, it was ranked 24th. In 2018 declined and finished 28th, but in 2020 it improved its position and dropped to 26th. In 2010, it was ranked 12th. Looking at ecosystem vitality, it ranks 10th in 2020 and 34th in health. The worst health position is the PM2.5 particles, mainly caused by the combustion of pollutants, especially from cars.

The Czech Republic ranks second after Slovakia but finished in eighth place compared to other countries. However, if we compare 2020, it has a better location this year than Slovakia. In 2016, the Czech Republic ranked 27th with a score of 84.67, finished 33 in 2018 and improved to 20th in 2020. In 2020, it ranked 7th for ecosystem vitality, three places lower than Slovakia and ranked 32nd in health.

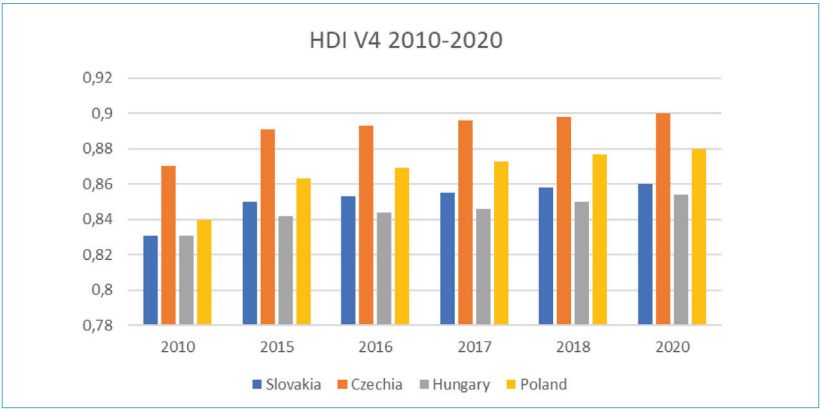
Hungary finished in 10th place in a comparison of all countries and third in a comparison of V4 countries. Hungary's worst place was in 2018, ranking 43 rd in the EPI. In 2020, Hungary improved and ranked 33 rd. When comparing health and ecosystem vitality, health was ranked 54th. The worst position is for solid household fuels, PM2,5 and ozone.

Poland ranked last among all countries. Moreover, Poland was still in more than 30th place for the reporting period. The worst place was in 2018, when it was ranked 50th. In 2020, it improved and finished in 37th place.

In the case of Poland, the values were the second highest. The highest value for the reporting period was recorded in 2017 at 8.9 tonnes per capita and the lowest in 2020. Values increased from 2015 to 2016 and have been declining since 2017.

Natural processes such as forest fires also contribute to PM2.5 in the air. These particles are also the main reason for the occurrence of smog. Exposure to PM2.5 has several short and long-term health effects, including short-term irritation of the eyes, nose and throat, coughing, sneezing and shortness of breath. Prolonged exposure to PM2.5 can cause permanent respiratory problems such as asthma, chronic bronchitis and heart disease.

Figure 1 HDI 2010-2020



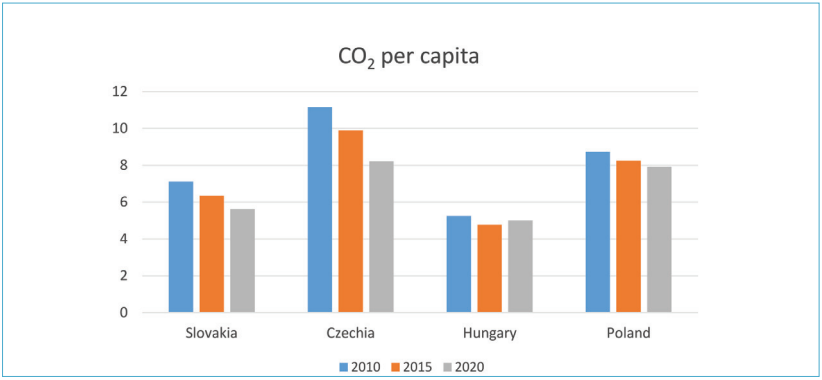
Source: own processing

Figure 1 compares the human development index in V4 countries for 2010 and 2015-2020. All countries have values above 0.8, and countries are among the countries with very high HDI.

In Poland, the HDI value rose by 0.017 between 2015 and 2020, the highest increase, but the Czech Republic still ranks first in the V4 countries. Poland was ranked third, fourth in Slovakia and last in Hungary. For global rankings, Slovenia ranked 22nd, the Czech Republic 27th, Poland 35th, Slovakia 39th and Hungary 40th.

The TOPSIS method also considers the amount of CO_2 per capita reported in tonnes to be a critical parameter. Figure 2 shows its evolution from 2010-2020.

Figure 2 CO_2 per capita 2010-2020



Source: own processing

Using the TOPSIS method, the ranking of our selected countries was determined based on the values of quality of life indicators. The ranking of countries

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

based on multiple criteria and selected indices has been established, leading to a broader perception of the interdependence of the environmental performance of selected countries and economic growth in achieving adequate quality. The period analyzed was 2010, 2015, and 2020.

Criteria :

K1 – EPI index
K2 – CO2 per capita in tonnes
K3 – HDI index
K4 – GDP per capita in USD
K5 – Years of Healthy Life (HLY)
K6 – CIP Index – Industrial Competitiveness Index

These criteria are commonly used in the quality of life examined (Tab.2).

Table 2 TOPSIS 2010-2020

2010	di+	di-	ci	Rank
Slovakia	4400,766	176,8558	0,038635	2
Czechia	4236,311	341,3104	0,074561	1
Hungary	4555,139	22,49248	0,004914	3
Poland	4577,618	0,870632	0,00019	4

2015	di+	di-	ci	Rank
Slovakia	3860,33	163,2272	0,040568	2
Czechia	3783,634	239,9251	0,05963	1
Hungary	4018,151	5,432216	0,00135	3
Poland	4023,557	0,753138	0,000187	4

2020	di+	di-	ci	Rank
Slovakia	4511,633	166,6903	0,03563	2
Czechia	4303,831	374,4925	0,080048	1
Hungary	4667,257	11,08182	0,002369	3
Poland	4678,322	0,747324	0,00016	4

Source: own processing

Slovakia ranked last in all indicators. When evaluating the Human Development Index, this country ranks penultimately but still ranks among the countries with a very high HDI. Middle years of life increased yearly but were lower than in other countries. From the Health Index, Slovakia ranked 34th, and the biggest problem is air quality and particulate matter PM2.5, where Slovakia ranked 80th out of 160 countries. With ecosystem vitality in case of the growth rate of black carbon, Slovakia is at 73 rd place and with a 10-year change was a decrease of 38.4, and with the trend of greenhouse gas intensity, a shift to 39th place was recorded. As part of this index, one of Slovakia's most significant environmental problems is waste management and air quality, where

Slovakia is lagging more. Appropriate financial support for environmental and energy policy, economic policy and eco-innovation in line with the recovery plan can focus on addressing these challenges.

Using the TOPSIS method, other EU countries have also been analyzed and when compared to other EU countries — especially the Nordic countries- they are lagging more in the performance of the V4 country. An interesting feature of this extensive research, which goes beyond the scope of this publication, is that Slovenia in demographic development comparable to the V4 countries that ended before the Czech Republic. V4 countries do not reach 75 % of the EU average GDP.

Conclusion

Slovakia has stagnated in such an assessment. We can say that Slovakia is poorer by a quarter compared to the EU average and the country's main objective is to catch up with developed EU countries. When building on Slovakia's recovery plan, namely the green economy, the country should focus on reducing greenhouse gas emissions from industrial and agricultural production, which would help to end the combustion of lignite in power plants. The Czech Republic is in first place among V4 countries. The biggest problem is the CO_2 pollution in tonnes, a highly represented industry. The areas where this industry is represented are also reflected in the population's health status. Poland ranked last in the Environmental Performance Index, but overalls moved 13 points higher compared to 2018, which can be assessed positively. One of Poland's biggest problems is air pollution by particulate matter. This country invests the least in waste management. Hungary's results show us that environmental performance needs to be improved — e.g. Hungary produces the lowest CO2 emissions. A small amount of the population is connected to wastewater treatment plants. They are accelerating the reduction of PM10 and PM2.5 emissions and concentration precisely by reducing emissions from energy production and heat from solid fuels. Examining the relationship between economic growth and the quality of life is conditioned by the complexity of the processes. The COVID-19 pandemic, changing consumption patterns, supporting economies in individual countries, and the challenges of energy and self-sufficiency in energy production show us today how difficult it is to face the challenges of the 2030 Agenda, with V4 countries reaching around 75 % of the EU average. The development of society has increasingly brought to the fore the issue of the protection of human health and, therefore, the need to create better opportunities. Defining quality of life is very difficult, as is its quantification. Many economists focus on the development of socio-economic indicators, which usually only include one aspect of the quality of human life. From this aspect, finding one measurable indicator that includes a measurable result is complicated. Using measurable aggregated indices and examining their interconnectedness, it is possible to demonstrate the interdependence and relationships between the environment, society and the economy.

Acknowledgement
This research was supported by the National Research VEGA 1/0338/22,VEGA 1/0240/20, KEGA 035EU-4/2022

Bibliography

1. Abdul Mohit, M. (2018). Analysis of Malaysian Regional Quality-of-Life and its Policy Implications. Asian Journal of Quality of Life, 3(9), 11. https://doi.org/10.21834/ajqol.v3i9.73
2. Ardielli, E. (2019). Use of TOPSIS Method for Assessing of Good Governance in European Union Countries. Review of Economic Perspectives, 19(3), 211–231. https://doi.org/10.2478/revecp-2019-0012
3. Baltussen, R., Marsh, K., Thokala, P., Diaby, V., Castro, H., Cleemput, I., Garau, M., Iskrov, G., Olyaeemanesh, A., Mirelman, A., Mobinizadeh, M., Morton, A., Tringali, M., van Til, J., Valentim, J., Wagner, M., Youngkong, S., Zah, V., Toll, A., … Broekhuizen, H. (2019). Multicriteria Decision Analysis to Support Health Technology Assessment Agencies: Benefits, Limitations, and the Way Forward. Value in Health, 22(11), 1283–1288. https://doi.org/10.1016/j.jval.2019.06.014
4. Băndoi, A., Jianu, E., Enescu, M., Axinte, G., Tudor, S., & Firoiu, D. (2020). The Relationship between Development of Tourism, Quality of Life and Sustainable Performance in EU Countries. Sustainability, 12(4), 1628. https://doi.org/10.3390/su12041628
5. Bravo, G. (2014). The Human Sustainable Development Index: New calculations and a first critical analysis. Ecological Indicators, 37, 145–150. https://doi.org/10.1016/j.ecolind.2013.10.020
6. Burström, B., & Tao, W. (2020). Social determinants of health and inequalities in COVID-19. European Journal of Public Health, 30(4), 617–618. https://doi.org/10.1093/eurpub/ckaa095
7. Cerenio Adriatico, Vangilit Retome, & Placa, R. (2019). The Fractal Dimensions of Environmental Performance Index. https://doi.org/10.13140/RG.2.2.28863.56486
8. Costa, D. S. J., Mercieca-Bebber, R., Rutherford, C., Tait, M.-A., & King, M. T. (2021). How is quality of life defined and assessed in published research? Quality of Life Research, 30(8), 2109–2121. https://doi.org/10.1007/s11136-021-02826-0
9. Feneri, A.-M., Vagiona, D., & Karanikolas, N. (2015). Multi-Criteria Decision Making to Measure Quality of Life: An Integrated Approach for Implementation in the Urban Area of Thessaloniki, Greece. Applied Research in Quality of Life, 10(4), 573–587. https://doi.org/10.1007/s11482-014-9335-1
10. Hadad, S., Hadad, Y., & Simon-Tuval, T. (2013). Determinants of healthcare system's efficiency in OECD countries. The European Journal of Health Economics, 14(2), 253–265. https://doi.org/10.1007/s10198-011-0366-3
11. Henchoz, Y., Meylan, L., Goy, R., Guessous, I., Bula, C., Demont, M., Rodondi, N., & Santos-Eggimann, B. (2015). Domains of importance to the quality of life of older people from two Swiss regions. Age and Ageing, 44(6), 979–985. https://doi.org/10.1093/ageing/afv130
12. Koišová, E., Grmanová, E., Škrovánková, K., & Kostrová, J. (2019). Competitiveness of Regions in the Visegrad Group Countries. Engineering Economics, 30(2), 203–210. https://doi.org/10.5755/j01.ee.30.2.21746
13. Lee, P., & Park, Y.-J. (2017). Eco-Efficiency Evaluation Considering Environmental Stringency. Sustainability, 9(4), 661. https://doi.org/10.3390/su9040661
14. Moretti, L., Di Mascio, P., & Bellagamba, S. (2017). Environmental, Human Health and Socio-Economic Effects of Cement Powders: The Multicriteria Analysis as Decisional Methodology. International Journal of Environmental Research and Public Health, 14(6), 645. https://doi.org/10.3390/ijerph14060645

15. Murgaš, F., & Klobučník, M. (2016). Municipalities and Regions as Good Places to Live: Index of Quality of Life in the Czech Republic. Applied Research in Quality of Life, 11(2), 553–570. https://doi.org/10.1007/s11482-014-9381-8
16. Murray, A., Skene, K., & Haynes, K. (2017). The Circular Economy: An Interdisciplinary Exploration of the Concept and Application in a Global Context. Journal of Business Ethics, 140(3), 369–380. https://doi.org/10.1007/s10551-015-2693-2
17. Rusche, K. (2010). Quality of life in the regions: An exploratory spatial data analysis for West German labor markets. Jahrbuch Für Regionalwissenschaft, 30(1), 1–22. https://doi.org/10.1007/s10037-009-0042-6
18. Sachs, J. (2015). The age of sustainable development. Columbia University Press.
19. Slottje, D. (2019). Measuring The Quality Of Life Across Countries (0 vyd.). Routledge. https://doi.org/10.4324/9780429033896
20. Stofkova, Z., Seemann, P., & Binasova, V. (2021). Evaluation of quality of life in the period of globalization. SHS Web of Conferences, 92, 02059. https://doi.org/10.1051/shsconf/20219202059
21. Stoian, M., Brad, L., & Zaharia, A. (2022). Drivers of the European Union's Environmental Performance. Frontiers in Environmental Science, 10, 954612. https://doi.org/10.3389/fenvs.2022.954612
22. Suganthi, L. (2020). Sustainability indices for energy utilization using a multi-criteria decision model. Energy, Sustainability and Society, 10(1), 16. https://doi.org/10.1186/s13705-020-00249-2
23. Triantaphyllou, E. (2000). Multi-criteria Decision Making Methods: A Comparative Study (Roč. 44). Springer US. https://doi.org/10.1007/978-1-4757-3157-6
24. Veenhoven, R. (2006). Quality-of-Life in the Modern Society Measured with Happy Life Years. V Y.-K. Ng & L. S. Ho (Ed.), Happiness and Public Policy (s. 19–44). Palgrave Macmillan UK. https://doi.org/10.1057/9780230288027_2
25. Wendling, Z., Emerson, J. W., Sherbinin, A. D., & Esty, D. C. (2020). Environmental Performance Index 2020. Yale Center for Environmental Law & Policy. https://doi.org/10.13140/RG.2.2.21182.51529

Correspondence address:

Ing. Pavol Andrejovský, PhD., University of Economics in Bratislava, Faculty of Business Economics with seat in Košice , Department of Economy,Tajovského 13, 04 001 Košice, Slovakia. Email: *pavol.andrejovsky@euba.sk*
ORCID: https://orcid.org/0000-0002-3210-1821

doc. RNDr. Zuzana Hajduová, PhD., University of Economics in Bratislava, Faculty of Business Management, Department of Corporate Finance, Dolnozemská cesta 1/b, 852 35 Bratislava, Slovakia. Email: *zuzana.hajduova@euba.sk*
ORCID: https://orcid.org/ 0000-0002-9381-776X

doc. Ing. Roman Lacko,PhD., University of Economics in Bratislava, Faculty of Commerce, Department of Tourism, Dolnozemská cesta 1/b, 852 35 Bratislava, Slovakia. Email: *roman.lacko@euba.sk*
ORICID: https://orcid.org/0000-0002-5801-1998

HUMAN PERFORMANCE ASSESSMENT METHODS IN THE PUBLIC AND COMPETITIVE SECTORS IN THE CONTEXT OF DIGITAL INDUSTRY 4.0

Zsolt BARNA

MATE University, Gödöllő, Hungary

Received: 17. May 2022 *Reviewed: 23. June 2022* *Accepted: 30. June 2022*

Abstract

The digitalisation of business means that the related business functions and stakeholders will be at the forefront of its development, so IT solutions that serve the core business of the organisation will also be at the forefront. This trend, also boosted by Industry 4.0, is also fundamentally changing the field of management controlling and human performance management.

This trend will enable new forms of collaboration between companies, suppliers, customers, and employees, leading to new product and service offerings. Just think of the emergence and proliferation of cross border service centres (SSCs). Here, we have seen global companies first start to provide services in the financial, economic, human resources and controlling areas, initially to their own consolidated subsidiaries, and then move out into the market and into the customer.

I will describe the relevant legal environment, the actual functioning, the practical experience of the studies carried out, and the common HR and corporate governance platforms and methods used, thus indicating, and supporting my hypothesis that the existence of technical and regulatory conditions does not automatically imply the possibility of an effective and strategic application of the system.

Keywords: *Controlling, Digitization, HRM, Industry 4.0, Public Companies.*

JEL Classification: J24, J31, J33

Introduction and theoretical background

The opportunities offered by digitalisation have generally increased in value, especially since the epidemic conditions have set the limits for companies to act. This is true for both competitive and state-owned companies, which have to operate effectively in the same environment, even if, despite similar industrial activities, the organisational and ownership structures of the companies in question are different.

The importance of digitalisation and the improved performance it can bring to companies operating and doing business in the competitive sector is self-evident and quantifying the results is a daily activity. It is a fundamental determinant of a company's market position and its value or saleability.

In for-profit organisations, it is common practice to measure and monitor both organisational performance and the individual performance that contributes to it, and to build a motivation system around this.

The changes in IT, the introduction and spread of integrated ERP systems and other innovative IT solutions, as envisaged by Industry 4.0, are changing the role of controlling-centred human resource management within organisations. Its popularity among companies continues to grow, as it holds up a mirror to measure the qualities that can make a fundamental contribution to the optimal functioning of individual areas or even the entire organisation.

Performance measurement in the public sector is based on an adaptation of the performance measurement used in the controlling area of business, although the specificity of the sector raises a number of problems and questions. *„The public sector is primarily characterised by indirect results, as these are slow, indirect and difficult to measure. The performance of an organisation is the sum of the performance of its employees, so measuring the performance of individual employees is essential to ensure effective operation"* (Gonda, 2019). Take, for example, the social benefits of resources invested in education, which are very often measured in two or three decades, and whose content is also difficult to define and test.

Secondly, the quantitative analysis and quantification of the performance of public tasks runs counter to the classical public service theory, which holds that public service is essentially an attitude that is achieved by conforming to abstract values. Public service professions are based on a moral foundation, on a respectable attitude, such as the image of the dutiful civil servant or the idea of the obsessive teacher. The expression of performance in figures, and pay based on it, eclipses this view. Since the human factor has always played an important role in value creation processes, it is therefore recommended from the point of view of companies that several specialist areas - both controlling and HR - focus on the more efficient use of human resources in order to increase competitiveness. (Szőke, Tóth, Vanó 2022)

The importance of this is underlined by a report produced by the State Audit Office of Hungary two years ago (Németh, 2020), which raises important questions about public offices and the public sector. It does so by using modern IT solutions from the market to answer them, while of course keeping the focus on basic functions. The scope of the questions ranges from the relevant and measurable statement of objectives to their substantiation by correct information, including the hierarchy of objectives, sub-objectives, and the timing of their achievement. Not forgetting, of course, the regulatory, institutional and financial framework, as well as the evaluation environment, monitoring and follow-up.

While the public sector sees this as a partly new and mandatory task - contributing to the process of creating customer and organisational value (Felméry, 2015) - large companies see human IT solutions to support their operations as a key strategic issue. At the same time, at a global level, operators can no longer expect a specific competitive advantage from the use of this module of integrated management systems. It is important that the necessity of applying controlling as an approach and methodology has also been proven in the case of public service and non-profit organizations, because the quality and standard of the management system is also a key issue in organizations outside the competitive sphere. Based on this, the primary goal of public service controlling is to promote the improvement of the quality of public services — the outputs created by public service organizations (e.g. public administration, law enforcement, healthcare, education) (Horvath & Partners, 2015).

This has become an expected basis for supporting day-to-day IT, as the implementation of ERP systems has become a prerequisite for staying competitive.

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

Nevertheless, companies do not always have the resources to implement the optional integrated IT system solutions. This is particularly true for human resources management systems, as often the main focus is on administrative support of this function, managing basic data - including data related to GDPR rules - including possibly financial information related to employee remuneration.

Despite the economic expectations of ERP systems, a large number of implementation projects fail because the decision process of the initiatives that trigger them is not sufficiently prepared, decisions are taken in the wrong life cycle of the company or are delayed, and therefore the projects often exceed the resources available to the companies. System implementations cannot be left to IT specialists without organisational skills. Software developers can only develop capabilities already specified by management.

Be it any module within the ERP system, - in connection with the controlling support systems - a number of stated requirements must be met for the users.

Nowadays, it is natural that the management of programs should be simple and user-friendly. In addition to the help screen and the operator's manual, it can also be telephone and online assistance. Partial implementation and continuous development of the program must also be ensured. In the case of large databases, an acceptable response time is required and it should be possible to perform well-parameterized, flexible queries, prepare reports, and display graphics. The development of plans, plan variations, and alternatives without the help of programmers, the electronic transfer of data from already functioning systems, should be compatible with other operating systems (Musiszinszki 2012).

At the same time, the lack of knowledge of software developers in organisational management makes it difficult for business professionals to recognise the potential of these systems, and companies are already struggling to implement ERP systems. At present, solutions that significantly exceed the complexity of ERP systems have become available in the market. Market leading large companies are already in a trend-setting period that will lead to a technology shift; therefore, I consider it important to examine the operational change of human performance management systems in public companies, the role of future-proof technologies at the interface of information technology and management sciences. The precise measurement of the competitiveness of a national economy is an extremely complex task, as it is by definition a phenomenon encompassing all factors that affect the productivity of firms in the long run (Vakhal, 2022).

Material and methods

The focus of controlling activity in the 21st century companies is improving organizational performance. Previously, there were differences between German and Anglo-Saxon trends in controlling. Whereas, according to the German approach, controlling is a system of tools, with the help of which the information necessary for managerial decision-making is available, and based on which, planning, inspection and control activities can be implemented. In addition, according to the German trend, a separate organizational unit is responsible for controlling activities. On the other hand, according to the Anglo-Saxon view, controlling is a part of management, and the task of managers is the efficient allocation of resources, the so-called *"management control"*, the simultaneous performance of planning and control tasks. However, in relation to the *"place"* of controlling within the company's organizational framework,

we can discover differences between the two trends. However, it can be stated as a fact that management and controlling are inseparable from each other, the joint goal of both areas is to increase company performance (Sütő, 2017)

If we look only at the last decade or two, we can see that the role of controlling, whatever the ownership structure of the company, has increased.

As corporate governance has been defined so far, the primary function of IT-support systems has been to increase organisational efficiency and control the functioning of the organisation. This function was essentially focused on the core business. However, today's rapidly changing market and organisational circumstances require the existence of systems that underpin the corporate information base, including on the human side, but no longer as mere administrative support.

From a controlling point of view, these systems also support human resource management itself, through human resource policy planning, the monitoring of plans, economic analysis, and reporting; by coordinating human resource processes and matching them to organisational needs. This includes assessing the efficiency and effectiveness of human resource management. Measure and quantify the costs and benefits of human resource decisions. *"The purpose of measurement is to ensure evaluability"* (Karoliny - Poór, 2010)

IT developments bring along a necessary change in approach and this process leads to an increase in the number of human-related IT projects. The managerial knowledge needed to successfully implement these projects is not available in most companies, requiring the involvement of external consultants.

The use of appropriate data-driven assessment tools requires more than the extension of corporate structure, it requires a focus on controlling and a rethinking of organisational information flow and organisational coordination along the lines of the business case for controlling, based on IT systems extensions.

The availability of an information base for companies is a key issue for the compilation of appropriate key performance indicators (KPIs). However, the question of which specific indicators to focus on and with what relative weight has so far been a pure management issue. New organisational opportunities, hitherto neglected, can be brought to the attention of management by evaluating the KPIs available to management and identifying new indicators that better support strategic implementation (Poór, 2016)

Waiting between the implementation of the necessary action plans and the emergence of a change in KPIs greatly impairs organisational responsiveness. With the help of integrated IT systems, the company can accelerate the speed of data processing, so that the necessary information reaches decision-makers faster.

The responsiveness of companies to new environmental conditions is greatly improved, but it is also important to examine the impact of continuous monitoring on human resources. If the system worsens the efficiency of human resources and generates additional errors, the use of systems should be carefully considered in terms of controlling and strategic management. The consequences of management decisions that are not only of a human nature, including hidden and long-term costs, can be anticipated. The quantified costs and benefits can be communicated to management in financial language, facilitating decision-making.

Benchmarking and related human controlling is not a method but a strategic process: integrative, evaluative thinking and calculation to assess human policy decisions, including their economic and social consequences. It is a tool that helps to achieve rational, cost-sensitive human resource management at company level.

We use our precisely defined metrics system to measure the use of resources for management, providing continuous feedback to management on changes. Many of

its benefits are also reflected on the controlling side in various related functions such as developing a compensation strategy that ensures competitiveness in the labour market and contributes to employee incentives, headcount management, reporting systems, job analysis, planning, evaluation, or the assessment of training and development opportunities.

Analyses are also necessary from an accounting point of view, and detailed cost-benefit analyses can be carried out to offset decentralisation in human resources policy work.

The difficulty in implementing and measuring the human resources studies used by the organisation is because human resources management contributes only indirectly to the value creation processes of the organisation, as a so-called supporting activity. Everything can be measured; it is just a matter of finding the right (measurement) indicators.

The advantage and strength of such a system is that it has a modular structure, storing all the information related to employees in its database. In addition to the employee's personal data, it is possible to register his/her qualifications, certificates, competences, career history and management experience. The system can also be used effectively for motivation and career planning. It includes a competency-based performance appraisal module which supports but does not replace the performance appraisal interview. Using the results of the Human Performance Evaluation module, the system can be used to build aptitude and skills profiles, provide appropriate training, but also as a basis for individual career planning.

It is a challenge for companies to integrate the human IT-systems they use, in many cases the systems operate in isolation from each other. Data is entered manually, from one system to another, without pre-screening, as everyone assumes that the data has been checked on first entry. Unfortunately, in many cases this is not the case, so incorrect data can generate a lot of noise in end-user systems.

Increasing the integration of IT-systems contributes to the development of new business capabilities. Companies will be able to make better decisions with greater accuracy and more options to choose from, and to formulate strategies that are better aligned with market trends. As the IT integration of individual companies and supply chains increases, the integration of markets is expected to increase. Firms without access to information will be at a strong competitive disadvantage and will be driven out of the market. This type of market dynamic leads to a reduction in the number of players in each industry.

IT-solutions for human resource management and the impact of Industry 4.0
According to a paper by Judit Nagy (Nagy, 2019) in Management Science, referring to a publication by Rüssman and colleagues (Rüssmann, Lorenz, Gerbert, Waldner, Justus, Engel, Harnisch, 2015), nine technologies have been collected that characterise the leading companies in this fourth industrial revolution. Let's not forget that the labour market - and the human domain itself - feeds on the same medium, whether we are talking about state-owned enterprises, public administration, or the competitive sector. The article also mentions the technical tools and organisational methods:

- 3D-Printing – Additive manufacturing,
- Augmented reality,
- Autonomous robots, vehicles
- Big data analysis,
- Cloud services,
- Cybersecurity,
- Horizontal and vertical systems integration,

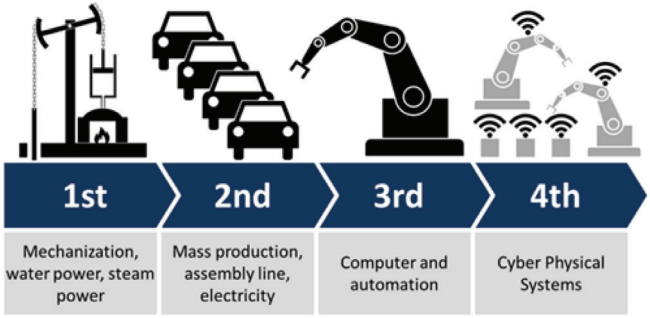
- Industrial IoT (IIoT), (CPPS),
- Simulation.

If we look at the characteristics of the different business objectives, based on Attila Chikán (2008), business is a human activity that aims to satisfy consumer needs while ensuring profit and wealth creation.

Its organisational framework is the enterprise, which operates within a legally delimited structure, carrying out the processes and activities necessary to achieve its purpose. If we look further at the set of objectives and means, we see similarities there too. Although the concept or ownership structure is different, the objective is similar. The human resources area is developing accordingly, for example by introducing and using cloud computing solutions or by analysing and integrating systems to serve the needs of individual employees in addition to the specialised areas of work, while also striving for cyber security.

Before accepting the technical achievements of the fourth industrial revolution as a fact, it is worth looking behind the processes that have given rise to this technical and IT background. Edina Erdei, in an article published in Acta Carolus Robertus (Erdei, 2019), entitled *"The evolution, use and challenges of Industry 4.0 today"*, writes about the precursors that have enabled the application of these modern technologies in production, trade, or even in logistics and supply chains, which have meanwhile become a major industry.

Table 1: The impact of successive industrial revolutions on production



Source: www.cnc.hu

Results and discussion

In connection with this, I started my own research, which I hope will provide sufficiently well-founded answers in relation to company performance evaluation. My aim is to collect both qualitative and quantitative answers. The currently ongoing research, which is based on a complex questionnaire, tries to shed light on the internal structure, IT, controlling and HR capabilities of the surveyed companies. We put a lot of emphasis on personal opinions, as well as on the circumstances of the respondents, on getting to know basic information about the nature of the companies.

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

The structure of the research is relatively strict, as it consists of mandatory answers, and where possible, the Respondent participating in my research can make a detailed assessment that is characteristic of it.

Thanks to this consistent structure, we get quality answers, so based on the set and filled in questionnaires, we get a comprehensive picture of the given organization. We also paid attention to the fact that, in addition to assessing the interviewee's environment, we also get to know their opinion, and in a free-text block we gave them a way to express their own thoughts regarding the performance evaluation system.

At the end of the research, we prepare a comprehensive report on the results. More than 30% of the respondents so far claim the results, which indicates the relevance of the questions.

Controlling – The implementation of monitoring

In the application of the control function in the Controlling organisation, the controller needs to know the long-term capabilities of the company, i.e. the conditions under which it can perform the tasks defined in the strategy.

This now includes a digital strategy, which takes advantage of digital technologies - also pointing the right direction - and allows managers to see, understand and manage digital opportunities, assess their progress, possibly even modifying them. (Ross et al., 2017). Controllers must play a proactive role in identifying digital opportunities and managing appropriate changes to business models and organisational strategies. Also for these reasons, they need to develop and adapt not only new KPIs, but also flexible management approaches (e.g. a system of objective and key performance indicators), new portfolio techniques, combining traditional and digital business models.

Consequently, traditional capital budgeting or investment control approaches may prove insufficient in the context of exponential growth. Possible research questions in this area are: to what extent and in what ways do digital business models differ from and influence strategy implementation and its monitoring, and what kind of management or control systems can be applied in the digital context. How are planning analytical methods being used and how are they influenced?

Where the IT foundations are in place, the majority of companies have already implemented data analytics and automated forecasting. These solutions, which use - or combine - time-series techniques and machine/deep learning with simulation. The main challenge is the selection of the right tool itself and, more importantly, the right combination of "*man and machine*" in the application process. The Coronavirus has made it clear that a combination of human judgement and business acumen, combined with a wide range of data and technology, is key. Full automation is only likely to be effective in niches with clearly defined and understood processes. Possible research questions include: what will be the impact of specific digital techniques on specific financial processes? How can planning drivers, forecasting and simulation be identified, used, categorized, analyzed and optimized? How can the interaction between "*(man and) machine*" be designed? What behavioural biases can be mitigated and what behavioural biases can arise from the use of digital technologies?

The Reports answer the questions, but if the input data is wrong, then obviously the result will be wrong or incorrect - as we so often say, relevant and correct data from a reliable, secure database should form the basis for any decision. The creation and maintenance of such a 'single source of truth' is a fundamental responsibility

of controllers, but one that is increasingly being questioned by data scientists and other IT professionals. In a WHU digitalisation pulse check, (Schäffer, Weber 2018b) it was perceived that only 50% of data officers in larger German companies are finance (CFO) or controlling managers. In other words, in half of the companies, the person who is ultimately responsible for data quality does not report to the person who is typically the company's sole source for financial data and their interpretation. In addition, new information routines may lead to a more decentralized, self-service reporting and decision-making environment, which may change the nature of control and the role of auditors. The use of chatbots and other robotic process automation techniques can lead to efficiency gains, but require robust governance.

"The challenges are many, as are the research opportunities: what are effective digital reporting designs, processes, structures and management systems? What are the prerequisites for self-monitoring and self-reporting solutions? What are the behavioural problems that arise in digital reporting? How does a self-service reporting system impact managerial decision making and how does it affect the relevance of the audit? How do companies manage data management?" writes the trio of authors Möller, Schäffer and Verbeeten in their publication (Möller, Schäffer, Verbeeten 2020).

Digital opinion making

In most organisations, there are two types of individual evaluation, informal and formal. Informal appraisal is based on the thoughts and opinions of managers, who are always thinking about how each employee is performing.
However, this form of evaluation is highly subjective, as it can be distorted by personal relationships, individual cultural tastes and differing political views, so it is not advisable to rely solely on it.

Increasingly precise and sophisticated methods and techniques are being used to measure the performance of organisations, their managers and their staff. The Performance Evaluation System (PER) is an important part of performance management, one of the youngest branches of management and leadership science and skills. Managers need to be familiar with performance appraisal techniques in the first place, since they have to appraise their staff almost constantly, just as they are constantly appraised by their own bosses and informally by subordinates. If we look at the IKEA method (Babovic, 2013), we start with the basics to assess individual performance. The enhancement of motivation starts with the one-year development adventure programme, including travel opportunities, a greater emphasis on leadership responsibility, on which the incentive scheme is based.

The performance management system is a means of achieving predefined performance based on planned strategic, tactical and operational objectives and levels within an agreed framework. Performance is always the result of some activity and consists of qualitative and quantitative elements related to the achievement of the tasks assigned by the organisation. As we can see down, in Table 2, a number of external and internal circumstances affect the possibilities for accurate measurement.

Today, performance improvement is part of a system that combines incentives and remuneration, competence development and quality assurance. It is no coincidence that performance management in organisations, for example, involves many people within a company: departmental managers, human resources specialists, internal and external management consultants. In larger companies, a separate department deals with all aspects of performance management. A book on business economics (Chikán,

2017) also covers the topics of motivation, remuneration and incentives, which is fundamentally reshaping human resource management and bringing these modern functions to the fore, now with the powerful help of IT-solutions.

The main general objectives of appraisal are not only to assess the performance of managers and employees, but also to provide a basis for the allocation of remuneration and a basis for promotion, transfer and dismissal.

This is why the basic questions of the system need to be answered at the time of its introduction, not only the purpose for which the appraisal is used, but who, what, by what method, what is considered performance and how it is communicated.

For many decades, individual performance was evaluated almost exclusively by the employee's line manager.

Once or twice a year, the manager would sit down separately with the subordinates and give his/her opinion on the employee's performance and, in principle, the employee being evaluated would also have the opportunity to give his/her opinion, explain the circumstances and justify any below-expected level. Although in most cases individual performance appraisals are based on specific indicators, it is not usually possible to ignore (in the short term, of course) so-called private factors that affect performance, such as illness or the death of a close relative. The emotional intelligence required of managers should not be abused, i.e. private factors should not be invoked too often.

Table 2: The impact of successive industrial revolutions on production

Table1: The environmental factor and measurement opportunities of the human controlling the human with the help of the measurement system of a performance*			
Environment			
Outer		Inner	
Factors	Factor's elements	Factors	Factor's elements
Sociological	society the development of his combination, an economy, environment and health care, family, values,	With workforce substance related factors	the quantitative, qualitative change of staff numbers, substance
Technological, technical	the design of an expected qualification, the development of production cycles, products,	The features of the wage-system	wage-level, allocations, fluctuation
Economic	union, investments, competition, cheaper, inpouring workforce	The features of training systems	new, qualified you are the training of existing ones, life-long-learning
Political	a government's social politics, multinational company companies' behaviour, Transzatlanti relation, EU markets' situation	Informational systems	IT the size of a support, his character, his combination

		Protections of interest, trade unions	their role, their strength
		Workplace atmosphere	satisfaction with the aims, knowledge, information, from measures, decisions, a responsibility
Measurement opportunities:			
Staff number combination	arrangement	qualification	the character of working hours, employment
The efficiency of expenses with a personal character	Human resource management expense	proportion the rotatory velocity of human costs	net production value pro a personal costs
Additional opportunities	human cost pro person	fluctuation	organizational efficiency, intellectual capital

My own editing
Source: The Author's own editing

The results of performance appraisals have many consequences. In both positive and negative terms, it affects, among other things, salary, bonuses, training and promotion opportunities, as well as performance targets for the following period. Results-oriented appraisal is an important feedback for the employee. It is not the concept of performance itself that is new in the public sector, but rather how it is measured. What to measure? How do we measure education performance? By student outcomes, enrolment indicators, etc.? For example, a civil servant performs well if he or she meets deadlines, deals with customers' problems impartially, is efficient, economical, etc. Performance also includes other data such as the number of accidents, absenteeism, punctuality, etc. However, it is now accepted that it is important to set precise performance targets for employees in the public sector and to monitor their performance.

The law no. CXXI of 2006., which - in Hungary - provides the legal basis for the performance evaluation system of civil servants (Wolters Kluwer, 2019), as well as Government Decree 301/2006 (23.12.2006) on the rules for performance evaluation and rewarding of civil servants, which aims to build an efficient and effective, service-oriented, customer-focused state are the basis of the performance evaluation system (PER). It clarifies the expectations civil servants need to meet, identifies individual performance and establishes an incentive system to match it. In doing so, it increases open and cooperative working relationships and the level of satisfaction of civil servants.

This could be facilitated by the so-called 360-degree appraisal method, which, although time-consuming, involves few subjective elements and is used by many companies today. By choosing the right IT solutions, the 360° method, not only offers the best practice, but can also be customized. Everything from running a simple performance evaluation through an agile project evaluation to an anonymous management evaluation is available.

The idea is that a person is appraised not only by his/her boss but by all (or part of all) those with whom he/she has a working relationship. The appraisals received are then used by the line manager and/or the HR department to compile an

annual appraisal, which is discussed with the employee. This thorough and highly objective performance appraisal technique takes a lot of time (especially at company level), but it is worthwhile because it evaluates many aspects, answers many questions and is virtually untamper-proof. It also provides certainty and clarity for those being evaluated.

There are many publications dealing with the various areas and possibilities of controlling, which today must be an integral part of the daily life of a modern company. The world economy is moving forward amidst many challenges, with the powerful help of IT, while the changing world order, scarcity of raw materials, local wars and epidemics are presenting ever new challenges. Now, it is in this uncertain and ever-changing landscape that controlling performs its planning function, providing a comprehensive view of the decision making process, helping managers to make informed decisions. It is precisely this planning system that has been overturned in the last few years. We have accepted the version of long-term decisions being made beyond the year, and short-term decisions being made within the year, when new challenges such as epidemics, changes in the product structure of industry, or supply chain disruptions due to global raw material shortages emerged.

This completely rewrote the controlling calendar. We draw conclusions on a monthly basis until the quarterly decisions are taken, and in parallel we rewrite and adjust our expectations and options for the year.

Adapting the controlling organisation to the new situation

As regards the preparatory activities, it is important to mention that other departments are also involved in this work, such as portfolio management and human resources.

The portfolio area helps to prepare in a standardised way the management decisions that the different areas of the company want to achieve in management. The human resources area does not only exercise control over its own activities, but also tries to coordinate this task by focusing on performance measurement for the whole organisation. My own experience suggests that organisational managers are more likely to produce business-case material, plans and concepts than to assess the actual performance of colleagues under their own management.

Yet let's separate what performance evaluation means from the point of view of employees, and what other economic performance is the subject of evaluations and measurements that controlling can carry out. From other economic indicators, such as various calculations of the return on planned investments, or savings on operational costs, there are many measurement possibilities to assess real performance. All this can be expressed in numbers, values and amounts of money, for which economic IT offers a number of new methods. These BI solutions present results, ratios and trends in a very attractive way, thus contributing to the efficient monitoring and controlling of the business, not to mention the fact that they are communicated in an easy and understandable way to decision-makers for a correct analysis of the situation.

Better late, than never to analyse

During the first year of the epidemic, I worked as a consultant or project manager in two different organisations. One of them was in the transport and logistics sector, where we were working with POWER BI on a daily basis, having already learned its mysteries. The other large company, which is state-owned, was just starting

to implement this system, so the setup, interpretation and training that went with it was a major task for my colleagues. Why is this interesting? It is to give a sense that every company that wants to do business today is strengthening the analytical and controlling area, whatever part of the company it is. In the context of management decision making, decision makers want to see exact numbers and trends. And making decisions, for better or worse, is now up to business analysts. If you look at a project, not even a good chart is enough, you have to be able to win over the leaders, because it is trust and belief that will vote for implementation, that will allow you to get going.

Analysis, the analytics area, while not a decision making function, has a significant value-adding role as a management decision support organisation within today's corporate hierarchy.

For example, when assessing different projects, portfolio management helps to ensure that the company does not start a project or devote resources to a requirement that does not bring business benefits or value to the company. It is worth mentioning here that possible organisational turnover is not good in these cases, as in the end there will not be the right person who was involved in the process from the beginning, making the implementation opaque and costly.

Analysis in itself, whether it concerns requirements or methodology, is not a magic bullet, so quality data is needed alongside good experts. From practice comes the statistical adage that if bad data go in, bad results come out. In many cases, you literally have to put together from little mock-ups and cubes what should go into the report.

I have also received on more than one occasion data from various areas that was unsuitable both for data integration and for independent presentation in a strategic document preparing or supporting a decision.

I used to say that administration is always very important. If the business is not going well, - sooner or later you will be asked why it is not going well - so it has to be documented. And if it does, it is because we will not be able to keep track of who we promised what, where we are at a particular moment. So it makes a difference what we record, what we monitor, what we summarise and, above all, in what context and with what opinions we send this data, in other words, it is the context that matters. *"In turbulent environments, value analysis should be used for important and complex problems!"* reads the book Decision Support Accounting - Clear and Entertaining, by Ágnes Laáb. (Laáb, 2016)

This is where the Business Analyst position, so sought after today, comes in, able to use and apply snippets of data to produce a complete, forward-looking material. If you look at the job advertisements, more and more companies are looking for business analysts, in different industries, in different fields.

And business IT has seized the opportunity, as several serious software companies have entered the market with products that look *"out of the box"* but can be tailored to the desired profile, helping companies to understand the realities and make decisions.

With these useful tools, we can see the time and cost constraints on projects, adhere to them, or even intervene in time if periodic reports show deviations from plans.

Conclusion

The dimensions of KPI performance indicators that underpin organisational and strategic effectiveness are defined by the human digitalisation systems that are part

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

of Industry 4.0, which support both evaluation and controlling tasks. They can be used to draw all the conclusions and prepare all the decisions that are now an indispensable part of an organisation's human resource management and planning functions.

In conclusion, the existence of adequate information and information systems will become a key issue for the survival of the company and market shares in the future, including the evaluation of human resources management and, within it, the performance of individuals, whether public or private, in order to be able to compete in the same market conditions.

Table 3: Company benchmarking – HR controlling

Company benchmarking - HR controlling*								
	Ownership	**Legal form**	**Staff**	**Main activity**	**ERP**	**HR modul**	**HR partner**	**HR monitoring**
1	private	Co.Ltd	150	car dealer	yes	"Island"	no	no
2	private	Co.Ltd	10	factory owned car importer			no	
3	state-owned	Inc. State-o.	37000	railway			yes	
4	state	State admin	1500	real estate, logistics, fleet			no	
5	private (stock ex)	Co.Pte	7000	logistics, fleet			yes	
6	state-owned	Inc. State-o.	1700	lottery			yes	yes

**my own experiences in the last 8 years*
Source: The Author's own experience

The need to measure the performance of public service provision and of state-owned enterprises and economic organisations must be an element of the system and must take into account both efficiency and effectiveness. The performance of the public sector must be measured on an ongoing basis to ensure that the objectives set by economic policy and government are well prepared and justified, that the achievement of the objectives can be measured, and that the means of ensuring the conditions can be adjusted if necessary to achieve the expected results.

The need for performance measurement is also underpinned by the fact that measuring government performance enables decision-makers to produce evidence-based background material and impact assessments, as indicated by indicators, which measure, analyse and present the dynamics of change over time, thus providing a basis for decision-making.

The two main factors analysed in relation to business performance are efficiency and economy. Many other performance indicators can be derived from these two factors. The performance of an organisation is the sum of the performance of its employees, so measuring the performance of individual employees is essential to ensure effective operation.

Bibliography

1. Babovic M. (2013) IKEA HRM [online] [cit: 2021. 04. 03.]
2. Belyó P. (2019) A HR controlling feladata, képletei [online] [cit: 2021. 04. 04.]
3. Chikán A. (2005, 2008, 2009, 2017) Vállalatgazdaságtan, Közgazdasági és Jogi Kiadó, Aula Kiadó
4. Erdei E. (2019) Az Ipar 4.0 fejlődése, használata és kihívásai napjainkban, Acta Carolus Robertus, 2019. 9 (1) pp 49 – 63, [online] [cit: 2022. 03. 02.] DOI: 10.33032/acr.2019.9.1.49
5. Felméry Z. (2015/1) Megkövetelt teljesítmény? Közgazdász Fórum OSZK [online] [cit: 2021. 02. 12.]
6. Gonda Gy. (2019) A teljesítmény, az értékelés, mérése – technikák, Az Üzlet [online] [cit: 2021. 02. 12.]
7. Hegedűs Sz. – Molnár P. (2019) Közüzemi vállalatok gazdálkodása NKE [online] [cit: 2021.11. 28.]
8. Horvath P. – Partners (2015) Controlling, Út egy hatékony controllingrendszerhez Budapest, Wolter Kluwer Kiadó ISBN 978 963 224 940 7
9. Karoliny M.né, – Poór J.(2010) Emberi erőforrás menedzsment kézikönyv 5. átdolgozott kiadás Budapest, CompLex Kiadó
10. Laáb Á. (2016) – Számviteli ismeretek – Érthetően, szórakoztatóan, Wolters Kluwer Budapest, ISBN / 9789632955889
11. Möller K. – Schäffer U. – Verbeeten F. (2020) Digitalization in management accounting and control: Journal of Management Control 31:1–8[online] [cit: 2022. 02. 21.]
12. Musiszinszki Z. (2012). Kontrolling alapjai. Oktatási segédlet. Miskolc: Miskolci Egyetem. [cit. 2022.10.15]
13. Nagy J. (2019) ¬ Vezetéstudomány / Budapest Management Review L. ÉVF. 2019. 1. szám/ ISSN 0133- 0179 DOI: 10.14267/ [online] [cit: 2021. 11. 28.]
14. Németh E.– Szikszainé Király M. (2020) Állami Számvevőszék Elemzés Budapest [online] [cit: 2021. 02. 12.]
15. Poór J. (2016) Menedzsment-tanácsadási kézikönyv 4. bővített, átdolgozott kiadás Akadémiai Kiadó Budapest
16. Ross, J. W., Beath, C. M., & Sebastian, I. M. (2017). How to develop a great digital strategy. MIT Sloan Management Review, 58(2), 7[cit: 2022. 02. 03.]
17. Rüssmann, M. - Lorenz, M. - Gerbert, P. - Waldner, M. - Justus, J. - Engel, P. - Harnisch, M. (2015): Industry 4.0: The future of productivity and growth in manufacturing industries. Boston Consulting Group, 9. [cit.: 2017.07.19]
18. Schäffer, U., & Weber, J. (2018b). Der Controller verliert die Kontrolle. Frankfurter Allgemeine Zeitung, 16, March 26. [cit: 2022. 10. 15.]
19. Sütő D. (2017). Controlling fejlődéstörténete, helye és szerepe a gazdálkodó szervezetekben. International Journal of Engineering and Management Sciences (IJEMS) Vol. 2. (2017). No. 4. DOI: 10.21791/IJEMS.2017.4.37 [cit: 2022. 10. 15.]
20. Szőke B. – Tóth E.I. – Vanó P. (2022) The links between Human Resources Management and corporate and Human Resources strategy Acta Carolus Robertus, 12(1),85–95. DOI 10.33032/acr.2878
21. Vakhal P. (2022) Újraosztják a lapokat a világon: itt vannak Magyarország erősségei és gyengeségei, Portfólió [online] [cit: 2022. 02. 03.]
22. Veresné, Somosi M. – Hogya O. (2011) A teljesítménymenedzsment, Digitális Tankönyvtár [online] [cit: 2021. 02. 12.]

23. Wolters Kluwer jogtár 89/2019 (IV.23) sz. Kormányrendelet [online] [cit: 2021. 02. 12.]
24. CreativeHRM [online] [cit: 2021. 04. 03.]

Correspondence address:

Zsolt Barna Ph.D. Student, GRTDI Doctoral School of Management and Business Administration, University MATE, Gödöllő, 2100 Páter Károly u. 1. Hungary, email: *zsbarna007@gmail.com*
ORCID: https://orcid.org/0000-0002-8844-0363

COMPETITIVENESS OF THE VISEGRAD FOUR IN THE INTERPRETATION OF THE IMAGE OF HEALTH

Beatrix FARAGÓ

Research Centre, Alexandre Lamfalussy Faculty of Economics, University of Sopron, Sopron, Hungary

Szabolcs CSISZÁR

István Széchenyi Doctoral School, University of Sopron, Sopron, Hungary

Received: 02. May 2022 *Reviewed: 19. June 2022* *Accepted: 30. June 2022*

Abstract

The Visegrád countries have many similarities due to their similar historical past, cultural similarities and territorial proximity. Poland, the Czech Republic, Hungary and Slovakia are the countries of the Visegrad Four, which follow different development paths. The foundations of the cooperation of the Visegrad Four present the goals in which they can jointly increase their economic and social competitiveness in the European Union. Health and its determinants are an outstanding area of society, which also affects the economy, and plays a prominent role in global competitiveness. The theory of the study points to these standard directions, the development indicators of the V4s, which determine their current positions. The aim of the research is to present the health picture of V4 large and medium-sized cities in comparison to a medium-sized city in the Visegrad cities, thereby establishing a ranking between them. The methodology of the study is, on the one hand, secondary data analysis of the statistical central database of large cities, and on the other hand, primary research on the assessment of the health picture of the central city level. The results of the study indicate which of the V4 cities are at the top, and what ranking can be established in the Visegrad Four cities in terms of health status. In terms of health competitiveness, none of the big cities reaches the level of the developed member states of the European Union, but the ranking of the V4 cities among themselves can be demonstrated based on the health indicators.

Keywords: *V4 countries, image of health, healthy city, Visegrad Four, competitiveness*

JEL Classification: I15; I38; A13.

Introduction and theoretical background

The importance of the cities is increasing globally, thanks to the economic and social centralization of the infrastructure. Due to the concentrated industrial and economic services, the growing population is gaining an expanding role. One

motivation for those moving to cities is a higher quality of life by taking advantage of the opportunities. Quality of life can be measured using socio-economic indicators such as income, health status, technological infrastructure, education system, public safety or the approach to ecological problems. From this approach, cities achieve a high level compared to smaller settlements. In the study, among the factors affecting the quality of life, we deal with the field of health and health infrastructure, which is a determining factor in determining society's standard of living. (Majerová, 2019) The development of the socio-economics is an integrated process, as it affects other sectors as well. (Christian et al., 1977)

WHO (2016) expressed that the material capital invested in healthcare positively affects the economic processes. The key to the socio-economic development of cities is the quality of health. There is a close connection between economic development and the population's health status. (Semyonov et al., 2013) Health, like education, is the foundation of human capital and determines economic development. (Bloom, Canning, 2003) Socio-economic development always involves changes, and new challenges arise, including the growing population, economic challenges, and following international trends. Smart city concepts, resilient reactions, sustainability and a healthy lifestyle, appear in the responses to emerging needs. The economic competitiveness of the Visegrád 4 has already been examined with several indicators, which included more hard economic indicators, the social and health situation as a factor of competitiveness was presented less. (Molendowski, E. & Folfas, P. 2019)

The literature base of the study presents the political background of the Visegrad Four to make visible the historical and cultural background that makes the cities of these countries comparable. The socio-demographic data of the countries and cities of the V4 are exhibited, and then the importance of the role of the cities and their development paths and methods are also presented. Scientists have already set up many models of the development of cities, and they are being investigated in different directions. We have to examine the development dynamism of cities in a complex way since all innovative methods affect the socio-economic environment. The society's state of health shows the social and economic conditions; we can infer the development trends. The health behavior and the health image of the inhabitants of the cities also show the quality of life; therefore, our study is a guideline for the socio-economic indicators of the region.

The political background of the Visegrad Four

Visegrad Declaration began its more than 30-year history on February 15. 1991, with the participation of Poland, the Czech Republic, Hungary, and later Slovakia. The similar regional features and economic situation predestined the development of common goals. The advancement of the market economy, the assertion of European political interests, and the striving to catch up with Western Europe also played a role in regional cooperation. With the states' accession to the European Union, the designation of the development path was directed in the direction of the regional community of interests, contributing to the development of economic relations and cross-border cooperation. With cooperation covering all economic, political and social levels, the Visegrád Four group wanted to become a defining and stabilizing player in the Central European region. The geographical-historical-cohesion cooperation is also called the Central European pole (Márky, 2018), which also appears as a brand name in political life, representing similar positions, such as migration. (Juhász, 2018) Within the framework of European integration, the role of the V4 is decisive, both because

of its territorial location and in terms of the territorial expansion of the European Union. (Figure 1)

Figure 1. V4 countries

Source: airportal.hu

The countries of the Central European region, the common objectives of the European Union, appear as an essential development pole in following the unified European directives, in which it is in the interest of the V4 to act together within the framework of European integration in the areas that are important to them for the sake of democratic development, the Central European strengthening the stability of the region. (visegradgroup.eu, 2022)

The cooperation of the Visegrád Group is characterized by the joint representation of its economic, diplomatic and political interests and the coordination of its possible actions. The V4 countries have territorially similar characteristics, but their territorial size and population are different; despite this, the similar past and cultural identity increase the concentration of power in the Central European region. (Figure 2)

Figure 2.
Demographic data of V4 countries

Country	territory	population	the length of the external state border/ km	national currency
	distribution, %			
Czech Republic	14,8	16,6	1279	CZK
Slovakia	9,2	8,5	204	EUR
Poland	58,2	59,5	2174	PLN
Hungary	17,5	15,4	1567	HUF

Source: KSH, 2018

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

The Central European spirit also reflects the intellectual and cultural harmony of the Visegrad Four, in which the V4 countries chose cooperation and the path of conflict mitigation instead of previous war situations and conflicts. (Martonyi, 2017) With the accession to the European Union (2004), the future orientation of the Visegrad Four was transformed since the states could not make independent decisions within the union. Nevertheless, this V4 created a strong common spirit-based representation of interests, which works with its system of ideas, referred to as the *"Visegrad idea"*. (Kiss, 2020) The essential point of view of the V4 states is that the member states also represent a specific policy, in which the assertion of their interests is highlighted. Their opinions may differ, and convergence is facilitated by summit meetings, where differences of opinion are mitigated. (Bauerová, 2018) Flexibility, Visegrad identity and diversity are decisive in characterizing the Visegrad Four group. The pandemic has once again transformed the V4's target system, and the dynamism of development is seen not only in the enforcement of regional interests but also in broader economic and social goals, such as economic and financial cooperation, energy and climate policy, space research cooperation, start -up's support, sustainability, environmental protection. (Szabó Szakálné, 2021) Based on economic indicators of competitiveness the economic performance indicators, Hungary's GDP per capita (based on purchasing power parity) of the V4 countries is 37,128 US dollars, that of the Czech Republic is 43,837 US dollars, that of Poland is 37,786 US dollars, that of Slovakia is 35,463 US dollars, while the GDP per capita of the European Union is 48,750 US dollars. Bulgaria has the lowest value in Europe, 25,914 US dollars, while Luxembourg leads with the highest GDP, 131,875 US dollars. (World Economic Outlook, 2022) Based on the data, the Visegrad Four are in the center field.

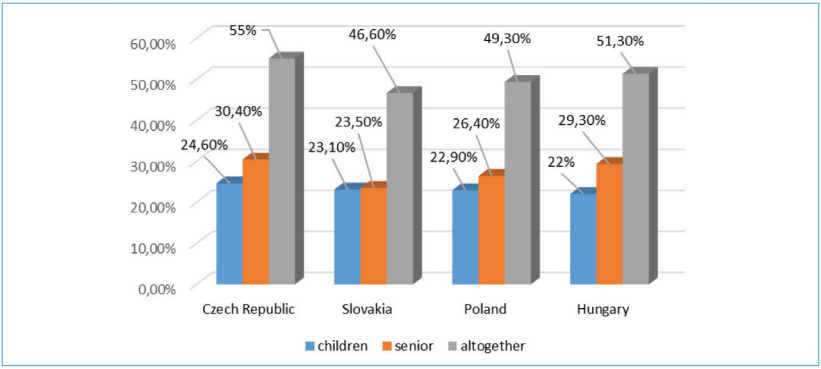
The health determinants of the Visegrad Four

For the health situation of the V4 countries, we took the most critical population and popular movement characteristics as a basis. The total population of V4s in 2020 was 63.9 million people. Poland leads the population with 38 million people, followed by the Czech Republic with 10.7 million inhabitants, Hungary with 9.8 million people and Slovakia with 5.5 million people. The indicators of population decline are higher in Hungary and Poland, while the Czech Republic and Slovakia achieved growth in population. Hungary's death rate is the highest among the four countries, and natural lessening is also the most significant. The balance of international immigration in each country has positive indicators, which shows the difference between those arriving and leaving the country. The age composition of the population reflects the historical past of the V4 countries. A similar political history is also reflected in the population. The regime change and the following periods followed the same path in the four countries. These historical threads appear in the core of the population, which have the same form.

The age group 40 appears most strongly, then the age group 60-64 follows and the proportion of children follows a downward trend. The median age supports the data for the V4 countries, based on which the median age of the population of the V4 countries is lower than the EU27 average. The proportion of people of active age is lower compared to the elderly, but compared to the proportion of the age group under 15, the number of elderly is also higher. In this case, these indicators of the inactive population are negative since fewer people represent the active age group. In this ranking, the Czech Republic ranks higher, followed by Slovakia. The numbers of Hungary and Poland are less oriented towards the positive phase. In Slovakia, there is almost the same number of children and older people per 100 active-age

residents, which means that Slovakia has a population with a balanced age composition. (Figure 3)

Figure 3 Dependency rates



Source: KSH, 2019

Hungary also has the leading role in the ageing index, as there are 133 elderly persons per 100 children, while in the Czech Republic, there are 123, in Poland, 115, and in Slovakia, 102 elderly persons. These numbers clearly show the lack of population supply. Regarding gender differences, an excess of women is typical among the elderly. The death rates show an upward trend in all four countries. One of the reasons for this is the age composition of the population, which indicates a higher proportion of older people. According to life expectancy at birth, the Czech Republic leads with 79.1 years, followed by Poland with 77.7 years, Slovakia with 77.4 years and Hungary with 76.2 years. The indicator of each country is significantly lower than the EU27 average. (KSH, 2020)

The cities of V4 in the competitiveness

As the proportion of the urban population increases, the role of cities becomes more remarkable due to economic and social concentration. Cities also play an increasingly significant role in the contribution to GDP, which in 2018 was more than 80%. (World Bank, 2018) The importance of cities is illustrated by the characteristics highlighted by the World Economic Forum, which are as follows. They own 2% of the land area, but about 50% of the population lives in cities, and cities are responsible for 75% of the world's energy consumption and 80% of CO_2 emissions. (WEF, 2016) For these reasons, they significantly influence industry, communication networks, and infrastructure. Due to the economic and industrial concentration of the cities, the residential population and services appear in a large proportion, in which the development mechanisms and the dynamics of development can be easily examined.

This trend can also be in reverse proportion; the more people live in a settlement, the wider the market spaces, so we can count on more functions and the appearance of organizations and institutions embodying them. (Rechnitzer, 2019) In territorial competition, cities face each other regarding investors, professionals, and infrastructure development. (Kézai, 2021) In this competitiveness, the development indicators and the place occupied by the cities in them are decisive in the territorial

competitiveness positions. The success of a city is determined by the innovation appearing in the area, the members of the creative class, the standard of living, and the economic development. The basis of the development of cities is the alleviation of inequalities, which requires social structural, complex interventions. (Szirmai & Fábián, 2021)

Competitiveness indexes of V4 cities

The development of cities is examined in the literature using several indicators. These include methods for measuring economic, social and innovation levels, whose indicator components include measures of health, economic and sustainability levels. Among the indices showing the development of the V4 cities, the resilience and the smart city index are presented below. The resilience index consists of three defining parts. The 1st is social resilience, which is the change in the number of the population, the ratio of people aged 0-14 compared to the total population, the ratio of the elderly population (over 65), and population density per person/km^2. Its second component is economic resilience, which is determined by the number of hospital beds, GDP per capita, Euro/capita, the number of students participating in higher education compared to the total population, cap/1,000, and the employment rate. The third indicator of the resilience index is environmental resilience, which means the number of days when the ozone concentration exceeds 120 μg/m^3, the built-up area per capita (m2/capita), and the size of green infrastructure per capita (m^2/capita). (Banica, Muntele, 2017) The measurement and determination of the indicators of the smart city (smart index) can be found in the databases of the Urban Audit (74 indicators) and the Urban Audit Perception Survey (278 indicators). The definition of indicators appears in 74 indicators (Giffinger, 2007); some define the smart index based on 28 indicators (Cohen, 2014), or Lados (2011), who considered 278 indicators important for determining the level of a smart city.

Summary based on the assessment of the smart index and the resilience indices, the following characteristics apply to the V4 cities.

Prague: It typically rests on a solid social pillar. It can be said that the city has a robust internal migration; one of the reasons for this may be that it is easy to find a job. (European Commission Report, 2015)

Bratislava is in fourth place in the overall indicators. The decreasing population can be said about the city. The employment rate is typically high, and the educational situation is outstanding compared to other cities. A dominant number of residents with higher education have adequate language skills. Large companies prefer it as an investment destination, making it easy to find a job. (European Commission Report, 2015)

Warsaw reached fifth place on the development scale in European countries. The city is densely populated, and they are vital in terms of the environmental component (e.g. low ozone concentration).

Budapest is at the bottom of the ranking. Based on the employment rate of recent graduates, it ranks 2nd among the V4 countries in the labor market assessment, with Prague and Bratislava in the first place. The proportion of people over 65 is typically high.

In the economic component, cities play a leading role in V4 settlements, which is contributed to by centralization. However, this does not mean a high value in terms of adaptability. (Figure 4)

Figure 4. Resilience and smart index values of V4 capitals and their position in the ranking

	Bratislava	Praha	Warsawa	Budapest
social resilience component	0,14 (4)	2,24 (2)	-0,64 (6)	-2,49 (10)
economic resilience component	5,66 (1)	2,58 (2)	0,27 (5)	1,17 (3)
environmental resilience component	-1,38 (8)	-1,82 (10)	0,37 (5)	-0,94 (7)
resilience index	1,47 (1)	1 (2)	0 (6)	-0,75 (8)
economic component	3,8	4,86	3,81	2,21
people component	5,18	3,39	2,44	-1,04
government component	-1,24	2,26	-2,71	4
mobility component	-2,89	4,4	2,1	-0,11
environment component	-4,55	1,15	-0,4	-0,56
quality of life component	6,29	2,66	-2,23	0,68
smart index	-1 (9)	2,37 (1)	0,5 (3)	0,86 (2)

Source: Author's editing based on Nagy et al., 2018

Material and methods

The main aim of the research is to assess the health picture of the four Visegrad cities in comparison with a medium-sized city, which establishes an order among the V4 cities. As a sub-goal, the research shows what differences can be discovered in comparison with a health-conscious city center. The survey examines the health awareness of the residents of V4 cities, their health and infrastructural opportunities in metropolitan and mid-city environments, which affects their health, standard of living, and quality of life. The research covers the health situation of cities, the quality of schools and health services.

The quality of life and the available organizational background influence the residents' lifestyle, but this also appears the other way around, since quality services increase the standard of living, and the health factor increases workplace productivity, contributing to the development of the economy.

In the researching the health picture of the Visegrad Four cities - Warsaw, Prague, Budapest and Bratislava - we used the Eurostat database, the latest statistical results of which are available for the year 2019, the member states according to the harmonized methodology for the European Union and the Eurozone, from which we filtered out the V4 cities and obtained the statistical data on the health picture.

The other direction of the research is the results of the primary health image research conducted in Győr, in the middle-sized city, which was prepared for the 2021 Health Strategy of the Hungarian organization of the WHO and the City of Győr County. The number of the primary research is 1803, which includes the health behavior of the people of Győr and the assessment of the health situation. The research methodology is an online questionnaire survey, which was evaluated with the SPSS statistical program. For this reason, Győr was also included in the survey of V4 cities as a medium-sized city and served as a basis for comparing large cities.

WHO The Healthy Cities program operates in 5-year cycles, it was launched in 1986, and for the first time 11 European cities joined the initiative in which

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

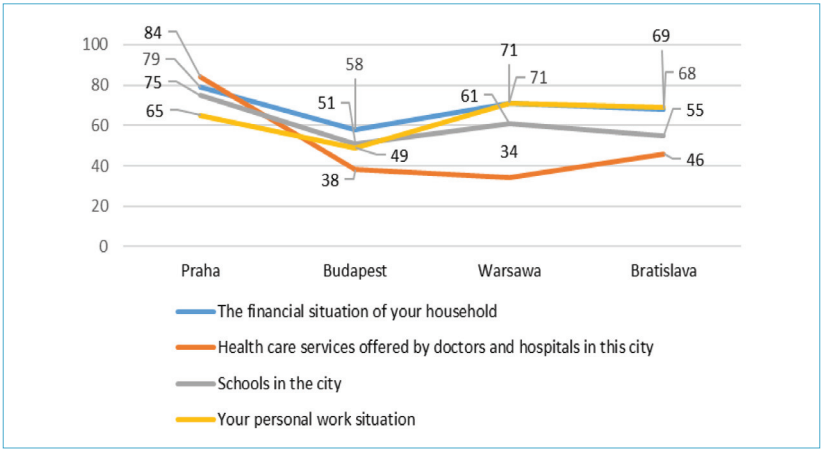
the urban sports concept is developed based on strategic goals. At the local government level, Győr is one of the prominent players in the program based on the local public administration system. Today, 1,500 European cities participate in the Health for All strategy.

Results and discussion

Results of the research

The research data provide insight into the quality of life and the factors determining the quality of life. In the Prague, Budapest, Warsaw, and Bratislava questions and the later health image research in Győr, the standard of living and the image of health are shown in cities based on similar territorial conditions. The presentation of the demographic data of the V4 cities is essential for comparison data. (Figure 5) Győr, as a central city, is included in the list, supplementing the capital cities and at the same time comparing it with a central city health picture, in which the similarities and differences in terms of quality of life become visible.

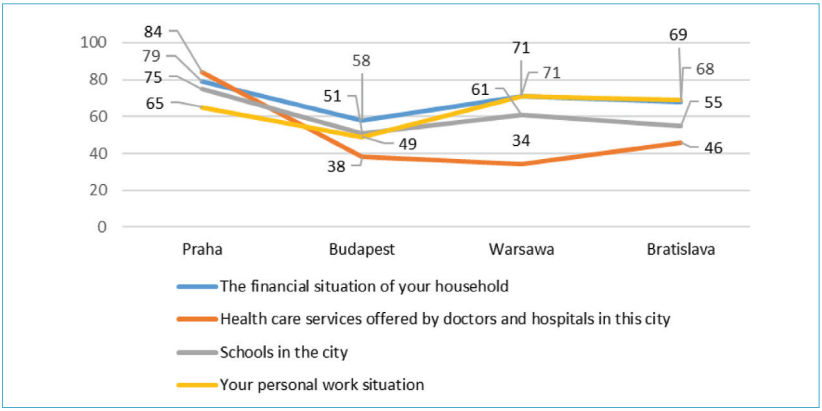
Figure 5. Demographic data of V4 cities (2021)



Source: Author's editing based on sts.gov.pl, slovak.statistics.sk, ksh.hu, hu.db-city.com

The determinants of the standard of living are the services, training, and working conditions that significantly influence the quality of life. That is why the financial situation of households, health services, schools and the workplace were examined. In V4 cities, residents were more dissatisfied with healthcare services than in Prague, while they were the most satisfied with the workplace environment. (Figure 6)

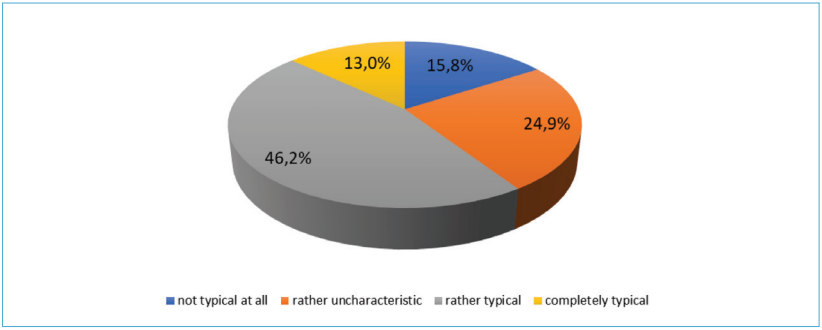
Figure 6. Satisfaction with the financial situation, services of doctors and hospitals, schools, and workplace (%)



Source: Author's editing based on Eurostat, 2019

Győr's health image survey (2021) examined the workplace environment, in which 46,2% of the city centre residents found a calm atmosphere at work as a determining factor in their quality of life. (Figure 7)

Figure 7. Workplace calm atmosphere

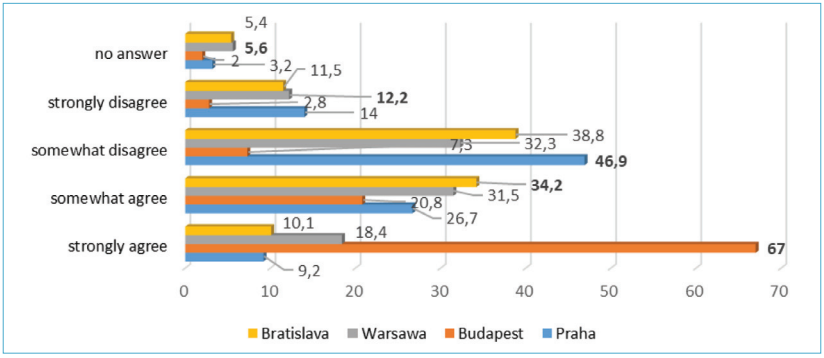


Source: Author's editing based on Győr health image survey 2021

Among the cities of the V4, Budapest showed an exceptionally high rate of poverty in the city, which also affects the living conditions of the residents; if they encounter much poverty, it also negatively affects their mental health and social care. Prague and Bratislava indicated fewer problems in the city, where poverty is not felt to the same extent as in Budapest or Warsaw. (Figure 8)

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

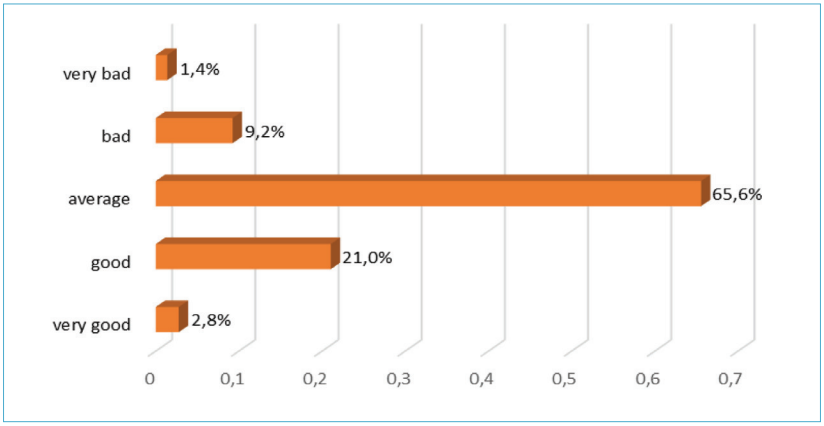
Figure 8. Poverty is a problem in the city (%)



Source: Author's editing based on Eurostat, 2019

In the Győr 2021 health image survey, based on the responses to their financial situation, the residents consider themselves to have an average (65,6%) financial level, which is slightly lower than in the big city. (Figure 9)

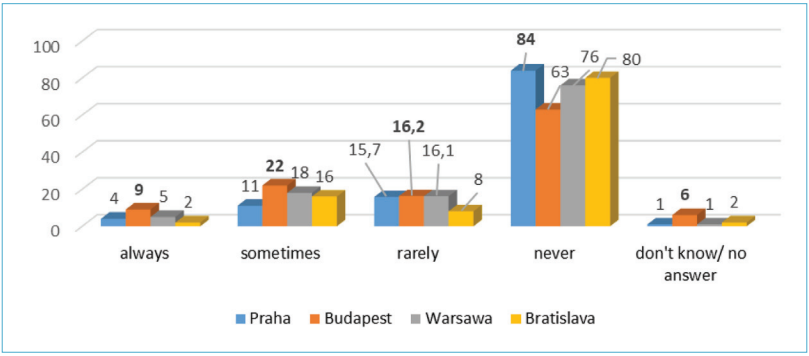
Figure 9. Assessment of the subjective financial situation



Source: Author's editing based on Győr health image survey 2021

In the context of the problem of poverty, the financial situation of households is also a critical attitude. City dwellers do not lack this. Regular payment of bills is not a problem in their standard of living. (Figure 10)

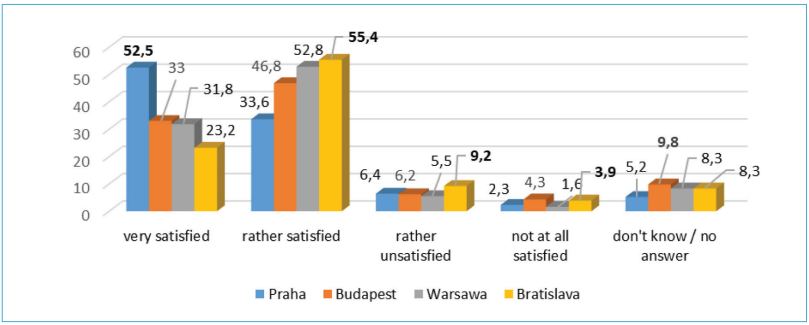
Figure 10. Difficulty paying bills at the end of the month (%)



Source: Author's editing based on Eurostat, 2019

Culture determines the social life of the population, the quality of which also affects living conditions and education. Prague (52,5%) and Bratislava (55,4%) indicated high satisfaction in this area. Both Budapest and Warsaw showed a high satisfaction rate in the field of culture. (Figure 11)

Figure 11. Cultural facilities, e.g. concert halls, theaters, museums, and libraries in the city (%)

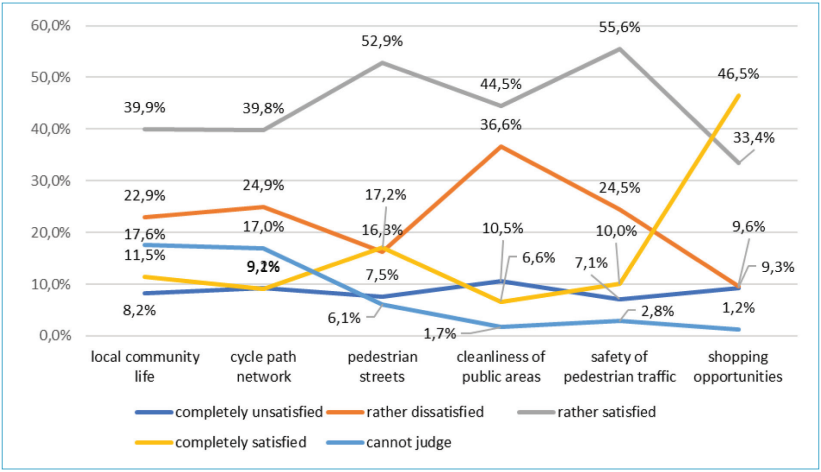


Source: Author's editing based on Eurostat, 2019

In Győr's health image assessment, social and community values and social capital represent the development path. Added to this is the infrastructure that provides the environment. The living environment, its services, infrastructure, and the possibility of leisure activities improve living conditions and quality. In Győr, residents are satisfied with social life (39,9%), safety (55,6%), and the number and quality of pedestrian streets (52,9%). (Figure 12)

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

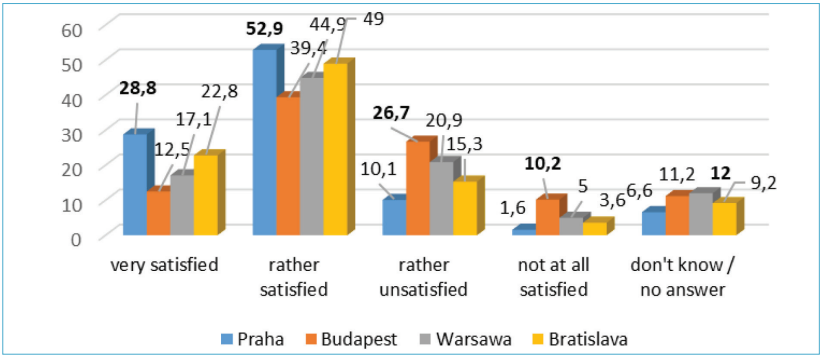
Figure 12. Residential environment, safety, community life, satisfaction with the cycle path network



Source: Author's editing based on Győr health image survey, 2021

The wealth of leisure opportunities shows the residents' healthy lifestyles and cultured leisure time. The basis for this is the availability of high-level infrastructure and specialists. Among the V4 cities, Prague indicated the highest satisfaction with leisure opportunities, but Bratislava was also 49% satisfied. Budapest is the most dissatisfied in this area, which is reflected in the percentages of the four cities. (Figure 13)

Figure 13. Outdoor recreation outside/around the city, e.g. walking, cycling or picnicking (%)

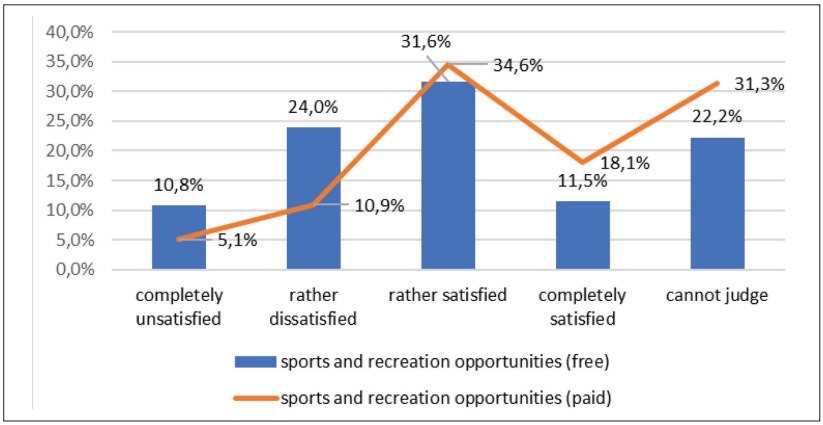


Source: Author's editing based on Eurostat, 2019

The sports infrastructure developments in Győr are outstanding at the national level. Despite this, the majority of residents (34,6-31,6%) expressed their satisfaction, but a large proportion of dissatisfied residents still exist. Public support

for this issue achieved greater satisfaction in the big cities. In the Győr survey, the availability of paid and accessible sports facilities is separated, in which the paid services slightly achieved higher satisfaction (Figure 14)

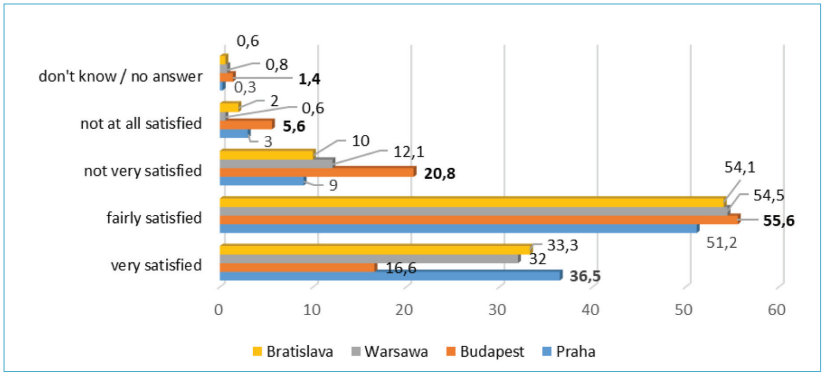
Figure 14. Sports and recreation opportunities



Source: Author's editing based on Győr health image survey, 2021

Budapest's lagging behind other cities is counterbalanced by the issue of satisfaction with lifestyle, where 56,6% of Budapest residents are satisfied. The other cities also indicated high indicators of a high standard of living. (Figure 15)

Figure 15. Lifestyle (%)



Source: Author's editing based on Eurostat, 2019

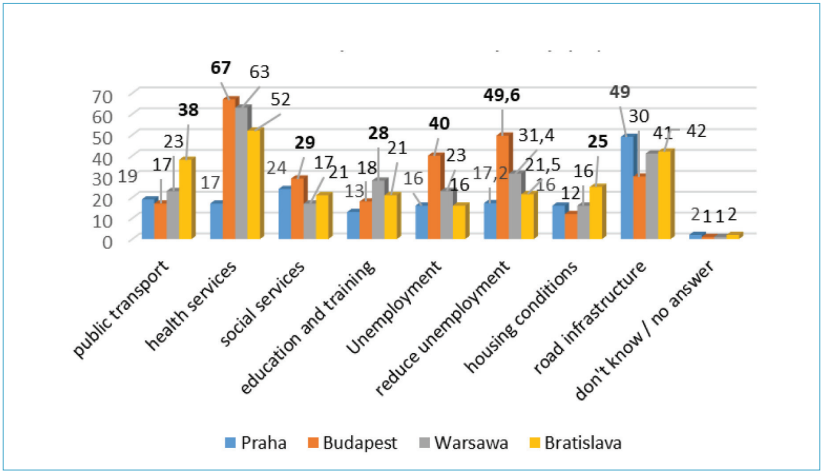
In the central city survey in Győr, residents showed high satisfaction with their living standard, development, and living environment (8 on a scale of 10), which are significant values (Chi-square 0.000). (Figure 22)

The availability and quality of health services are essential factors in the quality of life of city residents (Budapest 67%, Warsaw 63%, Bratislava 52%)

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

except for Prague (17%). According to the survey, the road network in Prague (49%) significantly influences their living conditions. In Budapest, unemployment reduction (49,6%) was prioritized, while in Warsaw and Bratislava (42%), the residents considered the road network (41%) to be the most critical task. (Figure 16)

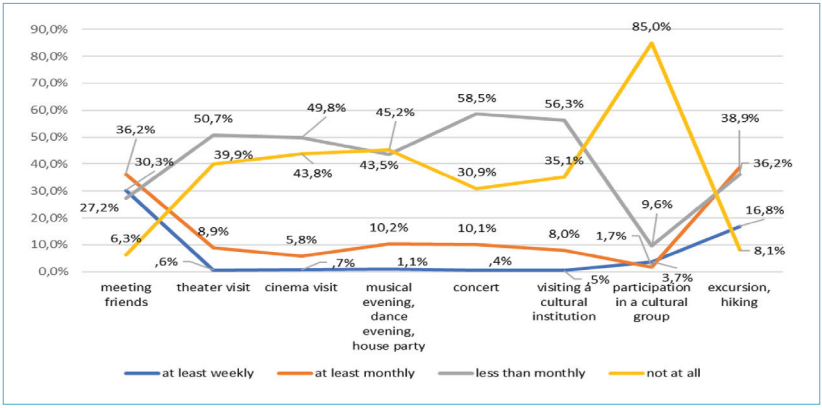
Figure 16. Most important in my city (%)



Source: Author's editing based on Eurostat, 2019

The standard of living is also reflected in cultured leisure time. Social life and participation in cultural life also appear as a factor in the identity of a local community. Among the residents of Győr, passive leisure is typical, which is also reflected in cultural life. Leisure and cultural activity is not intensive, as they participate in these programs less often than once a month (with an average of 50%) (Figure 17)

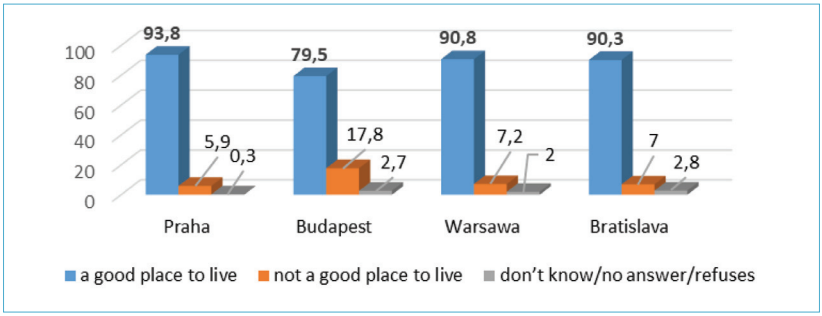
Figure 17. Leisure habits



Source: Author's editing based on Győr health image survey, 2021

The residents of the V4 cities love where they live and feel good. There are less visible differences in the opinions of the Visegrad Four, except for Budapest, where, although the rate is high (79,5%), it still lags behind the verdict of over 90% in the other three cities. (Figure 18)

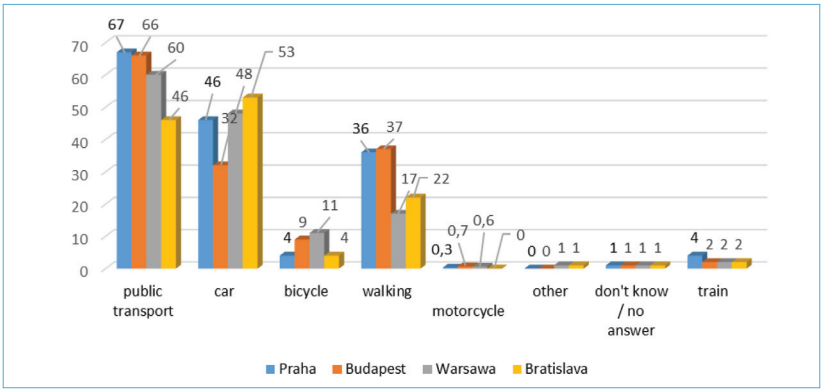
Figure 18. Residents' assessment of living conditions in the city (%)



Source: Author's editing based on Eurostat, 2019

Transportation and travel time to the workplace are also important issues in the quality of life. In the division of time, physiologically bound time (9-10 hour, sleeping, cleaning, eating), socially bound time (9-10 hour, studying, transport, family programs), free time, and transport is located in socially bound time, the measure of which also affects the length of free time. For commuters and people living in big cities, this can take several hours, which affects the quality of life. Public transport in big cities is generally favorable, but traveling by car is time-efficient. Even in big cities, real estate prices are an influencing factor, which also plays a prominent role in living conditions and distances to work. Residents of the Visegrád Four cities like and find public transport favorable, but it differs slightly from car transport. Pedestrian traffic also shows a high rate, in which further investigations suggest directions in the sample in the housing area. (Figure 19)

Figure 19. Means of transport to work/school (%)

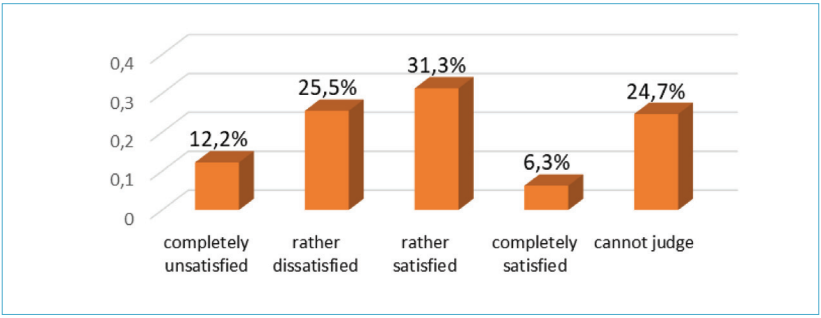


Source: Author's editing based on Eurostat, 2019

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

Public transport also appears in the Győr health image survey (2021) as the most popular form of transport. However, the public satisfaction reflected in this shows a mixed picture. The quality of this form of transport in the city center reached a medium level of satisfaction. (Figure 20)

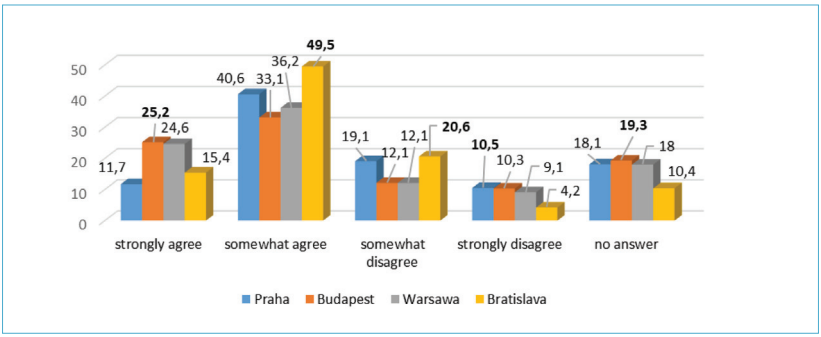
Figure 20. Satisfaction with public transport Győr



Source: Author's editing based on Győr health image survey, 2021

Urban identity appears in the plans of the population; they are optimistic about the future and somewhat agree that living in a city will provide a pleasant environment in the coming years. There are no significant differences between the four cities in this area. (Figure 21)

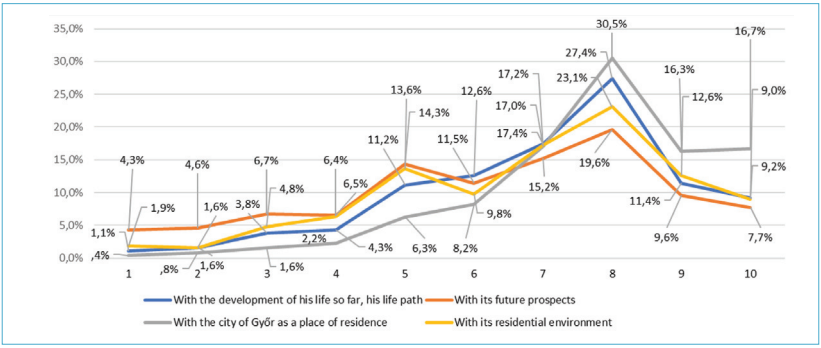
Figure 21. In the next five years, it will be more pleasant to live in this city (%)



Source: Author's editing based on Eurostat, 2019

Similar satisfaction with life in a big city can also be found in the middle-town level, as far as the vision of the future is concerned, since they are satisfied with the living environment (30,5%, the development of their lives (27,4%), living environment (23,1%), prospects (19,6 %) achieved a rating of 8 on a scale of 10. These indicators have better values in urban environments (Figure 22).

Figure 22. Satisfaction with the development of life, future prospects, and his living environment



Source: Author's editing based on Győr health image survey, 2021

Conclusion

A healthy lifestyle is of primary importance for cities in terms of economic and social development. To create healthy cities, to achieve sustainability and human capital productivity, the government's primary task is to embed this in a strategic goal system.

In the literary background of the study, the Visegrad Four and their historical and cultural similarities were presented, as well as the innovative factors of competitiveness, such as the smart index and the resilience index, which can be used to measure the economic and social development paths of these cities.

In the results of the research, the health picture examination defined in the research objective showed that in the "*four competition*" the cities are in order: Prague, Bratislava, Warsaw and Budapest, but based on the indicators, some countries provide outstanding performance in some areas. This result is the same as the descriptive analysis of the competitiveness of the Visegrád 4s. (Ivanova & Cepel, 2018) In V4 cities, residents are satisfied with their way of life, consider their health relatively good, and find favorable opportunities in the healthcare system. From the point of view of a healthy city, the more favourable results can be seen in the big cites of Prague and Warsaw, but the difference is not significant in the other cities either. From the point of view of Budapest alone, a lower value can be mentioned in several surveys, but the ratio is not exceptionally high.

In comparing the middle-sized city environment, which in this research is Győr, Hungary, the middletown received a less favorable opinion than the big city, even though the middletown sees health as a priority strategic goal. The availability of services and the size of the population influence the level of health care, but the priority strategic direction predestines the population's health image to create a higher quality of life. The limits of the study are given by the available data of the statistical database, in which it was possible to examine specific topics.

The indicators of economic development not only determine Central and Eastern Europe's competitiveness indicators, but as the literature analysis also pointed out, resilience, social and environmental development, and a healthy lifestyle, healthy

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

behavior and, with it, a health-conscious urban population also contributes. The specificity of the research was given by this health picture examination. The innovative development methods cover social values, and these indicators are becoming more and more potent since the economy can be increased by society and capital elements. Additional possibilities of the research include the creation of a validated questionnaire, in which the V4 large cities and the economically developed (western) large and medium-sized cities of the European Union could be assessed from the point of view of health behavior based on the same system of criteria.

Győr health image survey (2021) was prepared with the support of the WHO and the City of Győr.

Bibliography

1. Az egészségügyi rendszerek tipológiája (2014). Gyógyszerészeti és Egészségügyi Minőség- és Szervezetfejlesztési Intézet, Budapest
2. Bănică, A. & Muntele I. (2017). Urban transitions and resilience of Eastern European Union cities. Eastern Journal of European Studies 8(2): pp 45-69.
3. Bauerová, H. (2018). The V4 and European Integration. In: CABADA, Ladislav – Waisová, Šárka (szerk.): Politics in Central Europe. The Journal of the Central European Political Science Association. De Gruyter Poland, pp 121-139.
4. Björnberg, A. (2017). Euro Health Consumer Index. 2018. Health Consumer Powerhouse LTD
5. Bloom, D. & Canning, D. (2003). Health as Human Capital and its Impact on Economic Performance. The Geneva Papers on Risk and Insurance. 28(2), pp. 304-315.
6. Cohen, B. (2014). Estudio "Ranking de Ciudades Inteligentes en Chile" http://dg6223fhel5c2. cloudfront.net/PD/wp-content/uploads/2014/06/Ranking-Ciudades-Inteligentes-enChile.pdf
7. Demographic data in Hungary (2021). http://ksh.hu
8. Demographic data in Chech Republic (2021). https://hu.db-city.com/Csehorsz%C3%A1g--Pr%C3%A1ga--Pr%C3%A1ga
9. Demographic data in Poland (2021). http://www.stat.gov.pl
10. Demographic data in Slovakia (2021). https://slovak.statistics.sk/
11. Euro Health Consumer Index (2018). https://EHCI-2018-report.pdf
12. Európai Bizottság jelentése Európai Bizottság (2015). Quality of Life in European Cities 2015, Urban Audit Perception Survey. http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/urban/survey 2015_en.pdf
13. Giffinger, R. & Pichler-Milanovic, N. (2007). Smart Cities: Ranking of European MediumSized Cities, Vienna University of Technology, University of Ljubljana and Delft University of Technology. http://www.smart-cities.eu/download/smart_cities_fi nal_report.pdf
14. HDI index (2019). https://hdr.undp.org/data-center/documentation-and-downloads
15. Christian, B., Ray, D., Benyoussef, A. & Tanahashi, T. (1977). Health and socio-economic development: An intersectoral model. Social Science & Medicine, 11(2), pp. 63-69
16. Ivanová, E. & Čepel, M. (2018). The impact of innovation performance on the competitiveness of the visegrad 4 countries. Journal of competitiveness. Vol. 10, Issue 1, pp. 54 - 72

17. Juhász, K. (2018). A Visegrádi csoport migrációs és menekültügyi politikája. In: PRO PUBLICO BONO – Magyar Közigazgatás, Ludovika Egyetemi Kiadó, Budapest. 2018/2. pp 24-49.
18. Kézai, P. K. (2021). A kelet-közép-európai regionális központok a városi rangsorok és indexek fókuszában. CITY.HU: Várostudományi Szemle 1:1 pp. 34-51., 18 p.
19. Kiss, É. (szerk.)(2020). A Visegrádi Csoport együttműködése. II. Rákóczi Ferenc Kárpátaljai Magyar Főiskola, Ungvár
20. KSH (2019, 2020). GDP: https://www.ksh.hu/stadat_files/gdp/hu/gdp0080.html
21. Lados, M. (2011). „Smart Cities" tanulmány. IBM, MTA Regionális Kutatások Központja, Győr, Nyugat-magyarországi Tudományos Intézet. p. 119.
22. Majerová, I. (2019). Socio-economic development and its impact on health personnel in regions of Visegrad Group Plus countries. Review of Economic Perspectives – Národohospodářský obzor Vol. 19, Issue 1, 2019, pp. 3–24
23. Márky, Z. (2018). Egyedi-e a V4? Regionális együttműködési minták az EU-ban. In.: Balaskó, Angéla (szerk.): A Visegrádi Négyek jelentősége, struktúrája és értékei. Külügyi és Külgazdasági Intézet, Budapest. 52-80.
24. Martonyi, J. (2017). A közép-európai együttműködés szerepe az európai integrációban. In.: Szekeres, I. (szerk.): (Közép-európai) érdekérvényesítés az Európai Unióban. A Visegrádi Együttműködés 25 éve. Szeged: Szegedi Tudományegyetem Állam- és Jogtudományi Kar Nemzetközi és Regionális Tanulmányok Intézete és a Europe Direct Szeged iroda szervezete
25. Molendowski, E. & Folfas, P. (2019). Effects of the Pillars of Competitiveness on the Competitive Positions of Poland and the Visegrad Group Countries in the Post-Accession Period. Comparative Economic Research. Central and Eastern Europe, De Gruyter, Warsaw, Vol. 22, Iss. 2, pp. 55-67, ISSN 2082-6737, https://doi.org/10.2478/cer-2019-0012
26. Nagy, Z., Sebestyénné Szép, T. & Szendi, D. (2018). Smart cityk teljesítménye a visegrádi országokban. Erdélyi Társadalom, 16 (1), 2018, DOI: 10.17177/77171.208, pp. 59-82
27. Rechnitzer, J. (2019). Nagyvárosok a magyar területi politikában és területfejlesztésben a rendszerváltozástól napjainkig. Tér és Társadalom 33 : 1 pp. 3-26., 24 p.
28. Semyonov, M., Lewin-Epstein, N. & Maskileyson, D. (2013). Where wealth matters more for health: The wealth–health gradient in 16 countries. Social Science and Medicine. 81, pp. 10-17.
29. Szakálné Szabó, Z. (2021). Harminc éve a közös úton – A Visegrádi Négyek együttműködésének politikai fejlődési íve a kezdetektől napjainkig. Külügyi Műhely 2021/2. szám, pp 138-156.
30. Szirmai, V. & Fábián, A. (2020). A középvárosok jövőbeni fejlesztését megalapozó új innovatív modell kidolgozását támogató főbb szempontok. [The main aspects supporting the development of a new innovative model that lays the foundation for the future development of central cities] In: Szirmai, Viktória (szerk.) Középvárosi társadalmak. Egy új, innovatív városfejlesztési modell megalapozása, Soproni Egyetem Kiadó, 247 p. pp. 212-219., 8 p.
31. United Nations Development Programme (2017). http://hdr.undp.org/en/content/human-development-index-hdi
32. Visegrádi Négyek célkitűzései (2022). https://www.visegradgroup.eu/v4
33. WHO (2016). Working for health and growth: investing in the health workforce. Report of the High-Level Commission on Health Employment and Economic Growth. Geneva: WHO.

34. World Economic Outlook (2022). (IMF, Washington D.C.). https://www.imf.org/en/Publications/WEO/Issues/2022/07/26/world-economic-outlook-update-july-2022

Correspondence address:

Dr. Beatrix Faragó, PhD., associate professor, Research Centre, Alexandre Lamfalussy Faculty of Economics, Sopron University, Erzsébet u. 9., 9400 Sopron, Hungary. email: *farago.beatrix@uni-sopron.hu; dr.farago.beatrix@gmail.com*
ORCID: https://orcid.org/0000-0002-3480-8898

Szabolcs Csiszár, Ph.D. student, Széchenyi Doctoral School Sopron University, Erzsébet u. 9., H-9400 Sopron, Hungary, email: *csiszar.szabolcs5@gmail.com*
ORCID: https://orcid.org/0000-0001-8895-9766

THE EVALUATION OF ENVIRONMENTAL TAXES IN HUNGARY AND SLOVAKIA

Norbert GYURIÁN

Department of Management, Faculty Economics and Informatics, J. Selye University in Komárno, Slovakia

Nikolett GYURIÁN NAGY

Department of Leadership and Marketing, Kautz Gyula Faculty of Economics, Széchenyi István University in Győr, Hungary

Received: 04. March 2022 *Reviewed: 12. April 2022* *Accepted: 25. April 2022*

Abstract

This paper deals with the environmental impact of taxes. The relevance of the topic is given on the one hand by the climate change, which is increasingly coming to the fore, and on the other hand by the impact of taxes on the economy, which has also been in the focus of research. The natural, political, economic and, last but not least, the pandemic in the past few years have increasingly drawn the attention of humanity and the leaders of states to the importance of environmental protection. The goal of our study is to analyze environmental protection measures and the budgetary role of taxes levied in Hungary and Slovakia. As a result, conclusions will be drawn based on the obtained results and proposals will be formulated. The research focused on tax types that directly or indirectly contribute to environmental protection. We consider it important to present the possible effects of different tax types on environmental protection, as well as their economic importance. The theoretical part of the paper is based on scientific papers. The research is based on the analysis of secondary sources, primarily data published by the offices of Hungary, Slovakia, and the European Union. We analyze the development of the ratio of environmental taxes in relation to total tax revenues and GDP, as well as the changes in tax revenues from the three most important types of environmental taxes from 2011 to 2020.

Keywords: *taxation, environment, tax revenues*

JEL Classification: H20, H71, Q58

Introduction and theoretical background

The continuous deterioration of the state of the environment is not only a serious economic problem, but also a healthcare and political issue nowadays. From an economic point of view, taxation is also one of the effective tools through which the behavior of business entities can be influenced. The levied taxes can influence the decision-making of companies and individuals alike and thus have a negative impact on the environment.

There was almost no connection between the tax system of nation states and environmental protection a few decades ago. Over the years, the increase in environmental pollution and its negative effects have drawn the attention of governments to the importance of environmental protection and the adoption of measures to tackle the problem. This approach has also come to the forefront in taxation. Nowadays, more and more specific and strict principles are being adopted in taxation, thus more complex environmental protection taxes have also been imposed (Sipos, 2008; Ziolo, Bak & Cheba, 2019; Prokopenko, O., Mishenin, Y. V., Mura, L. & Yarova, I., 2020).

More and more people share the view that environmental protection and environmental awareness are not only a necessary evil any more. In spite of this, market forces are still not efficient enough to preserve environmental values to an adequate extent and quality.

From an economic point of view, environmental pollution is viewed as an external economic effect, i.e., it arises due to the presence of externalities. A basic feature of external economic effects is that they are not subject to buying and selling. Thus, practical problems may arise due to poorly defined ownership rights. Environmental pollution by companies can be cited as an example. In this case, companies believe that they have the right to pollute the environment through their activities, while the people living in the area believe that they have the right to clean air. This therefore leads to the inefficient appearance of externalities. In this case, if it is possible, both parties can benefit from changing external economic influences (Varian, 2008).

The theory of the internalization of externalities related to environmental goods has been elaborated by Arthur C. Pigou, who mentioned environmental taxes for the first time as early as in 1932. By defining environmental tax, he developed the theory of welfare economics, pointing out the insufficiency of resource allocation and the costs incurred as a result of environmental pollution (Pigou, 1932; Csikósová, et al., 2020).

An increased interest in environmental taxes appeared in the 1970s, when environmental pollution was increasing significantly, oil crises (shocks) were added, after which the question of energy saving measures had to be addressed. Ecological problems have increasingly become the subject of political debates and have made headlines. As a result, environmental awareness increased not only among end users and business entities, but also caused the gradual introduction of ecological aspects into the tax system of countries (Dubilová & Solík, 2010; Krajčírová, R., Ferenczi Vaňová, A. & Munk, M., 2016).

The first significant environmental taxes were introduced in the 1990s. Environmental taxes are not aimed at protecting the environment, but at encouraging polluters to take measures to reduce their environmental footprint and reduce emissions. The level of the environmental protection tax must therefore be determined in a way so that it is economically more beneficial for polluters to reduce the negative environmental effects. For example, if a company uses polluting old equipment, but its operation has low costs, then the task of the environmental tax is to increase the company's costs and thus make polluters invest in more environmental friendly technologies (Sipos, 2009; Dubielová & Solík, 2010).

The environmental protection policy and environmental protection aimed at reducing environmental impacts have become a significant world issues nowadays and are part of national and transnational economic policies alike. Environmental taxes are an important indirect economic tool for reaching environmental protection goals. These are indirect taxes in the form of consumption taxes, the purpose of which

is to avoid negative externalities, to adopt the principle of revenue neutrality for economic units, industries and sectors of the national economy in terms of cost reduction effects, technological changes, competitiveness, balance of payments, etc. (Csikósová, et al., 2020).

The theory of taxation determines the goals of levying taxes individually. Many authors have already tried to define the objectives of environmental taxes. Some authors distinguish between basic and additional criteria of environmental taxes. Those defined according to the "3E methodology" can be viewed in Table 1.

Table 1 Overview of the basic and complementary criteria of the 3E methodology

Criterion	Relevant question	Character criteria
Environmental efficiency	Has the application of the given criterion achieved the desired goal?	Basic
Economy	Is the tool implemented with minimal cost?	Basic
Efficiency	Is the best balance between benefits and costs achieved?	Basic
Public revenue	What volume of public revenue does the instrument generate?	Complementary
Innovations	What impact does the implementation of the given tool have on innovation activity? Does it speed it up or slow it down?	Complementary
Reach to economic subjects	What impacts on competitiveness does the implementation of the environmental instrument bring?	Complementary
Broader economic effects	What effects does the implementation of the given tool have on macroeconomic variables?	Complementary

Source: Pavel a Vítek (2010), Spratt (2012), Csikósová (2020).

Environmental taxes are additional taxes for businesses. Therefore, their introduction can naturally cause them being worried about losing their competitiveness. If the environmental protection taxes are reflected in the production costs of the companies, they are manifested in higher selling prices of the products. A higher price may result in a sales decrease and eventually, in an increase in unemployment. In globalized markets, it is also necessary to take into account situations where the production of certain products is transferred to countries in which no environmental taxes are imposed on the given product (Romančíková, 2008).

Material and methods

The aim this paper is to analyze the importance of environmental taxes in Hungary and Slovakia. The development, role and importance of environmental taxes are presented (environmental taxes are also known as ecological and green taxes in the relevant literature). The tax revenues in the researched countries are analyzed through secondary data sources. Although Hungary and Slovakia border each other and both are member states of the European Union, there are differences between their tax systems. The period from 2011 to 2020 was chosen to be analyzed. The secondary data processed and analyzed in this paper were obtained from the Eurostat database, and therefore are sufficiently accurate in terms of exchange rate differences and time. Descriptive statistics and graphic methods were used throughout the research. From a methodological point of view, it was important to group the analyzed environmental taxes, which were the following ones:

- Energy (including fuel for transport):
  - energy products for transport purposes - unleaded petrol, leaded petrol, diesel, other energy products for transport purposes (e.g. LPG, natural gas, kerosene or fuel oil),
  - energy products for stationary purposes - light fuel oil, heavy fuel oil, natural gas, coal, coke, biofuels, electricity consumption and production, district heat consumption and production, other energy products for stationary use,
  - greenhouse gases, carbon content of fuels, emissions of greenhouse gases (including proceeds from emission permits recorded as taxes in the national accounts).
- Transport (excluding fuel for transport):
  - motor vehicles import or sale (one off taxes),
  - registration or use of motor vehicles, recurrent (e.g. yearly taxes).
  - road use (e.g. motorway taxes),
  - congestion charges and city tolls (if taxes in national accounts),
  - other means of transport (ships, airplanes, railways, etc.),
  - flights and flight tickets,
  - vehicle insurance (excludes general insurance taxes).
- Pollution
  - measured or estimated emissions to air,
  - ozone depleting substances (e.g. CFCs or halons),
  - measured or estimated effluents to water,
  - non-point sources of water pollution,
  - waste management,
  - noise (e.g. aircraft take-off and landings).
- Resources
  - water abstraction,
  - harvesting of biological resources (e.g. timber, hunted and fished species),
  - extraction of raw materials (e.g. minerals, oil and gas),
  - landscape changes and cutting of trees.

Source: own processing based on data from Eurostat

Results and discussion

Environmental taxes provide significant revenues for the states nowadays, the effective use of which can greatly contribute, among other things, to the restoration of the environment. It is important to preserve the environmentally conscious behavior of individuals and companies, to prevent environmental damage, and to remedy the results of harmful actions in the past. This research focuses on the analysis of revenues from environmental taxes in Hungary and Slovakia.

Table 2 Total environmental tax revenue, 2011-2020 (Million EUR)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Hungary	2,600.05	2,533.22	2,489.64	2,557.84	2,784.34	2,941.78	3,095.07	3,094.45	3,307.92	2,982.81
Slovakia	1,726.98	1,743.89	1,872.7	1,932.31	1,997.55	2,019.35	2,149.02	2,202.67	2,245.98	2,191.2

Source: own processing based on data from Eurostat

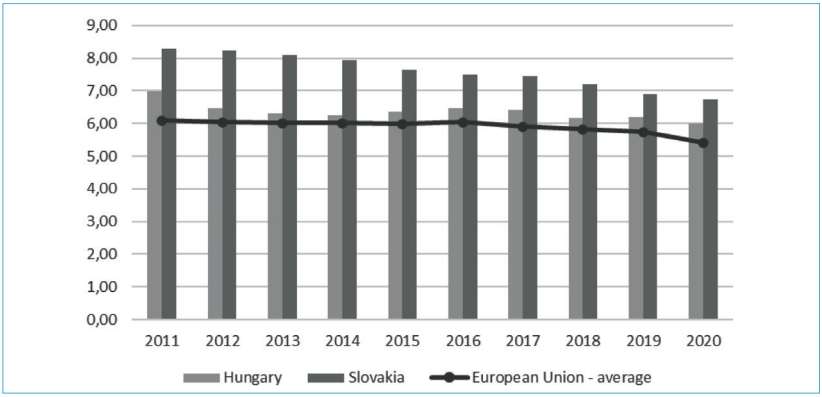
The evolution of revenues received from environmental taxes in Hungary and Slovakia in the period 2011-2020 can be seen in Table 2. It can be seen that the revenues received from environmental taxes were higher in Hungary in all years. In the case of Hungary, the development of the received revenues was varied. The increase in revenues was continuous, a smaller decline can be observed in the years 2012, 2013 and 2020. The lowest value was in 2013 (2,489.64 million EUR) and the highest value was in 2019 (3,307.92 million EUR) in the case of Hungary.

The values ranged between 1,726.98 million EUR and 2,245.98 million EUR in Slovakia. The lowest value was shown in 2011, and the highest value in 2019. The revenues from environmental taxes also increased continuously. In Slovakia, there was a decline only in 2020, but it was insignificant.

It can be observed that the revenues from environmental taxes ranged between 272,354 million EUR and 329,814 million EUR considering the European Union as a whole. A continuously growing trend can be observed here as well, which indicates that the leaders of the European Union member states are thinking more and more environmentally.

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

Figure 1 Total environmental tax revenue as share of total government revenue from taxes and social contributions (including imputed social contributions), 2011-2020 (%)

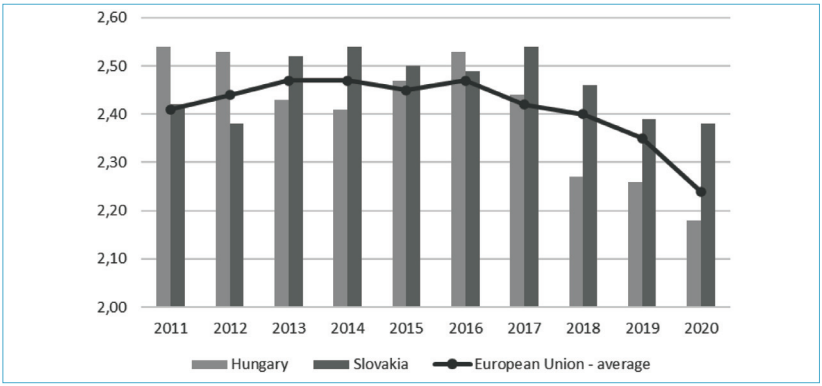


Source: own processing based on data from Eurostat

The contribution of environmental taxes to the overall tax and social revenues received as public finances was also analyzed. The values were in the range of 6-6.98% in the case of Hungary and in the range of 6.75-8.29% in the case of Slovakia. The European Union average ranged between 5.42 and 6.09 in the analyzed period. In the case of both examined states, higher values can be observed during the examined period, but in the case of Hungary, values closer to the European Union average can be observed.

It is also important to analyze the GDP contribution of environmental taxes. The average values in Hungary, Slovakia and the European Union are very similar. In the case of Hungary, the lowest value is in 2020 (2.18%), and the highest one in 2011 (2.54%). As for Slovakia, the lowest value is in 2012 and 2020 (2.38%), and the highest one in 2014 and 2017 (2.54%). The highest contribution in the EU was reached in 2013, 2014 and 2016 (2.47%), and the lowest one in 2020 (2.24%).

Figure 2 Total environmental tax revenue as percentage of gross domestic product, 2011-2020 (%)



Source: own processing based on data from Eurostat

As mentioned in the methodological part of the study, environmental taxes can be divided into energy taxes, transport taxes and taxes on pollution/resources. In the following, the revenues from these taxes are analyzed.

Table 3 Energy tax revenue, 2011-2020 (Million EUR)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Hungary	2,032.75	1,896.74	1,880.34	1,944.14	2,096.68	2,237.87	2,323.93	2,321.87	2,507.14	2,279.36
Slovakia	1,524.9	1,543.64	1,642.28	1,693.76	1,762.18	1,773.7	1,897.15	1,941.51	1,984.19	1,965.13

Source: own processing based on data from Eurostat

First, we analyze the revenues from the energy tax. We can observe that Hungary's revenues were higher than Slovakia's during the examined period. Slovakia's revenues, on the other hand, grew faster, as a result of which the difference between the revenues of the two states continuously decreased. It can be concluded that in the case of Hungary, Slovakia and the European Union, the most important group of environmental taxes are the taxes imposed on energy, based on the value of the revenues.

Table 4 Transport tax revenue, 2011-2020 (Million EUR)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Hungary	471.88	410.11	396.78	392.39	407.19	413.77	435.72	441.66	458.22	411.83
Slovakia	166.71	165.83	198.49	207.64	203.9	213.51	223.29	232.57	233.09	200.16
European Union	53,643	53,412	53,615	54,661	56,730	58,419	59,924	61,941	62,530	56,837

Source: own processing based on data from Eurostat

We examine the revenue from taxes imposed on transport in the next step. At first look, it can be established that compared to energy taxes, lower revenues were achieved in the case of Hungary, Slovakia and the European Union average. In the case of Hungary, the revenues were almost the double of those in Slovakia. Compared to the European Union average, both countries fall well short of it.

Table 5 Revenue from taxes on pollution/resources, 2011-2020 (Million EUR)

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Hungary	95.42	226.37	212.52	221.32	280.48	290.14	335.42	330.93	342.55	291.62
Slovakia	35.37	34.42	31.94	30.91	31.47	32.14	28.59	28.59	28.69	25.91
European Union	9,337	9,721	9,705	10,073	10,562	10,532	10,660	10,610	10,666	10,635

Source: own processing based on data from Eurostat

The third group of environmental taxes are taxes on pollution/resources. The evolution of revenues are presented in Table 5. We can observe that in the case

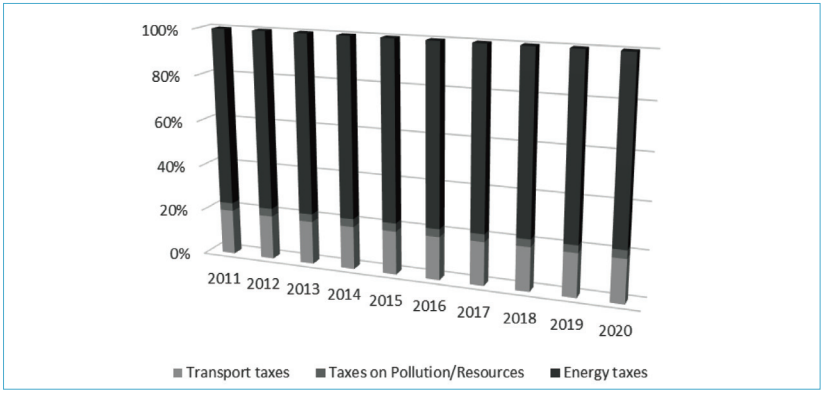
ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

of Hungary, the development of revenues was very variable. The lowest value was reached in 2011 (95.42 Million EUR), and the highest value was reached in 2019 (342.55 Million EUR). The largest increase occurred in 2012, and then there was a continuous increase in the following years. A smaller decline can be observed in 2018 and 2020.

Much lower revenues were achieved compared to Hungary in the case of Slovakia. The lowest value was reached in 2020 (25.91 Million EUR) and the highest value was reached in 2011 (35.37 Million EUR). We can see a continuous decrease in revenues.

The lowest value of revenues was reached in 2011 (9,337 million EUR), and the highest value was reached in 2019 (10,666 million EUR) in the case of the European Union average. We can state that in the case of Hungary and the European Union average, a continuous increase in revenue can be observed. An opposite trend can be observed in Slovakia, where there was a continuous decrease in revenues.

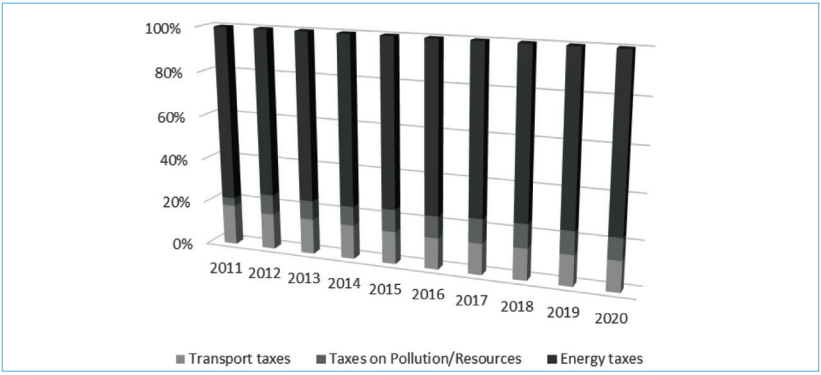
Figure 3 Environmental tax revenue by type in European Union – percentage of total environmental taxes, 2011-2020 (%)



Source: own processing based on data from Eurostat

The composition of the environmental tax is determined by the energy tax, the transport tax and the tax on pollution/resources. The development of revenues in the European Union in the period 2011-2020 is shown in Figure 3. We can clearly see that the energy tax is the most important component of environmental taxes, which accounts for almost 80% of the revenues from environmental taxes. The second most important group of environmental taxes are taxes on pollution/resources.

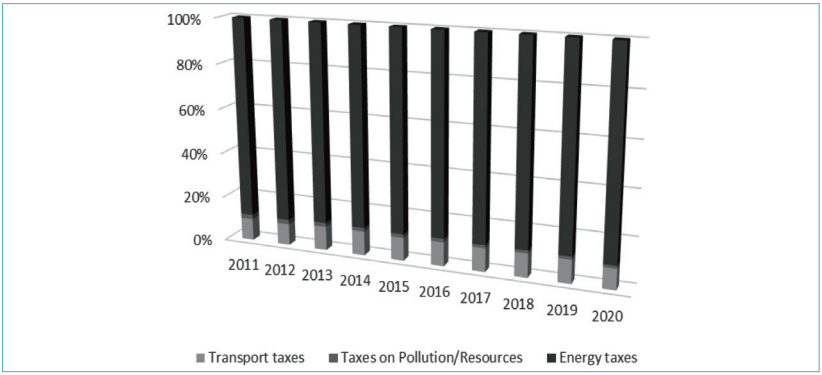
Figure 4 Environmental tax revenue by type in Hungary – percentage of total environmental taxes, 2011-2020 (%)



Source: own processing based on data from Eurostat

It can be concluded that the energy tax also plays the most important role, but the difference between the transport taxes and the taxes on pollution/resources is smaller, examining the composition of environmental taxes in the case of Hungary.

Figure 5 Environmental tax revenue by type in Slovak Republic – percentage of total environmental taxes, 2011-2020 (%)



Source: own processing based on data from Eurostat

It can be concluded that energy tax revenues are the highest among all environmental tax revenues, making up almost 90% in Slovakia. Transport taxes are the second most important, accounting for approximately 10%. The taxes on pollution/ resources are in the last place. Their share was 2.05% in 2011, and then a there was a continuous decrease during the whole period.

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

Conclusion

Nowadays, a more environmentally conscious behavior of business entities and individuals can be observed. General state environmental protection measures are also becoming stricter, but the proportion of taxes related to the environment is decreasing and there has been no significant transfer of tax burdens from labor to green taxes (Bokázóvá, Haluš & Haščič, 2020).

It can also be observed that almost 80% of the revenues from environmental taxes are taxes on energy carriers, the amount of which is not adjusted according to the level of pollution. In the case of Slovakia, almost 90% of the revenues from environmental taxes come from taxes on energy carriers.

It was pointed out that the total environmental tax revenue as share of total government revenue from taxes and social contributions was around 6% in the countries analyzed. In our opinion, given the change in the way of thinking of individuals, companies and governments, the role of environmental taxes will increase in the near future. It is almost certain that this trend will also be seen in the development of tax revenues.

The system of fees paid for waste disposal or air pollution in the member states of the European Union does not encourage environmental awareness among end users and economic operators enough.

Bibliography

1. Bodáczová, M., Haluš, M. & Haščič, I. (2020) Zelená zelenému zdaňovaniu. Inštitút environmentálnej politiky. Ministerstvo životného prostredia SR. [online] Available at: <https://www.minzp.sk/files/iep/analyzy/2020_08_zelena_zelenemu_zdanovaniu.pdf> [Accessed February 7, 2022].
2. Csikósová, A., Mokrišová, V., Čulková, K., Janošková, M. (2020). Postavenie a význam zavedenia environmentálnych daní v regióne V4. Verejná správa a spoločnosť, 20/2019 (2), pp 24-35.
3. Dubielová, V. & Solík, J. (2010). Energy taxes in Slovak Republic. Účetnictví v procesu světové harmonizace, Vysoká škola ekonomická v Praze - Nakladatelství Oeconomica, 256 p.
4. Eurostat. Environmental tax statistics. European Comission. [online] Available at: <https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Environmental_tax_statistics> [Accessed February 7, 2022].
5. Krajčírová, R., Ferenczi Vaňová, A. & Munk, M. (2016). Agricultural land and land tax – Significant indicators of agriculture business activities in the Slovak Republic. European Countryside. Mendel University in Brno. pp. 98-108.
6. Pigou, A. C. (1932). The Economics of Welfare. [online] Available at: <https://oll.libertyfund.org/title/pigou-the-economics-of-welfare> [Accessed February 7, 2022].
7. Prokopenko, O., Mishenin, Y. V., Mura, L. & Yarova, I. (2020). Environmental and economic regulation of sustainable spatial agroforestry. International Journal of Global Environmental Issues. Vol. 19, pp. 109-128.
8. Romančíková, E. (2008). Environmentálne dane a konkurencieschopnosť. National and Regional Economics. VII. 2008. Technical University of Košice - Faculty of Economics, pp. 761-767.
9. Sipos, N. (2008). Environmental tax reform: experiences in Europe and possibilities in Hungary. Gazdálkodás. Vol. 52. English Special Edition No. 22. pp. 114-118.

10. Sipos, N. (2009). Az adók, díjak, járulékok externális hatásai környezetvédelmi szempontból. Gazdálkodás. 2009/5. pp. 456-459.
11. Spratt, S. (2012). Environmental Taxation and Development: A Scoping Study. [online] Available at: <https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.2040-0209.2013.00433.x> [Accessed February 7, 2022].
12. Varian, H. R. (2008). Mikroökonómia középfokon. Budapest: Akadémiai Kiadó, pp. 646-671.
13. Ziolo, M., Bak, I. & Cheba, K. (2019). Environmental taxes - how public policy makers can use them in the decision-making process? Procedia Computer Science, Vol. 159. pp. 2216–2223.

Correspondence address:

Ing. Norbert Gyurián, PhD., Department of Management, Faculty Economics and Informatics, J. Selye University, Bratislavská cesta 3322, 945 01 Komárno, email: *ngyurian@gmail.com*,
ORCID ID: https://orcid.org/0000-0003-1793-2712.

PhDr. Nikolett Gyurián Nagy, PhD., Department of Leadership and Marketing, Kautz Gyula Faculty of Economics, Széchenyi István University, Egyetem tér 1, 9026 Győr, email: *nagynikolett.sze@gmail.com*,
ORCID ID: https://orcid.org/0000-0001-9495-5382.

TOURISM EFFICIENCY OF V4 COUNTRIES: A COMPARISON WITH AUSTRIA

Roman LACKO

Department of Tourism, Faculty of Commerce, University of Economics in Bratislava, Slovakia

Pavol ANDREJOVSKÝ

Department of Commercial Entrepreneurship, Faculty of Business Economics with seat in Košice, University of Economics in Bratislava, Slovakia

Zuzana HAJDUOVÁ

Department of Business Finance, Faculty of Business Management, University of Economics in Bratislava, Slovakia

Received: 27. January 2022 *Reviewed: 02. March 2022* *Accepted: 19. March 2022*

Abstract

Countries compare themselves to each other in tourism and look for processes in which they could be more competitive. However, these comparisons are inadequate in many cases. Countries have different tourist attractions, so one measure that is successful in one country may not be successful in another. The goal of this study is, based on several factors, to advance the proposal of a comparison of several countries based on multi-criteria analyses and to measure the efficiency of the Visegrad Four countries and Austria. For this purpose, the Data envelopment analysis method was used, specifically the CRS and VRS input models. Four input variables and two output variables were used. The result of this study is a comparison of the efficiency of the countries, in which the differences between the countries of Central Europe were found. For example, Poland lags significantly behind the efficiency of other countries. On the other hand, Austria and Slovakia are among the most efficient countries compared. We also pointed out the weak relationship between the area of protected areas, the GDP generated by tourism, and the occupancy of beds in accommodation facilities. These findings may impact the creation of policies and consider the effectiveness of investments in the tourism industry.

Keywords: *tourism, efficiency, DEA, Visegrad four*

JEL Classification: C34, C67, L88

Introduction and theoretical background

The efficiency of countries and tourism entities is widely discussed in scientific research. This is because the countries themselves, when creating strategies, must be based on comparing themselves with the best, the so-called benchmarks (Assaf, 2012; Corne, 2015; Peypoch & Solonandrasana, 2008). In the scientific community, we encounter the use of various methods and their modifications. An essential part of the scope of the effectiveness investigation is the sample of destinations or countries that will be subjected to the research. We must not forget comparability. If the research subject shows too much inhomogeneity of the tourism structure with another, the results are more challenging to interpret.

Hadad et al. (2012) concluded that the great interest in measuring efficiency and productivity in the tourism industry is not surprising, given the growing economic importance of tourism as a source of international income and employment and the increase in competition in the world tourism markets. Therefore, measuring efficiency and productivity in tourism has been the subject of considerable research in recent years, reflecting the growing economic importance of tourism as a source of international income and domestic employment and increasing competition in global tourism markets.

Matijová et al. (2019) claim that tourism is considered the most significant service sector, leading to many social and economic changes. Assaf a Josiassen (2012) claim that the key factors of interest to stakeholders in the quest to improve the tourism industry. A key obstacle to improving performance is the number of determinants affecting tourism performance. The literature has yet to provide concrete insight into the determinants of tourism performance and their relative importance. This study addresses this critical gap. The authors provided performance indicators of international tourist destinations. According to Radovanov et al. (2020) policymakers should gradually take control of the above variables to protect the interests of all relevant stakeholders involved in the tourism development process.

The literature that measures tourism-related efficiency can include, for example, the efficiency of airports (Ripoll-Zarraga & Raya, 2020), HORECA sector (Pablo-Romero et al., 2017), spa (Čabinová & Onuferová, 2019), and destinations (Barros et al., 2011).

This study will examine a relatively homogeneous group of Central European countries. Very few studies would compare this territorial grouping from such a point of view. Most research focuses on larger entities such as the European Union, but also others (Lozano & Gutierrez, 2011; Matijová et al., 2019; Radovanov et al., 2020)

For a comprehensive comparison, the Travel & Tourism Competitiveness Index was developed. However, it is extensive and challenging to compare the causes of differences between countries (Martín et al., 2017). Therefore, thanks to its simplicity but good comparability and robustness, a prevalent method is the Data Envelopment Analysis (DEA) method (Prorok et al., 2019).

The goal of this study is, based on several factors, to advance the proposal of a comparison of several countries based on multi-criteria analyses and to measure the efficiency of the Visegrad Four countries and Austria.

Material and methods

We use the Data envelopment analysis (DEA) method in this study. This method measures the efficiency of decision-making units with a relatively homogeneous subject of productivity. In this study, we perform measurements for DEA models

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

assuming constant returns to scale (CRS) and variable returns to scale (VRS). These models can be mathematically expressed as follows:

$$\min_{\theta_B,\lambda} \theta_B$$
$$\text{s.t. } \theta_B x_o - X\lambda \geq 0 \quad (1)$$
$$Y\lambda \geq y_o$$
$$\lambda \geq 0.$$

$$\min_{\theta_B,\lambda} \theta_B$$
$$\text{s.t. } \theta_B x_o - X\lambda \geq 0 \quad (2)$$
$$Y\lambda \geq y_o$$
$$e\lambda = 1$$
$$\lambda \geq 0.$$

These models, in their most basic form, were developed and developed by many authors, of which it is necessary to mention several studies that helped the theoretical as well as practical development of this method (Ahn et al., 1988; Charnes et al., 2013; Cooper et al., 2007; Färe et al., 1994; Farrell, 1957).

The DEA method measures the distance of production units from the efficiency frontier. DMUs on the efficiency frontier have an efficiency value equal to 1. The greater their distance from the efficiency frontier, the lower the relative efficiency values they achieve. For efficiencies to be measurable, we need to choose appropriate variables of the DEA model. This study was based on several significant studies and literature reviews. Based on these surveys and the availability of relevant data, we have identified several variables that can be considered suitable for investigating technical efficiency in tourism (Corne, 2015; Ilić & Petrevska, 2018; Nurmatov et al., 2021).

Table 1 Comparison of people employed in travel agencies and services

	Variable	Units
Inputs	Employees in the HORECA	Thousand of persons
	Employees in travel agencies and reservation services	Thousand of persons
	Number of beds in accommodation facilities	Number
	Natural reservations area – Natura 200	km²
Outputs	Bed occupancy rate	%
	The gross domestic product generated by tourism in current prices	mil. €

Source: own processing

In general, variables representing the three fundamental factors of production are used as inputs. In our case, the land is represented by the area of protected areas according to Natura 2000. Human capital - work is represented by two variables: the number of employees in the HORECA sector and the number of employees in reservation services. Finally, capital, or the capacity of national systems, is represented in this study by the number of beds in accommodation facilities.

In our case, the output of these sources is the GDP generated by tourism services and the occupancy of beds in accommodation facilities. For a more detailed description, see table 1.

Individual variables are not relativised concerning the number of inhabitants or other indicators. This is made possible precisely by the nature of DEA models. Of course, it is also possible to use relativised variables, but all variables would have to be relativised. Only in this way would we ensure the consistency of the results.

In this study, we examine the effectiveness of the relatively homogeneous countries that make up the grouping of the Visegrad Four (V4) and Austria, which is often a model for improving tourism-related processes for the V4 countries. Austria can be considered a leader in tourism in the given region of countries. We will examine the efficiency of the countries for the period from 2010 to 2018 to sufficiently capture the development in the period between significant crises that also affected the tourism industry. We obtained data for our research from publicly available Eurostat databases (Eurostat, 2022) and The World Bank (The World Bank, 2021).

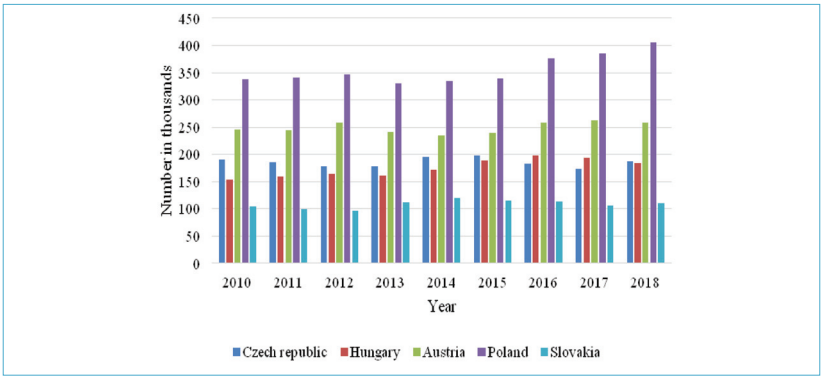
Results and discussion

In this chapter, we will characterise the results of our research in two main subchapters. First, we will focus on developing selected variables in the five investigated countries. Then we will look at the results and the comparison of technical efficiency in the V4 countries and Austria.

Development of selected tourism indicators in V4 countries and Austria

In this section, we will compare selected variables' development in the monitored five Central European countries. Figure 1 shows the development of the number of employees in the HORECA sector.

Figure 1 Comparison of people employed in the HORECA sector



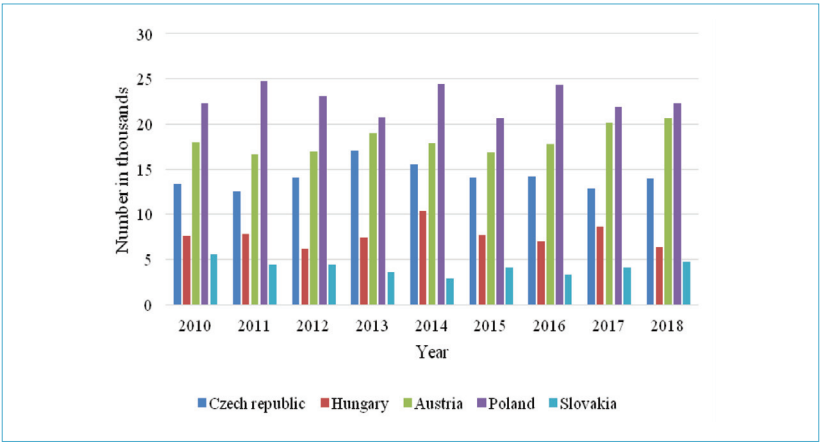
Source: own processing based on the data from Eurostat (2022)

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

Poland has the highest number of employees in the HORECA sector, where in 2018, it exceeded 400,000 people. On the contrary, the lowest numbers are recorded in Slovakia, where in 2018, 110 thousand people were employed in the HORECA sector. The numbers of employees in the HORECA sector are very similar in the case of Hungary, Austria and the Czech Republic. In general, no dramatic increase in the number of employees can be observed. However, there has been a slight increase in the last few years.

On the contrary, in 2013 and 2014, we observed a slight decrease in employees in the HORECA sector. This can be attributed to one of the consequences of the decrease in economic optimism. Figure 2 shows the development of the number of travel agencies and reservation services employees.

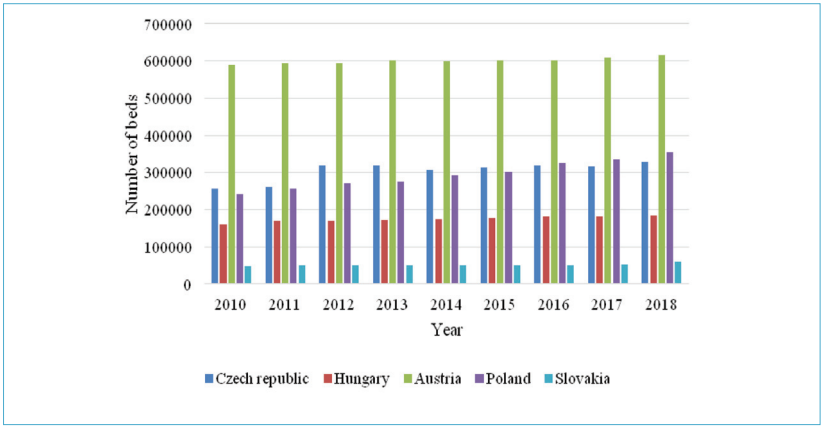
Figure 2 Comparison of people employed in travel agencies and services



Source: own processing based on the data from Eurostat (2022)

The highest number of employees in travel agencies and reservation services is also observed in Poland. In 2018, approximately 22 thousand people were employed in this sector. The fewest people in this sector were employed in Slovakia. In 2018 it was approximately 4,700 people. The development of the number of employed people did not have a uniform trend of increase in the examined countries. Even since 2013, a downward trend can be observed. This can be caused by the increased use of modern reservation systems and the electronification of this sector. Figure 3 shows the development of bed capacity in accommodation facilities.

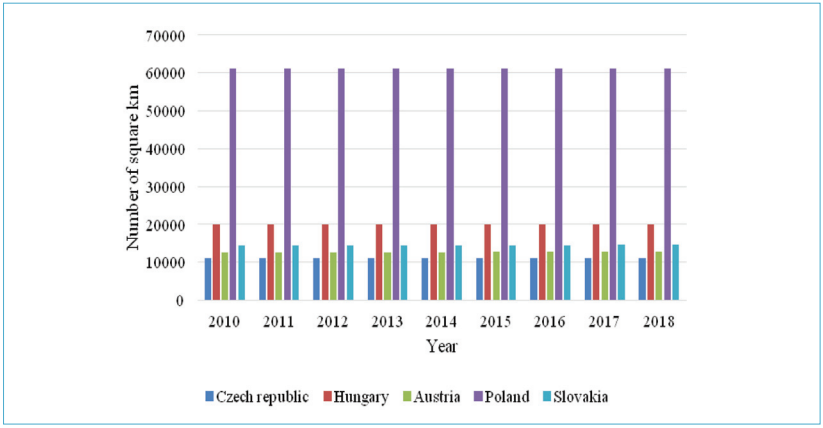
Figure 3 Comparison of the number of beds in accommodation facilities



Source: own processing based on the data from Eurostat (2022)

Regarding capacity, Austria has the highest number of beds in accommodation facilities. The number of beds increased from approximately 590,000 in 2010 to approximately 615,000 in 2018. Even in the country with the fewest available beds, Slovakia, there was an increasing number of beds, from approximately 49 thousand to more than 60 thousand. In general, an increase can be observed, which was slightly corrected in 2014 or 2015. In Figure 4, we present the absolute values of the area of protected areas in the countries we studied.

Figure 4 Comparison of Natura 2000 protected areas



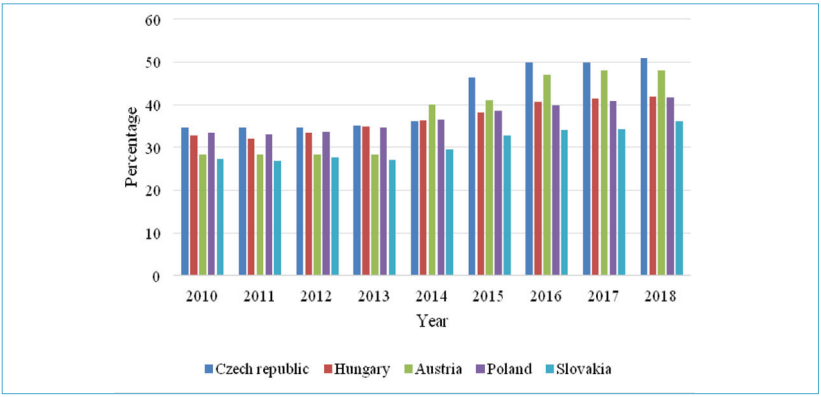
Source: own processing based on the data from Eurostat (2022)

Poland, which is also the largest country by area, has the significantly highest absolute value of the area of protected areas. The area of protected areas in Poland is

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

approximately 60,000 square kilometres. Other countries' protected areas range from 10 to 20 thousand square kilometres. Figure 5 shows the occupancy rate of beds in accommodation facilities.

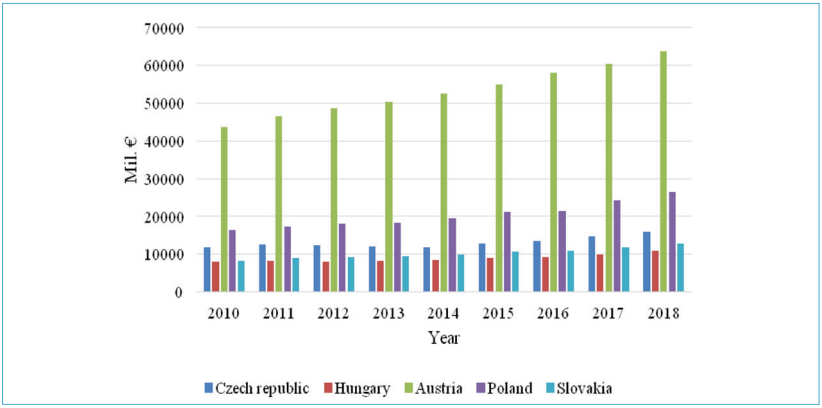
Figure 5 Comparison of bed occupation rate



Source: own processing based on the data from Eurostat (2022)

This variable reflects how effectively they use the capacity of beds in a given country because a high number of beds does not necessarily mean a high number of tourists. In most countries, the bed utilisation rate in accommodation facilities increased over time. They use the bed capacity most efficiently in the Czech Republic, where there was a significant increase from 35% to approximately 50% in 2018. The lowest values were reported in Slovakia, where the bed capacity utilisation was approximately 36%. Figure 6 shows the development of the GDP variable generated by tourism.

Figure 6 Comparison of GDP generated from tourism



Source: own processing based on the data from Eurostat (2022)

Undoubtedly, the highest GDP generated by tourism among the countries we examine was achieved by Austria. This is also the reason why Austria is a model for creating tourism strategies in neighbouring countries. The GDP in Austria increased significantly from almost €44 billion to approximately €64 billion, an increase of 46.1%. Even the other countries did not lag behind the relatively significant increase of Austria, but the absolute values of the GDP generated by tourism were significantly lower. For example, there are approximately 10.8 billion in Hungary or 12.8 billion in Slovakia. Table 2 shows the results of the correlation analysis of inputs and outputs of DEA models.

Table 2 Correlation between selected indicators

	Employees in the HORECA sector	Employees in travel agencies and services	Number of Beds	Natura 2000 areas	Occup. rate	HDP Tourism
Employees in the HORECA	1.0000					
Employees in travel agencies	0.9167	1.0000				
Number of Beds	0.5368	0.7018	1.0000			
Natura 2000 areas	0.7999	0.6045	-0.0459	1.0000		
Occupancy rate	0.2534	0.2931	0.3311	-0.0056	1.0000	
HDP Tourism	0.4191	0.5442	0.9071	-0.0854	0.2230	1.0000

Source: own processing

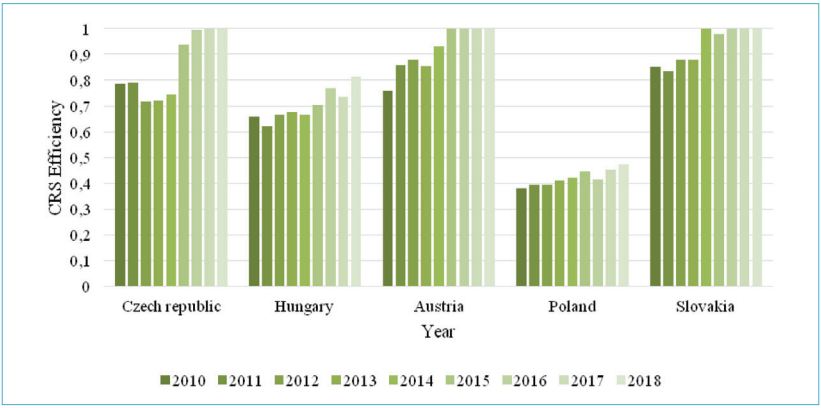
The results indicate a relatively high interconnectedness of the inputs and, thus, a possible relationship of a positive nature. On the other hand, a very weak and even negative relationship can be observed between the number of beds and the area of protected areas. Moreover, we can observe a negative correlation between the area of protected areas and GDP. We also did not confirm the correlation between bed occupancy and GDP generated by tourism.

Tourism efficiency of V4 countries and Austria

This section presents the efficiency measurement results using the DEA CRS and DEA VRS models. First, in Figure 7, we present the DEA CRS model's results using the abovementioned variables.

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

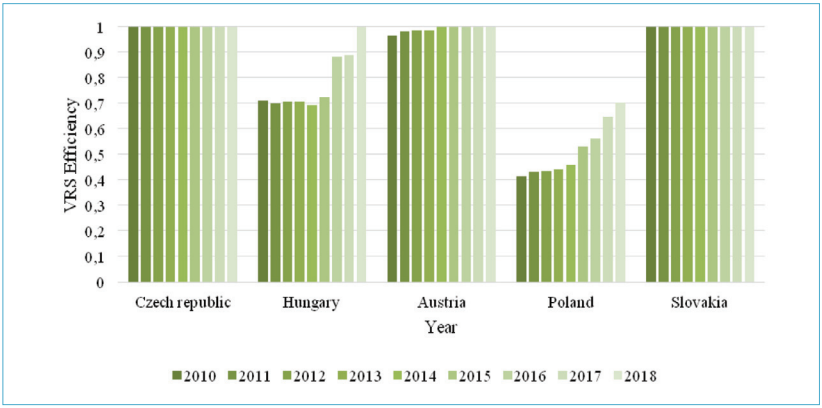
Figure 7 Individual results of CRS efficiencies



Source: own processing

As seen in Figure 7, the positive trend is the increase in efficiency in all countries. This indicates a more efficient use of resources to increase the output, which is the rate of bed capacity utilisation and the economic benefit of tourism - GDP. During the last three years, as many as three countries were efficient – Austria, the Czech Republic and Slovakia. Poland achieved the lowest efficiency. Poland's efficiency values ranged from 0.38 in 2010 to 0.47 in 2018, which is low. Hungary is among the three most efficient countries and Poland. The most significant increase in efficiency was achieved in the Czech Republic and Austria. Figure 8 presents the DEA CRS model's results using the abovementioned variables.

Figure 8 Individual results of VRS efficiencies



Source: own processing

Since the VRS model uses a non-linear frontier of efficiency, it can be said to be more benevolent towards individual DMUs. This was also reflected in the achieved efficiency scores. The Czech Republic and Slovakia are efficient throughout the entire examined period. Austria also achieved excellent results. Hungary also achieved efficiency in the last year under review. Poland is significantly the least efficient, but in recent years efficiency has been growing significantly. From a value of 0.41 in 2010, the efficiency increased to approximately 0.70 in 2018. In Table 3, we present a summary table of the typical descriptive characteristics of the variables used in these models.

Table 3 Descriptive statistical indicators of efficiencies

Model	Country	Mean	Standard deviation	Variance	Min	Max
CRS	Czech republic	0.854550	0.118963	0.014152	0.716232	1
	Hungary	0.700560	0.057645	0.003323	0.621394	0.814296
	Austria	0.920838	0.082257	0.006766	0.759371	1
	Poland	0.420109	0.029309	0.000859	0.380229	0.472383
	Slovakia	0.935443	0.068745	0.004726	0.832986	1
VRS	Czech republic	0.999966	<0.0001	<0.0001	0.999694	1
	Hungary	0.779311	0.107538	0.011564	0.691479	1
	Austria	0.990901	0.011160	0.000125	0.966375	1
	Poland	0.513716	0.099233	0.009847	0.413172	0.704791
	Slovakia	1	0	0	1	1

Source: own processing

The highest average value of CRS efficiency was achieved by Slovakia (0.94), followed by Austria (0.92) and the Czech Republic (0.85). This is in significant contrast to the average efficiency of Poland, which was only 0.42. The same countries achieved very high average VRS efficiency values as in the case of the CRS model. The variability of the statistical sets was not high.

Conclusion

Several interesting conclusions and recommendations can be evaluated based on the above results. First, none of the investigated countries is a significant seaside destination. Although Poland has access to the sea, this is not very important in summer seaside tourism destinations compared to, for example, the countries of the Mediterranean Sea. These countries attract the most tourists thanks to their natural and cultural attractions. Although there are differences between countries, Hungary and the Czech Republic, do not have significant high mountains. However, natural capital also needs to be promoted effectively and used sustainably. However, in many cases, this is replaced by other cultural attractions and the capital cities' attendance. Therefore, to a certain extent, the given set can be considered homogeneous, at least from a geographical and cultural point of view. However, natural capital also needs to be promoted effectively and used sustainably.

We must evaluate the increase in efficiency in all countries very positively, which is very important from an economic point of view and sustainability. Inefficient

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

use of resources leads to waste and, subsequently, to worsened economic results. Despite the enormously higher GDP generated by tourism, Austria cannot be considered the most efficient country, which is somewhat surprising. These revenues are also due to a higher rate of entry. Conversely, Poland, which employs a relatively high number of people in the tourism industry, achieves a relatively low GDP for these inputs, reflected in the efficiency results. Over-employment may result from significant investments that Poland has made in infrastructure and accommodation facilities, mainly thanks to the support of the European Structural Funds. However, these investments require some time to be reflected in economic benefits.

Comparing these countries using the DEA method showed us an important fact. Countries cannot be compared only to one or two indicators, but multi-criteria relationships must be understood. Only such a thorough comparison can provide a basis for implementing strategies and policies at the level of regions, states and political groups.

Acknowledgement
This research was supported by the National Research VEGA 1/0338/22,VEGA 1/0240/20, KEGA 035EU-4/2022

Bibliography

1. Ahn, T., Charnes, A., & Cooper, W. W. (1988). Some statistical and DEA evaluations of relative efficiencies of public and private institutions of higher learning. Socio-Economic Planning Sciences, 22(6), 259–269. https://doi.org/10.1016/0038-0121(88)90008-0
2. Assaf, A. G. (2012). Benchmarking the Asia Pacific tourism industry: A Bayesian combination of DEA and stochastic frontier. Tourism Management, 33(5), 1122–1127. https://doi.org/10.1016/j.tourman.2011.11.021
3. Assaf, A. G., & Josiassen, A. (2012). Identifying and Ranking the Determinants of Tourism Performance: A Global Investigation. Journal of Travel Research, 51(4), 388–399. https://doi.org/10.1177/0047287511426337
4. Barros, C. P., Botti, L., Peypoch, N., Robinot, E., Solonandrasana, B., & A., G. A. (2011). Performance of French destinations: Tourism attraction perspectives. Tourism Management, 32(1), 141–146. https://doi.org/10.1016/j.tourman.2010.01.015
5. Čabinová, V., & Onuferová, E. (2019). Efficiency and Financial Performance Evaluation of the Medical Spa Sector: An Empirical Study from Slovakia. QUALITY MANAGEMENT, 20(172), 8.
6. Charnes, A., Cooper, W. W., Lewin, A. Y., & Seiford, L. M. (2013). Data Envelopment Analysis: Theory, Methodology, and Applications. Springer Science & Business Media.
7. Cooper, W. W., Seiford, L. M., & Tone, K. (2007). Data Envelopment Analysis: A Comprehensive Text with Models, Applications, References and DEA-Solver Software (2nd ed.). Springer US. //www.springer.com/la/book/9780387452814
8. Corne, A. (2015). Benchmarking and tourism efficiency in France. Tourism Management, 51, 91–95. https://doi.org/10.1016/j.tourman.2015.05.006
9. Eurostat. (2022). Database—Eurostat. https://ec.europa.eu/eurostat/data/database
10. Färe, R., Grosskopf, S., Lindgren, B., & Roos, P. (1994). Productivity Developments in Swedish Hospitals: A Malmquist Output Index Approach. In A. Charnes, W. W. Cooper, A. Y. Lewin, & L. M. Seiford, Data Envelopment Analysis: Theory, Methodology, and Applications (pp. 253–272). Springer Netherlands. https://doi.org/10.1007/978-94-011-0637-5_13

11. Farrell, M. J. (1957). The Measurement of Productive Efficiency. Journal of the Royal Statistical Society. Series A (General), 120(3), 253. https://doi.org/10.2307/2343100
12. Ilić, I., & Petrevska, I. (2018). Using DEA method for determining tourism efficiency of Serbia and the surrounding countries. Menadzment u Hotelijerstvu i Turizmu, 6(1), 73–80. https://doi.org/10.5937/menhottur1801073I
13. Lozano, S., & Gutierrez, E. (2011). Efficiency analysis of EU-25 member states as tourist destinations. International Journal of Services Technology and Management, 15(1/2), 69. https://doi.org/10.1504/IJSTM.2011.038663
14. Martín, J. C., Mendoza, C., & Román, C. (2017). A DEA Travel–Tourism Competitiveness Index. Social Indicators Research, 130(3), 937–957. https://doi.org/10.1007/s11205-015-1211-3
15. Matijová, M., Onuferová, E., Rigelský, M., & Stanko, V. (2019). Impact of Selected Indicators of Tourism Capacity and Performance in the Context of the Unemployment Rate in Slovakia. Journal of Tourism and Services, 10(19), 1–23. https://doi.org/10.29036/jots.v10i19.95
16. Nurmatov, R., Fernandez Lopez, X. L., & Coto Millan, P. P. (2021). Tourism, hospitality, and DEA: Where do we come from and where do we go? International Journal of Hospitality Management, 95, 102883. https://doi.org/10.1016/j.ijhm.2021.102883
17. Pablo-Romero, M., Sánchez-Braza, A., & Sánchez-Rivas, J. (2017). Relationships between Hotel and Restaurant Electricity Consumption and Tourism in 11 European Union Countries. Sustainability, 9(11), 2109. https://doi.org/10.3390/su9112109
18. Peypoch, N., & Solonandrasana, B. (2008). Aggregate Efficiency and Productivity Analysis in the Tourism Industry. Tourism Economics, 14(1), 45–56. https://doi.org/10.5367/000000008783554794
19. Prorok, V., Šerić, N., & Peronja, I. (2019). Analysis of Overall and Pure Technical Efficiency of Tourism in Europe. Transactions on Maritime Science, 8(2), 219–229. https://doi.org/10.7225/toms.v08.n02.007
20. Radovanov, B., Dudic, B., Gregus, M., Horvat, A. M., & Karovic, V. (2020). Using a Two-Stage DEA Model to Measure Tourism Potentials of EU Countries and Western Balkan Countries: An Approach to Sustainable Development. Sustainability, 12(12). https://doi.org/10.3390/su12124903
21. Ripoll-Zarraga, A. E., & Raya, J. M. (2020). Tourism indicators and airports' technical efficiency. Annals of Tourism Research, 80, 102819. https://doi.org/10.1016/j.annals.2019.102819
22. The World Bank. (2021). World Bank Open Data. https://data.worldbank.org/

Correspondence address:
doc. Ing. Roman Lacko,PhD., University of Economics in Bratislava, Faculty of Commerce, Department of Tourism, Dolnozemská cesta 1/b, 852 35 Bratislava, Slovakia. email: *roman.lacko@euba.sk*
ORCID: https://orcid.org/0000-0002-5801-1998

Ing. Pavol Andrejovský, PhD., University of Economics in Bratislava, Faculty of Business Economics with seat in Košice , Department of Economy,Tajovského 13, 04 001 Košice, Slovakia. email: *pavol.andrejovsky@euba.sk*
ORCID: https://orcid.org/0000-0002-3210-1821

doc. RNDr. Zuzana Hajduová, PhD., University of Economics in Bratislava, Faculty of Business Management, Department of Corporate Finance, Dolnozemská cesta 1/b, 852 35 Bratislava, Slovakia. email: *zuzana.hajduova@euba.sk*
ORCID: https://orcid.org/ 0000-0002-9381-776X

DEVELOPMENTS OF FDI FOR SLOVAKIA AND HUNGARY

Vivien PÁSZTÓOVÁ

Department of Economics, Faculty of Economics and Informatics,
J. Selye University in Komárno, Slovakia

Noémi FÓTHY

Department of Economics, Faculty of Economics and Informatics,
J. Selye University in Komárno, Slovakia

Received: 09. January 2022 *Reviewed: 28. February 2022* *Accepted: 03. March 2022*

Abstract

International buying and selling plays a key role in the development of the world economy and countries. There are several ways to boost a country's economy, such as by the inflow of capital from abroad. In addition to increasing efficiency and competitiveness, it brings knowledge, competences and technologies that have not been present in the host country earlier, and they can add novel elements to the local economy, allowing them to move upwards in their development trajectory. At the time of privatization, foreign investment was a key type of capital investment, as it played a role in issues referring to the structure of the market and in the development of a market economy. As in many other economies, in the Slovak and Hungarian economies that were undergoing regime change, foreign investment has been significantly contributing to effective economic change. Through foreign capital investment, both countries have embarked on the path of economic development and continued to reap the benefits of incoming capital sources to this day. The aim of this study is to learn about the theoretical background of the impact of FDI on countries. In addition, the paper aims to compare the international perception of the economic situation of Slovakia and Hungary and to examine how FDI inflow has changed in the recent period in both countries. Our research is based on secondary data obtained from the UnctadSTAT database and from the Fraser Institute comparison, plotting and analysing the obtained data through graphs. The analysis of data from a ten-year interval revealed some surprising findings in the case of both countries, but the complexity of the studied area leaves room for further questions to be answered.

Keywords: *foreign direct investment, macroeconomics, Slovakia, Hungary*

JEL Classification: E22, F16, F62

Introduction and theoretical background

Globalisation can be seen as a driver of trade, export and import activity between countries. In the spirit of competitiveness, a sales relationship is established between countries, which brings along the improvement of the economic situation

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

and the appearance of foreign investors and international companies on domestic markets. The target countries can benefit from a number of advantages through foreign investment. These are primarily capital and new investment flowing into the host country, reforming of the corporate and institutional environment, playing a role in the development of macroeconomic indicators and the development of an effective economic system. Over the past few decades, central and eastern European countries, including Slovakia and Hungary, have undergone similar processes due to their similar historical and cultural backgrounds. These countries are not only close to each other in geographical terms, but also have the same economic structure and similar infrastructure. For this reason, they are significant competitors in terms of foreign capital investments (Mura & Zsigmond & Machová, 2021). Since the 1990s, a strong wave of foreign investment has started, which has also had an impact on the restructuring of the countries concerned (Kalotay, 2010). After the change of regime, in both countries there was a significant need for foreign investment, which unfolded when they joined the European Union in 2004 and became a significant part of the economy. The geographical location of the countries is an advantage that can be exploited, as the location between East and West hides several opportunities to be exploited from the point of view of buying and selling (Sőreg, 2019). After the change of regime in Central and Eastern Europe, foreign capital flows were considered decisive, which also determined the direction and pace of development in the two countries (Gál & Fazekas, 2021).

In the case of post-communist countries, inflows from abroad have played an important role at both national and regional levels (Sipikal, 2010). Foreign Direct Investment (FDI) involves the relocation of a company's activities and specific processes from home to abroad (Acs et al., 2007). The growth and volume of foreign investment is mainly influenced by the potentially attractive business environment for investors in the host countries (Fifeková & Nemcová, 2015). Foreign capital investment is long-term and has an impact on the economic development and speed of the host country (Fabuš & Csabay, 2018). They enrich the target country with many advantages and involve great duty (Rodionova & Yakubovskyi & Kyfak, 2019). Investors do not change their minds unexpectedly, unlike short-term investments, as well as types of investments that are more resilient to crisis situations (Götz et al., 2018). Attracting foreign direct investment is the main objective of emerging economies (Hampl & Havranek & Irsova, 2020). In addition to investing in material goods, they provide the host countries with various forms of know-how transfers, bringing managerial and marketing specificities and novel production processes to the destination country. An economy can reap the benefits of FDI if it is willing to deepen and use its capacities to absorb foreign capital (Almfraji & Almsafir, 2014; Kostownians, 2016). The evolution of unemployment and employment varies periodically and differently from the type of capital from abroad (Strat & Alexandru & Vass, 2015).

The continuous growth of FDI has allowed the emergence of non-existent industrial sectors. In the countries of Central Europe, the automotive industry is worth mentioning. Slovakia has undergone a radical change due to the influence of the West. Between 2004 and 2008, Slovakia's imports ranged from 67.6% to 73%, and its exports to Europe ranged from 85.2% to 86.8%. Leaving the economic crisis of 2009 behind, foreign capital has been constantly flowing to the country, which has also positively affected the efficiency of work (Rajnoha et al., 2018). Since 2009, the official currency of the country has been the euro, from the introduction of which residents expected positive changes in terms of buying and selling abroad (Šeben et al., 2019). The country's GDP and employment rate have also risen. Slovakia's most important

foreign investor from the west is the Netherlands, Germany and Australasia. In terms of investment, the western part of the country has been the most favorable and most successful, as it has a well-developed infrastructure. The cities of Nitra and Galanta are home to companies with foreign capital (Táncošová, 2019). The beneficial effect of FDI on regional unemployment can be illustrated through a concrete example, when the opening of a Samsung plant in Galanta resulted in a significant decrease in unemployment in the district and in the surrounding regions. The investment of the corporation has had a significant impact on employment, and the same trend applies to neighbouring areas where a large foreign company of similar importance has invested. Foreign capital promotes the development of the Slovak economy and favors certain regions of the country (Dudáš, 2013; Minarčík, 2009).

After the change of regime, Hungary proved to be an FDI-focused country, and since 1991 it received a significant amount of FDI, except for the period between 2015 and2016 (Tőkés, 2019). Hungary was the first country in Central Europe to be open to foreign investment. In 2000, the number of foreign capital investments was higher than in any other Visegrad country. It ceased to be the primary receiver of FDI in the region in the years 2009 and 2010 (Sass, 2004). To this day, the country still has a prominent position in terms of working capital inflows from abroad, which is also recognized in international comparison. FDI success is also the result of the failure of domestic companies. The change of regime also meant the failure of domestic companies, which facilitated the expansion of foreign companies (Sass & Kalotay, 2012). Hungary, like the other Visegrad countries, focused primarily on supply chains and the automotive sectors, primarily to attract FDI in Germany. Initially, foreign investors benefited from privatization, then greenfield investments became increasingly important (Bohle & Regal, 2021). FDI projects in the electronics sector proved attractive, towards which Hungary took the first step, Slovakia joined only later (Antalóczy & Sass, 2001). Hungary's FDI share in GDP is high (67%), which proves both its integration with EU economies and its dependence on international companies abroad. In Slovakia, this FDI share is much lower. Nevertheless, as far as the manufacturing sector is concerned, the shares of foreign subsidiaries in Slovakia (80%) and Hungary (70%) are very high. Hungary's most developed counties are in Central Hungary, Western Transdanubia and Central Transdanubia, and the foreign capital stock per capita is also highest in these regions. The backward regions of the country are in Eastern Hungary and South Transdanubia, where there is a shortage of foreign investment (Gál, 2019).

Government provisions affecting FDI

The regions that attract foreign investors and investment the most are those that provide the lowest investment costs, thereby providing opportunities to make higher profits and reduce risks. Certain regions and countries may offer more benefits to investors, preferring investment opportunities (Dorozynski & Kuna-Marszalek, 2016). The legal and institutional conditions of a country significantly affect foreign investors. Research suggests that a country's tax policy is one of the key factors for investors (Edwards & Newton, 2016). A simple tax system can increase the amount of foreign investment flowing into the country (Van Parys & James, 2010). Based on Kłysik-Uryszek (2011), among the most relevant conditions are:

1. economic, political, and social stability, level of corruption, security, legal and administrative regulations
2. the existence of state aid, investment incentives, discounts for investors
3. market competition, risk of entry, operational requirements
4. the existence and efficiency of institutions supporting investors, the efficiency of state administration, the business environment.

The countries studied, Hungary and Slovakia, have been member states of the European Union since 2004, which significantly facilitated foreign capital inflows into the countries (Tintin, 2013). In addition to various investment incentives, the countries that most effectively attract foreign investors have a stable, predictable political system and business environment. In addition, reliable state institutions are built that support foreign investors (Bobenič Hintošová et al, 2021).

In the case of Hungary, a specialized agency helps foreign investors, the National Investment Agency (HIPA), which is managed by the Ministry of Foreign Affairs and Trade. The Hungarian market is divided into eight sectors: automotive, business service centers, electronics industry, information and communication technology, food industry, life sciences, logistics and transportation, renewable energy and medical technology (Gáspár-Szilágyi, 2019). In terms of legal regulations, Hungary has adopted an independent law that helps screen foreign investments. Under the Hungarian Law LVII of 2018, investors operating in sensitive sectors are obliged to declare their activities to the competent Hungarian minister. Based on the declaration, the relevant minister checks whether the investment affects the security interests of Hungary (LVII of 2018). The country offers the following investment incentive discounts:

- tax benefits,
- cash grants,
- low-interest loans,
- obtaining free or preferential land.

Hungary offers foreign investors an income tax discount for 13 years after the completion of the investment, which can reach 80% of the amount to be paid (Kotlíková & Blaschke, 2020).

In Slovakia, Law No 57/2018 on regional investment aid regulates the support of foreign investors who want to do business in the country. The country offers the following investment incentives, mainly aimed at promoting regional development (Kotlíková & Blaschke, 2020):

- support for the acquisition of tangible and intangible assets,
- income tax benefit,
- contribution to newly created jobs,
- transfer or rental of immovable property at a price lower than its actual value.

There are several types of comparisons for assessing the economy of each country. The Economic Freedom Index is determined each year by the Fraser Institute. The index ranks countries based on 5 areas: The size of the government; Legal system and security of property rights; Sound money; Freedom to Trade Internationally; Regulation. The data required for comparison are obtained from a secondary source, so they support the statement with objective data (fraiserinstitute.org).

Material and methods

The aim of the study, based on secondary research, is to examine the development of foreign capital in the context of two neighbouring countries, Slovakia and Hungary. First, the findings of previous papers on the topic were presented, which establishes the theoretical background of the researched problem area. Then, the concept of foreign working capital and its importance for the economic development of countries was discussed. Based on earlier published papers, this study also presents the gradual development of FDI in both countries. We were primarily looking for an answer to the question of how the international image of the two chosen countries has

developed in the last ten years. To answer this, we used a secondary source, a ranking published by the Fraser Institute. The institute uses secondary data, including analyses published by Ease of Doing Business and Doing Business, to compare the economic environment of each country in five areas. Comparative data are presented in the form of tables, and a descriptive analysis is made. The current FDI situation in the countries studied is illustrated through graphs along with their explanation. The presented findings come from secondary research. The corresponding data were extracted from the database published by Unctad STAT. The period under review is a ten-year interval, which falls between 2011 and 2021. For transparency and easier interpretation, the data are also shown in graphs. The main benefit of the secondary research is a current summary, displayed in the form of figures, which present the development of foreign capital investments in Slovakia and Hungary over the past ten years.

Research Results

The Fraser institute is a Canadian organization that compares the economic freedom of each country every year. The table below illustrates the rankings of Hungary and Slovakia in the period 2011-2020.

Table 1 Evolution of the economic freedom indicator

Year		Country	
		Hu	Sk
2011	Economic Freedom Summary Index	7,61	7,70
	Rank	34	30
2012	Economic Freedom Summary Index	7,58	7,63
	Rank	37	31
2013	Economic Freedom Summary Index	7,51	7,61
	Rank	43	35
2014	Economic Freedom Summary Index	7,60	7,70
	Rank	44	35
2015	Economic Freedom Summary Index	7,48	7,54
	Rank	50	46
2016	Economic Freedom Summary Index	7,61	7,62
	Rank	45	44
2017	Economic Freedom Summary Index	7,55	7,61
	Rank	47	43
2018	Economic Freedom Summary Index	7,49	7,62
	Rank	52	45
2019	Economic Freedom Summary Index	7,51	7,61
	Rank	53	46
2020	Economic Freedom Summary Index	7,24	7,33
	Rank	57	54

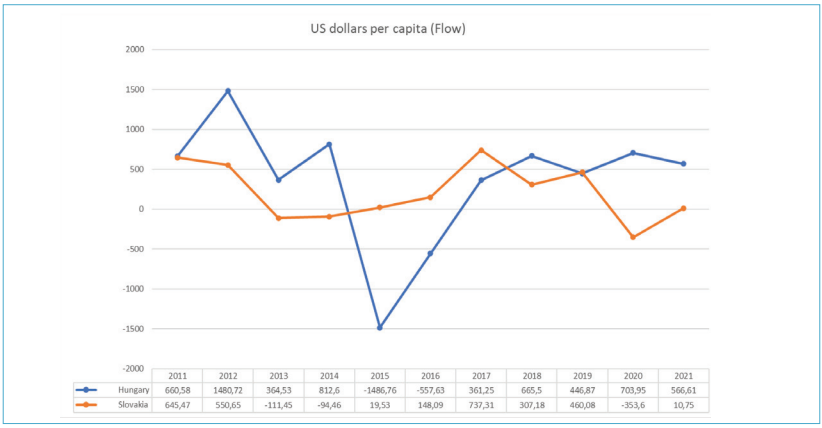
Source: fraserinstitute.org

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

Based on the data in the table, it can also be said that in 2011 both countries were ranked higher by the organization compared to 2020: Hungary slipped 13 places in total in the ranking issued by the Institute, while Slovakia fell back14 places. According to the statement, Slovakia has a more advantageous business environment for investors than Hungary throughout the period under review. In 2013, Hungary was transferred to the 2nd Quartile of countries from the group of countries with the freest economies, and in 2015 Slovakia was also downgraded to the same category. Both countries have achieved the most visible deteriorations in the categories examined by the Institute in the last 10 years in the Sound Money and Regulation categories. Factors in the Sound Money category include the rate of inflation, the amount of money the country holds, and the possibility of owning a foreign currency bank account within the country. The factors in the Regulations category are borrowing provisions, labour market provisions and business start-up provisions.

In the next part of the research, the actual development of foreign investment was analysed. For this purpose, data from secondary sources were used, namely data from UnctadStat. The graph below illustrates how the amount of FDI flow per capita developed in each country in the period 2011-2021, shown in US dollars. The per capita breakdown was necessary because, due to the size differences between the two countries, it would not give an accurate picture just to compare the amount of capital inflow.

Figure 1: FDI flow per capita (US dollars)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Hungary	660,58	1480,72	364,53	812,6	-1486,76	-557,63	361,25	665,5	446,87	703,95	566,61
Slovakia	645,47	550,65	-111,45	-94,46	19,53	148,09	737,31	307,18	460,08	-353,6	10,75

Source: own edit based on Unctad STAT data

The comparison of the data shows that Slovakia had a negative or lower FDI flow in the period from 2013 to 2016, with the highest number of foreign investments coming in in2017, followed by another low in 2020. The evolution of FDI per capita is much more diverse in Hungary. In 2012, the country received the largest amount of foreign investment, namely 1,480.72 dollars per person, but in 2015 the country recorded a record negative value, the value of FDI flow was -1,486.76 dollars per person.

Conclusion

The aim of the study was to get an idea of the economic perception of Slovakia and Hungary abroad, and of the development of the volume of foreign investments over the last 10 years. Hungary and Slovakia share a common history, similar economic and political structures and cultural backgrounds. Throughout history, they have been parts of the Austro-Hungarian Monarchy, then belonged to the Soviet Block, and now both are member states of the European Union and of the Visegrad Four. FDI became available to individual countries after the regime change, but in the first few years, during the privatization, FDI did not automatically bring along the creation of new jobs.. However, until the economic downturn of 2008, several greenfield investments had already been established in the region, and Hungary received the most of FDI. Each country can offer different incentives for investors to attract them into their country. In Hungary, a state institution deals with direct assistance for investors, but at the same time it has to report on its activities to individual ministries. Both countries offer tax breaks and cheap loans to investors, mainly to support entrepreneurship in certain regions.

Relying on secondary sources, namely the ranking prepared by the Fraser Institute, the international image of Hungary and Slovakia was evaluated for the period 2011-2020. There were changes in the ranking of both countries, with Slovakia having been downgraded in 2015 and Hungary in 2013 into the category of countries offering a less favourable economic environment.

In addition, based on secondary data, we compared the amount of FDI per capita flowing into the two countries in the period 2011-2021. Based on the data obtained, it can be stated that both countries are popular among foreign investors. In the case of Slovakia, the lowest FDI amount was received in 2020, and the country also reported a negative bottom line in terms of FDI in 2012. There have been significant fluctuations in Hungary as well. , While the highest amount of FDI arrived in the country in 2012, the FDI inflow was recorded in 2015.

Bibliography

1. Acs, Z. , J., O'Gorman, C. , Szerb, L. & Terjesen, S. (2007). Could the Irish Miracle be Repeated in Hungary? Small Business Economics, 28, p. 123-142. DOI 10.1007/s11187-006-9027-9
2. Almfraji, M.A., Almsafir, M. K. (2014). Foreign direct investment and economic growth literature review from 1994 to 2012. Procedia – Social and Behavioural Sciences, 129, pp. pp. 206–213. https://doi.org/10.1016/j.sbspro.2014.03.668
3. Antalóczy, K., Sass, M. (2001). Greenfield investments in Hungary: Are they different from privatization FDI? Transnational Corporations, 10(3), pp. 39-59. ISSN 1014-9562.
4. Bobenič Hintošová, A., Sudzina, F., Barlašová, T. (2021). Direct and Indirect Effects of Investment Incentives in Slovakia. Journal of Risk and Financial Management, 14, pp. 56. https://doi.org/ 10.3390/jrfm14020056
5. Bohle, D., Regan, A. (2021). The Comparative Political Economy of Growth Models: Explaining the Continuity of FDI-Led Growth in Ireland and Hungary. Politics & Society, 49(1), pp. 75–106. https://doi.org/10.1177/0032329220985723
6. Dorożyński, T., Kuna-Marszałek, A. (2016). "Investments Attractiveness. The Case Of The Visegrad Group Countries," Comparative Economic Research, Sciendo, 19(1), pp. 119-140.

7. Dudáš, T. (2013). Vplyv Prílevu Priamych Zahraničných Investícií na nezamestnanosť na Slovensku. Medzinárodné vzťahy, 11(11), pp. 22-32. ISSN 1339-2751 (online).
8. Edwards, J., Newton, S. (2016). Enhancing regulatory, financial, fiscal investment incentives as a means of promoting foreign direct investment. Analyzing the Relationship between Corporate Social Responsibility and Foreign Direct Investment, pp. 191–201.
9. Fabuš, M., Csabay, M. (2018). State aid and investment: case of Slovakia. Entrepreneurship and Sustainability Issues, Entrepreneurship and Sustainability Center, 6(2), pp. 480-488.
10. Fifeková, E., Nemcová, E. (2015). Impact of FDI on Economic Growth: Evidence from V4 Countries. Periodica Polytechnica Social and Management Sciences, 23(1), pp. 7–14. https://doi.org/10.3311/PPso.7993
11. Gál, Z. (2019). The role of FDI in the territorial differentiation of economic growth and investments in Hungary. Economic Review, 61, pp. 653-686.
12. Gál, Z., Fazekas, G. (2021). The specifics of Asian direct investment in the Visegrad countries: the relationship between investment strategies and productivity. Territorial Statistics, 61(1), pp. 105-130.
13. Gáspár Szilágyi, Sz. (2020). Country Report on Hungary and Romania (September 15, 2019). Forthcoming, Hindelang and Moberg (eds), A Common European Law on Investment Screening. Springer, http://dx.doi.org/10.2139/ssrn.3527586
14. Götz, M., Jankowska, B., Matysek-Jedrych, A. & Mroczek-Dabrowska, K. (2018). Governmental Change and FDI Inflow to Poland and Hungary in 2010-2016. Entrepreneurial Business and Economic Review, 6(1), pp. 153-173. DOI: 10.15678/EBER.2018.060109
15. Hampl, M. , Havranek, T. , Irsova, Z. (2020). Foreign Capital and Domestic Productivity in the Czech Republic: A Meta-Regression Analysis. Applied Economics, 52(18), p. 1949-1958.
16. Kalotay, K. (2010). Patterns of inward FDI in economies in transition. Eastern Journal of European Studies, 1(2), p. 55-76.
17. Kłysik-Uryszek, A. (2011). Gospodarcze Efekty Napływu Bezpośrednich Inwestycji Zagranicznych Do Regionu, [in;] Janusz Świerkocki (ed.), Rola Bezpośrednich Inwestycji Zagranicznych W Kształtowaniu Aktualnego i Przyszłego Profilu Gospodarczego Regionu Łódzkiego, Łódzkie Towarzystwo Naukowe, Łódź.
18. Kostownians, A. (2016). Verification of the Relationship between FDI and GDP in Poland. Acta Oeconomica, 66(2), p. DOI 307-332: 10.1556/032.2016.66.2.6
19. Kotíková, S., Blaschke, P. (2020). Investment Incentives in Countries of the Visegrad Group. MAGNANIMITAS, 2020-06-08T09:46:27Z. ISSN 2464-6733. doi:10.33543/0902
20. Minarčík, P. (2009). Zahraničný kapitál v elektrotechnickom priemysle na Slovensku. GEOGRAPHIA CASSOVIENSIS, 3, pp. 116-121.
21. Mura, L., Sigismund, T., Machová, R. (2021). The effects of emotional intelligence and ethics of SME employees on knowledge sharing in Central-European countries. Oeconomia Copernicana, 12(4), pp. 907–934. https://doi.org/10.24136/oc.2021.030
22. Rajnoha, R. , Merková, M. , Dobrovič, J. & Rose, Z. (2018). Business Performance Management and FDI: Key Differences between Foreign and Domestic-owned Firms – A Case of Slovakia. Journal of Business Economics and Management, 19(1), p. 42-62. ISSN 1611-1699/eISSN 2029-4433. https://doi.org/10.3846/jbem.2018.1538

23. Rodionova, T. , Yakubovskyi, S. O., Kyfak, A.O. (2019). Foreign Capital Flows as Factors of Economic Growth in Bulgaria, Czech Republic, Hungary and Poland. Research in World Economy, 10(4), doi:10.5430/rwe.v10n4p48
24. Sass, M. (2004). FDI in Hungary: The first mover's advantage and disadvantage. EIB Papers, 9(2), pp. 62-90. ISSN 0257-7755.
25. Sass, M., Kalotay, K. (2012). Inward FDI in Hungary and its policy context. Vale Columbia Center on Sustainable International Investment, https://doi.org/10.7916/D89S2083
26. Šeben, Z. , Korcsmáros, E., Machová, R., & White, L. (2019). Slovak Experience After 10 Years from the Introduction of the Euro as Globalization Factor. In: Globalization and its socio-economic consequences: sustainability in the global-knowledge economy: 19th international scientific conference: [conference proceedings]: sustainability in the global-knowledge economy: 19th international scientific conference: [conference proceedings]. Tomáš Klieštik. Žilina: Žilinská univerzita v Žiline, online, s. [1-8]. doi 10.1051/shsconf/20207406027
27. Sipikal, M. (2010). Concentration of FDI and regional disparities - The role of regional policy. Jönköping, Sweden: 50th Congress of the European Regional Science Association: "Sustainable Regional Growth and Development in the Creative Knowledge Economy. p. 19-23.
28. Sőreg, K. (2019). Growth slowdowns and the theory of dependent market economies in central and eastern Europe – Hungary economic growth in the light of the visegrad group's development path. Foreign Affairs Workshop, 1, pp. 20-43.
29. Strat, V.A., Alexandru, A. D., Vass, A. M.P. (2015). FDI and The Unemployment - A Causality Analysis for The Latest EU Members. Procedia Economics and Finance, 23, p. 635-643. doi: 10.1016/S2212-5671(15)00448-7
30. Táncošová, J. (2019). The Role of Foreign Direct Investment in the Economy of Slovakia. Entrepreneurship and Sustainability Issues, 6(4), p. 2127-2135. ISSN 2345-0282 (online). http://doi.org/10.9770/jesi.2019.6.4(40)
31. Tintin, C. (2013). The determinants of foreign direct investment inflows in the Central and Eastern European Countries: The importance of institutions. Communist and Post-Communist Studies, 46, pp. 287–98.
32. Mallard, L. (2019). The cyclical behavior of foreign working capital flowing into Hungary. Statistical Review, 97(4), pp. 387-408. DOI: 10.20311/stat2019.4.hu0387
33. Van Parys, S. , James, S. (2010). The effectiveness of tax incentives in attracting investment: Panel data evidence from the CFA Franc zone. International Tax and Public Finance, 17, pp. pp. 400–29.
34. Act LVII of 2018 on the control of foreign investments that harm the security interests of Hungary. Magyar Közlöny, Issue 157, 11 October 2018https://net.jogtar.hu/jogszabaly?docid=a1800057.tv
35. Fraiser Institute database, online, https://www.fraserinstitute.org/economic-freedom/approach [cit. 04.06.2022]
36. UnctadSTAT database, online, https://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_ChosenLang=en [cit. 02.06.2022]

Correspondence address:

Mgr. Noémi Fóthy, PhD. Student, Department of Economics, Faculty of Economics and Informatics, J. Selye University, Bratislavská cesta 3322, 945 01 Komárno, Slovakia, email: *120318@student.ujs.sk*
ORCID: https://orcid.org/0000-0003-4313-241X

Mgr. Vivien Pásztóová, PhD. Student, Department of Economics, Faculty of Economics and Informatics. J. Selye University, Bratislavská cesta 3322, 945 01 Komárno, Slovakia,
email: *123756@student.ujs.sk*
ORCID: https://orcid.org/0000-0003-0600-2384

QUO VADIS, MANAGEMENT CONSULTING?

József POÓR

Department of Management, Faculty of Economics and Informatics,
J. Selye University in Komárno, Slovakia

Zsuzsanna SZEINER

Department of Management, Faculty of Economics and Informatics,
J. Selye University in Komárno, Slovakia

Zoltán SZIRA

Institute of Agriculture and Food Economics
Hungarian University of Agriculture and Life Sciences, Gödöllő, Hungary

Erika VARGA

Institute of Rural Development and Sustainable Economy
Hungarian University of Agriculture and Life Sciences, Gödöllő, Hungary

Received: 22. February 2022 *Reviewed: 10. April 2022* *Accepted: 15. April 2022*

Abstract

This article aims to provide a detailed and comprehensive presentation of the field of management consulting. The history of management consulting begins at the time of the first industrial revolution, and since then, it has been one of the most prosperous industries and professions. Business life today is unthinkable without consultants. The paper presents the traditional and new reasons for employing consultants. It describes the most critical factors and global trends affecting the development and evolution of management consulting. Our study covers regional specificities and consulting trends in Central and Eastern Europe, focusing on Slovakia based on secondary data by reviewing and synthesizing the most recent literature.

Keywords: *management consulting, history, development*

JEL Classification: M10, M19

Introduction

Few professions in the world have been labelled with as much criticism and enthusiasm as management consulting during the last few years, both within our national borders and beyond.

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

Various consultants' jobs are frequently compared to exceptional "medical diagnostics" or "innovators" who are not afraid to try novel ideas.

Negative connotations of failed projects, on the other hand, draw attention to the shortcomings and challenges of this field. Consultants' work, like that of any other profession, is marked not only by success and considerable advancement but also by a variety of negative stereotypes: "charlatan," "quack," "jobless leader," and "success-seeking psychologist."

In some ways, the above assertions are correct, yet they do not adequately describe the essence of consulting. We do not find many encouraging notes in the literature regarding internationalization and globalization. The major consulting companies, which are now being reduced into the "Big Four", operate as "relationship development and orientation" agencies in this sector.

These popular or negative connotations in consulting are frequently connected to the fact that the general public is unaware of the consulting profession's essential qualities and added value and its genuine relevance.

The purpose of the present paper is to shed some light on the current and future trends in management consulting based on the most relevant literature sources we found in connection with the topic. It is worth mentioning that the paper is a review article by nature, summarising the sources that have made a significant contribution to the profession and drawing the most relevant conclusions.

Theoretical background

Let us get acquainted with the consulting terms below. The analysis of the work of different authors (Kubr, 1996; Schein, 2002; Biech, 2007; Kipping & Clark, 2012; Niedereichholz & Niedereichholz, 2012; Brooks & Edwards, 2014) indicates that consulting, in general, is like a kind of human assistance. In this process, some ask for help, while others assist. In agreement with the authors mentioned above, only targeted professional or public interest assistance, information, and recommendation can be considered for consulting regarding our subject.

About consulting

Apart from semantic and stylistic distinctions, there are two primary groups for the fundamental concept of consulting (Kubr, 1996; Markham, 1999; Kipping-Clark, 2012): the ability to provide assistance and organizational level help.

Authors who consider that any action or function aimed at offering assistance (including problem identification and problem solutions) falls under the consulting category belong to one of two groups. According to this interpretation, consulting can be delivered not just by an external, independent person but also by an internal organizational unit or individual. The consultant (counselor) and the individual seeking assistance (client) build a unique relationship during the consulting process. It is as vital to understand the consultant-client relationship as it is to understand the client's concerns in the consulting process. Consulting also necessitates the client's willingness. The reciprocity, the cooperative and adaptive character of the consulting activity, and the necessary personality attributes of the stakeholders participating in the process are all emphasized in this approach.

According to the other group, consulting is a professional service that can only be performed if certain conditions are met (e.g., legal, financial, and organizational

independence, as well as sufficient professional skills and competencies) (Greiner-Metzger, 1983). "Consulting is nothing more than what others decide to implement", Wesel (2013: 20) states emphatically. In support of this viewpoint, Kubr (1996: 3) quotes the Management Consultancy Handbook, which is available at practically every consulting company, and recommends the following notion concerning consulting:

"Consulting is a professional service provided to organizations and their managers by external (e.g., consulting firms) or internal (e.g., internal consultancy) service providers to help organizations achieve their goals, identify and solve problems, identify new opportunities, skills, and change."

About consultants

Given the preceding, the consultant is a specialist with appropriate professionalism and objectivity in management/leadership issues who perform activities that include identifying and analysing problems and opportunities, developing solutions, and assisting with implementation, although without direct authority, right of instruction to introduce and implement proposed changes.

Based on the work described above, consultants can be classified into the following three major groups (Table 1).

- Expert consultants propose solutions based on their expertise and experience, convince the customer of their correctness, and assist in implementation. For a long time, it was only the expert character that dominated the work of the consultants.
- Process consultants help their clients find solutions they can implement by stimulating and facilitating the creativity of the client's employees. Process consultants often deliver their services through interaction that requires team and individual collaboration.
- Inquiry consultants, the relationship becomes more personal and direct, rather than purely professional. All this leads to a new model of consulting, i.e., inquiry consulting, which responds to the challenges of a complex and uncertain environment.

Table 1 Different consulting models

Consultant Emphasis	The Advice Model	The Process Model	The Inquiry Model
What is the consultant's task?	Solve problem	Solve problem	Achieve the client's desired outcome
What should the relationship between consultants and clients be?	Consultant transfers or delivers knowledge to client	Consultant and client work together on human relationships and organization dynamics	Consultant and client are partners on technical and social/ human dimensions of change
Who is the expert?	Consultant is an expert who brings knowledge and best practices	Consultant is a „helper" or process expert	Client and consultant each bring different types of expertise to bear on achieving the outcome
How should the client's capacity be increased?	Transfer knowledge in the form of product or service	Help clients learn to work together more effectively	Client and consultant co-create knowledge needed to achieve the outcome

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

How much attention should the consultant give to the uniqueness of each client organization or community?	Low (knowledge transferable across contexts)	High →	High

Source: Brooks, A. K., and Edwards, K. (2014, p. 19.)

Specific features of consulting activities

There are several levels of relationship between the consultant and the client where different levels of added value can be achieved. Day (2004) distinguishes five levels of added value: commodity, product, adaptation service, proficiency, and profound transformation. In Markham's approach (1999: 2), consulting intervention can occur at four different levels:

- Information
- System planning
- Change
- Learning

Consulting is part of "knowledge-based services that can be bought and sold but cannot be dropped on your foot. … The service product is often intangible, hard to store and transport, and difficult to demonstrate in advance to potential clients." (Miles et al., 1999: 3). The following four specific features should be highlighted concerning such services:

- the crucial role of human capital and know-how,
- the high rate of intangible activities,
- diversity and standardized character,
- an intensive relationship between the customer and the service provider.

According to Drucker (2008), one of the knowledge industry's essential services is consulting, including domestic and international HR consulting.

Nowadays, it is noticeable that all three trends (experts, process, and inquiry) mentioned above are trying to learn from each other and translate each other's methods into their work.

Influencing factors of management consulting

Management or business consultancy (from now on referred to as consultancy) can look back upon nearly a hundred years of history. This profession was not born today (Kubr, 1996). As an independent venture, it was born in the US in the 1910s and 1920s. Today we can hardly find an area of business life that cannot be connected to consultancy business (Kipping & Clark, 2012).

- *Impact of the global financial crisis:* The global financial crisis at the end of the last decade highlighted the end of "shareholder capitalism" based on purely financial bases (Thomas et al., 2014). Our complex and unstable world today deserves more. There are many signs that a new phase of development of capitalism, "stakeholder capitalism", is emerging. The trends listed above non-exhaustively indicate a new era: special needs are put forward, which can affect different consulting work areas. Brooks and Edwards (2014) argue that due to the changes reported in the area of the nearly 150-year- old consulting, instead of the problem the result

orientation; instead of the expert work joint creation; instead of static, dynamic knowledge creation and instead of professional approach, personal relationships are in the limelight (Sturdy, 2011).

- *New digital area:* As a result of the new digital technologies, we have less and less expert work demanded, which doctors provide, lawyers, and among others, consultants. In their book, Richard and Daniel Susskind (2015) believe that new technologies far outweigh the human and expert performance of today's experience. The cited authors believe that new digital techniques will significantly transform the knowledge, use, and application of practice-oriented know-how. A similar opinion is echoed by Geffroy and Schulz (2015) in their work published in German. They believe that the process of generation change, the use of new digital technologies, networking, and speeding up processes transform companies and institutions significantly.
- *Emerging expectations of clients:* Fiona Czerniawska (2018), a well-known consulting author and consultant, has recently asked 100 major US companies about the type and character of consulting in the future. Ninety-one percent of the respondents indicated that it would be more convenient for them in comparison with the traditional one if consulting in the future would have the following features: "an on-going service, aimed at delivering a specific and concrete outcome, and involving a combination of software, data, and analytics, and consulting expertise".
- *Pandemic and unstable economic situation:* Management consulting industry, which is heavily dependent on travel and in-person meetings with clients, was severely hit by the Covid-19 pandemic. Like many professionals, consultants had to react and adapt quickly to continue to meet client needs during these times. The economic slowdown due to the pandemic has primarily impacted the revenues of consulting firms. Research institutes (consultancy.org, Source Global Research) estimate that the global management consulting industry witnessed a 19% loss in market value, amounting to lost revenue worth $30 billion in 2020.

All the abovementioned changes require the transformation of business consulting work and its education and training (Thomas et al., 2014). This transformation has a vital role in the new communication style, the use of digital tools, and the role of independent expert work (Ginevri & Trilling, 2017; Jimenez et al., 2017). The cited authors believe that the consultant does not have to be overwhelming; instead, a person who solves the different tasks of consulting work through expertise, focus, distinctive character, and perplexity (Schein, 2016).

In the process described above, the role of the consultant was completed by making recommendations. Today and perhaps soon, we are witnessing a revolutionary transformation in which the process of consulting work is being expanded. The characteristics of this new type of consulting work can be summarized as follows:

- *Professional Discussion:* The client becomes a consulting partner, sometimes knowing much more than what is described in traditional consulting.
- *Continuous communication:* The client wants to be kept updated with what is happening at their company and regularly consult with the consultant.
- *Client representatives are active participants in the project work:* The consultant is not alone; they work together to establish and implement the changes needed.
- *The client expects assurance:* The consultant's professional opinion is no longer almighty. The client expects professional facts and support to prove the consultant's suggestions.
- *Fast project work:* Time-consuming and long consulting work is a thing of the past.

- *Implementation is the key to success:* The best proposals can only be proven by successful implementation.
- *The client's active participation reduces the commission fee:* The client only wants to pay for the actual value. They try to eliminate all the unnecessary time spent and want to achieve a lower commission fee.

Reasons for consulting

Traditional drivers

Kubr (1996) lists five reasons why consulting is needed:

- helping organizations achieve their goals,
- solving management and business problems,
- identifying new opportunities,
- promoting organizational learning,
- making changes.

In connection with the above, Markham (1999:5), quoted above, states, "Management consulting products consist of proven services and methods, the theoretical and practical knowledge of which can be gathered in manuals." Over the past few years, this relationship has gradually become generally accepted, intending to increase customer efficiency.

In this context, Maister (1993:3) says: "There are three basic common elements to the mission of service providers, including consulting firms: communication, satisfaction, and success. The management of these professional service companies is expected to strike the right balance between demand in the customer market and actual demand in the labor market."

It is worthwhile to get to know McKinsey & Company's opinion (Poór, 2010). Six factors explain why consultants are needed. Consultants have competencies that the client does not have.

- They have the knowledge of adapting successful methods.
- Sufficient time is devoted to studying the problem being investigated.
- They have a good professional background.
- They are independent.
- They are able to formulate actions to facilitate their implementation.

New reasons (Emerging drivers)

In addition to the previous section, several new trends have emerged in the management field, making it essential to employ consultants. Among these, we would like to highlight the following without an exhaustive list.

The number of so-called structural funds related to pre-accession (e.g., PHARE, TACIS) and subsequent preparation and implementation support requirements in Hungary and the Eastern European area expanded dramatically due to Hungary's and the region's EU accession (Zubka, 2007). During the EU programming period 2014-2020, these demands produce additional primary needs.

The development of new methodologies and approaches to transforming government administration (e.g., New Public Management) has assisted and enhanced the employment of consultants.

According to certain studies, small and medium-sized businesses (SMEs) are beginning to appreciate the value of managerial expertise. However, it has the potential to create new niches for management consultants. Despite these findings, we must recognize that these firms do not seek to consult in many cases due to financial and austerity concerns.

In recent decades, as in other areas of the economy, the consulting profession has become highly internationalized. The internationalization of the consulting profession has also been greatly facilitated by the rapid acceleration of globalization of capital and human capital, including knowledge, in the business world (Blahó et al., 2021).

The dramatic development of information and telecommunications technology (IT) has left no area unaffected, including the consulting industry. While previously, the expertise in the consultant's mind and the experience gained over the years were sufficient, there is now little to gain. Advanced IT skills are also needed to meet customer needs best. Many companies are therefore beginning to establish closer relationships with computer system vendors and software companies, jeopardizing their former independence. This partnership does not pose a threat until the consultants lose their objectivity. Some consultants believe that only in this way can system integrity be provided. It should be noted that IT consulting has become the third central consulting service area in the world and Europe.

Pandemic and unstable economic situation: The pandemic has presented many challenges to consulting organizations and forced them to rethink their business strategy. The current digitalization trend and adoption of technologies have become vital in helping businesses survive during these challenging times. These technologies have affected everyday work by bringing their clients and their work closer. The consulting industry was one of the first ones to introduce telecommuting after the outbreak of the coronavirus in order to preserve the health of the consultants and their clients. After the pandemic, they switched to hybrid solutions. According to Andrew Duncan, CEO of Infosys Consulting in the UK, these developments are redefining consulting industry models (Consultancy.uk, 2021). The shift to telecommuting has provided organizations with a unique opportunity to tap into a new pool of consulting talent previously unavailable. This will continue in the new normal, with consultants expected to deliver seamless multi-geographic transformation projects using a hybrid model of onshore and off-shore teams. At the same time, it can be seen that digital renewal goes beyond video conferencing and collaboration tools. Programmes become immersive and interactive, using avatars and disruptive technologies for virtual breakout sessions, one-on-one interaction, and supervisory connectivity. According to the conclusions of the empirical research of Tavoletti (2021) and his research group, the success of MCFs primarily depends on their ability to create and manage the innovation ecosystem.

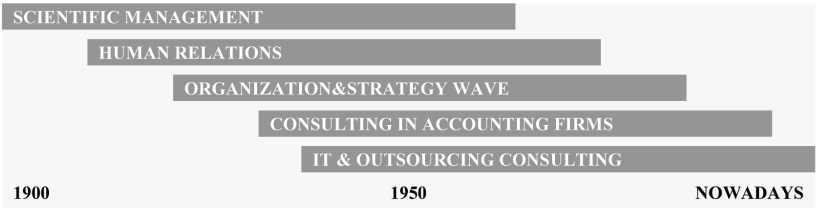
All in all, today's modern management approach on the part of clients requires consultants to ensure the right balance between professional and human relations in their work.

Evolution of consulting work in business as well as its typical methods

This time, it is essential to express our agreement with Kipping (2002:25), who believes that "when looking at the history of the development of consulting, one must not lose sight of and separate from the development of management practice and theory".

Nowadays, consulting embraces almost every area of business. Its focus areas have changed significantly recently (Poór et al., 2022). From its inception to the present, consulting development can be discussed in several divisions, as presented in Figure 1 below.

Figure 1 Five waves of development in management consultancy



Source: Authors' editing based on Kipping, M. and Clark, T. (2012)

Scientific Management view

The most significant and longest-standing trend was the School of Scientific Management, having influenced the field for nearly eighty years. The main reason for its creation was the growing need for efficiency assessment and improvement in management and other areas of economic life.

In the following part, we consider the following points to be important in terms of consulting.

With industrialization, there was a growing need for professionals with the proper management knowledge, skills, and vision to "guide" organizations. The decisive period of this trend was between 1900 and 1950. The forerunners in corporate consulting were F. Taylor, L. Gilberth, and H. Gantt. Frank B. Gilbreth was a prominent figure in Scientific Management and the founder of one of the first professional management consulting firms, Gilbreth Corporation, in 1901. Other prominent representatives were the Bedaux, Emerson, and the Maynard companies. Their work led to the emergence of so-called "efficiency experts" in American companies during World War I. The significant production boom in World War I provided a favorable environment for external experts specialized in developing different production methods, standardization, and sourcing. (Kipping-Clark, 2012).

In Europe, Lydon Urick and Charles Bedaux were the first pioneers in consulting.

Human Relations view

The second wave was the trend of human relations in the 1920s. Its best-known representative, George Elton Mayo, noted the relationship between efficiency and mental health and suggested reducing work-related stress. His approach can be linked to the emergence of employee interviews and the development of specific counseling techniques (Block, 1981).

Eric Lansdown Trist (Kipping-Clark, 2012) was also a significant representative of the trend. His purpose was to act as a consultant to help organizations grow and adapt scientific results through action research.

Strategic and Organization view

With the transformation of management, organization and strategy have come to the forefront. The main drivers of this trend were the increase in company size, the spread of decentralization, and portfolio-based planning.

Early evolution

Even at the beginning of the last century, internationally renowned, so-called 'classic' organizing consulting firms like Booz Allen, McKinsey, A. T. Kerney, and Boston Consulting Group emerged. Along with the scientific leadership school, Business Research Services, founded by Edwin Booz, began its work in 1914. In 1926, James O. McKinsey started his own company, McKinsey & Company. Just before he died in November 1937, he said: "It is much harder to make business decisions than to get paid for the advice that underlies them" (Kipping-Clark, 2012).

The scope of these consultants has been significantly expanded and improved from the start due to several influencing factors. In 1960, Bruce Henderson formed the Boston Consulting Group, a well-known strategic consulting firm. In this context, it is worth mentioning that many other strategy consulting firms were established during this period, including Bain & Company, Planning Associates, Braxton Associates, LEK Partnership, and Monitor Co.

Today's view

In the '50s, behavioral knowledge was applied to solve organizational problems, which led to Organizational Development (OD), the foundation of process consulting.

The work of an OD consultant is characterized by looking for self-propelled, self-directed solutions. In addition to serving traditional organizational efficiency, they aim to provide opportunities for human fulfilment by emphasizing cooperation. In addition to a quick solution, an adaptive, self-learning organizational solution must be sought.

An essential aspect of OD-type process consulting is that changes are implemented not only with the help of decision-makers at a higher level but also by the organisation's members directly involved in the change process.

Accounting view

Large international audit firms established their management consulting departments in the 1970s (the "Big Six": Arthur Andersen, Pricewaterhouse & Coopers, Deloitte & Touche, Ernst & Whiney, Arthur Young, KPMG). Their consulting departments have already outperformed their auditing divisions in recent years.

Evidence-based approaches

Consulting has always had the task of proving its raison d'être, which is why it has always been fact-oriented. At the same time, relying on the current state of the

IT technological background, it is possible to talk about organizations and the impact of consulting along much more qualitative approaches (Poór et al., 2022).

IT and outsourcing view

Over the last decade, the information and communication revolution has significantly influenced consulting development. The management consulting departments of large audit firms have become key players in this development phase.

As early as the 1990s, consulting firms realized that new information and communication technologies not only offered them an opportunity but also had to face considerable challenges. IT consultants often found that the problems being investigated, due to their complexity, could not be solved on a purely technical basis.

In the context of such consultancy projects and related ancillary services (e.g., software sales and application) directly related to them, it was suggested in the early 1990s that these activities should be organized into a separate division.

Since the Enron scandal (2001), we have known that this solution is inadequate and ineffective. At IBM and other IT companies (Capgemini, EDS, etc.), the merger of consulting and software and hardware is not yet being challenged by the business world, but that does not mean that conflicts of interest will not occur in the future. One of the most notable changes in recent times has been the sale of their consulting departments by significant audit firms. In the meantime, almost every major IT company has tried to participate in the acquisition of the consulting departments of auditing firms.

Digitalization

From the view of management consulting, IT consulting must rely on management science much more than computer science. "Real" IT is consulting services that support business, operation, strategy, organization, management, manager, and user using the IT toolset rather than selling, implementing, or operating a particular IT solution.

At the same time, information technology is one of the central scenes of today's technological development. Here the pace of development is dizzying. Moore's famous law has been in effect since the 1960s, according to which the number of active elements on silicon semiconductor chips doubles every 18 to 24 months. According to technological predictions, Moore's Law will be enforceable for three to five years. (Whenever the silicone tile becomes - at its atomic level – more profound, unmanageable, and unsuitable for further development. At the same time, there is no doubt that humanity will always find its way into development.)

IT consultants, among other things, are needed because

1. evolution must be followed, at least in some way: sooner or later, it must be adapted to the technological map drawn every one or two years,
2. There are also particular dangers to the development that have just been described as dizzying, and here are just a few:
   - developers appear with less mature technology products,
   - should quickly recover the cost of development,
   - application development has traditionally lagged behind technology and is likely never to be able to bring in many years of "delay",
   - Excited users and employees often expect miracles.

Robotization

According to The Economist 2014 research: "… in the next 20 years, half of the jobs may be lost, and new skills and qualifications will be created in parallel. Of the ten current kindergarten students, seven will work in positions that do not exist today. New companies are born, they take the lead very quickly, and future leading companies do not exist today." [1]

AON Hewitt's analysis shows that 30 percent of the activities can be done virtually, with an estimated 1.3 billion people working online. Organizations are getting smaller, more transparent, more democratic, and more diverse, and the era of "freelance" workers may come. The future leader will be much more "human" than today's leaders. Viewpoints change, and sustainability comes to the fore. [2]

New technologies can create opportunities for low-capital workplaces, i.e., the proliferation of Internet-based jobs, and remove barriers such as distance barriers for employees and employers. These projections play a decisive role in human resources, as the use and role of human capital are facing radical changes. HR managers, decision-makers, and company managers must be prepared for these changes, regardless of the company profile and size. Investigating and analyzing Industry 4.0, the technological change affecting and affecting the future workplace, provides an essential basis for considering and restructuring areas of HRM in depth.

It is inevitable to analyze the factors creating and influencing the new economic system, which should be considered when drawing up long-term plans.

Among these factors, the key ones include

- Concentration of capital may continue to increase global wealth
- Income disparities may increase further
- Return on investment in terms of capital and technology is generally better than for labor
- Future technology may replace some of the human work
- Preparing for long-term structural unemployment becomes emphasized

Regional differences

We have opted for comparing Asia and the CEE region, with a special focus on Slovakia, to discover some of the regional differences.

Asia

Consulting has long been a privilege for Americans and Western Europeans. Except for projects supported by international financial institutions and organizations, in recent years, few opportunities have been around for external consultants in Asia besides the former English colonies, Australia and New Zealand. In this environment, it has not long been accepted to employ external experts to solve corporate problems. However, it should also be borne in mind that in Japan, efficiency gains (e.g., kaizen) and quality work (such as TQM) have long been greatly assisted by both central and corporate tools. Today, the situation described above has changed significantly. Local and foreign consultants are starting to integrate into the daily life of Japanese companies. In other parts of Asia, consulting is more in its early stages, but the number of newly formed consulting firms is multiplying.

CEE region

If we had asked high school students from various eastern European nations 15-20 years ago what job or profession they wanted to pursue, they would have said physicians, lawyers, sports, travellers, and teachers, with management consultants being the exception. It was only reasonable, given that the general public in these nations knew relatively little about this topic at the time. There are minor or more significant differences in development in the consulting practices of the various Central and Eastern European countries due to traditions, the level of economic development of a particular country in the region, and the different degrees of centralization of the previous economic and political system.

Prior to the political developments of the late 1980s, most Eastern European nations' consulting services were provided by government-controlled sectoral research institutions, universities, or divisions of specific ministries. The International Labor Organization (ILO) and the United Nations organization, UNIDO, have assisted most nations in establishing central management consulting institutions. The characteristics of modern management consulting were just traces in these nations under the previous system. The features of the previously indicated trend of scientific leadership were present in most cases.

Consulting on privatization has grown dramatically in all nations since the regime change. Consultants have played a significant part in creating and implementing numerous projects, with billions of euros flowing into these nations under the European Union's PHARE program. Consulting associations have been founded in practically all nations, thanks to the European Federation of Management Consultancies Association (FEACO, 2013). Kubr's writings and publications, mentioned before (1996), were translated into various languages. Despite the significant growth, Eastern Europe remains a small portion of the European consulting business. Although the global slump in consulting has scarcely been seen in our region in recent years, consulting is now one of the most rapidly growing financial services in Eastern Europe.

Of course, a major global event, such as the present economic slump, will influence these nations' consulting industries. However, their primary focus will remain on identifying and solving regional problems.

An overview of Slovakia in the CEE region

The first long-established international consulting companies, including Ernst & Young, KPMG, and PriceWaterhouseCoopers, began settling in Slovakia in the early 1990s. In the beginning, the consulting companies mainly helped expand large international companies in Slovakia; in many cases, the consulting companies followed their clients to the region. In Slovakia, as in many countries around the world, consulting activities are not regulated by law. Anyone can set up a consulting company without a separate special consultant qualification if they meet the general economic and financial conditions for establishing a business.

At the end of the 1990s, the purposeful creation of an investor-friendly business environment began in Slovakia. The government's comprehensive reform measures targeted the banking system, the tax system, the pension system, the healthcare system, the social system, and the labour market (Mikloš, 2008). In 2004, it joined the European Union, the other V4 countries, and six other states. In the following years, the inflow of foreign working capital accelerated significantly.

In the years before the EU accession, the use of consultants in the public sector increased significantly due to the implementation of the accession criteria and the promotion of access to the PHARE programme. In the years after the accession, institutional and legal harmonization and access to EU funds were made available.

Nowadays, the Slovak consulting market shows a very colorful and dynamically growing and expanding picture. Many traditional and innovative forms of business consulting are now an integral part of the Slovak business environment.

In addition to the local subsidiaries of the largest global consulting companies, significant players in the Slovak market are the big domestic consulting companies, SMEs, and freelance consultants (Sedmina, 2016; Kadlečíková et al., 2017).

There are few empirical research and scientific articles on the Slovak consulting industry in scientific literature. Data on the size and other parameters of the Slovak management consulting market can be obtained from the results of the regional surveys conducted by global research centers. Unfortunately, Slovakia has not been included in the survey conducted by the European Federation of Management Consultancies Association (FEACO) since 1994.

According to Source Global Research, the Slovak market accounts for 8% of the CEE region's MC market, with 280 million dollars in annual sales.

The most prominent consulting organization in the country is PWC Slovakia, with 47 million euros as annual turnover. PWC has been operating in the Slovak market since 1991 with two offices, in Bratislava and Kosice, employing 770 people altogether.

Leadership and management of consulting companies

Objectives of consulting companies

Any enterprise is a human activity whose primary goal is to satisfy customer needs while generating profit. Companies are considered separate legal entities with a legal personality that does business (Chikán, 2003). A list of traits that knowledge-driven consulting firms typically exhibit is summarized as follows (Løwendahl, 1997).

- Professionals and their experience produce new value instead of machines and technology.
- Professional reputation and experience depend more on individuals than corporate skills as essential business competencies.
- Unlike traditional businesses, such as manufacturing, sales, and service orga-nizations, consulting firms must compete not just for exceptional professionals but also for clients.
- These businesses' products are innovative rather than material, and customer expectations greatly influence service quality.

These elements make managing consulting organizations extremely challenging.

Having a professional or team that can create a corporate culture to handle the "herding wild cats efficiently."

Specific features

It is worthwhile to consider the following issue at the beginning: Are consulting businesses comparable enough or distinctive enough to exclude them from the standard principles of corporate governance?

The profession's response to the query is that, while consulting firms' economic and financial issues are not vastly dissimilar from regular businesses, they have a few unique characteristics because of their unique service nature.
Let us list what precisely these traits are.

The outcome of the service is typically not a physical product but rather a non-tangible service, namely, advice. Most works are project-based. Most personnel are highly qualified, and the personal costs of consultants make up a significant portion of a company's cost structure.

The other issue is: Do consultants respond to business difficulties the same way as their clients? These businesses are continually learning about the issues of new clients through their regular work and the people they deal with. Even consulting companies make mistakes at times, just like their clients. Businesses, particularly consulting firms, must balance the four essential factors: monetary resources, industrial processes, human resources, and the market.

The subject of effective resource management has long been discussed in management literature. Different schools stressed the role of resource management to a different extent.

While it is not a simple task to gain the human resources that make up a consulting firm's renewal and find skilled, resolute employees, the acquisition of technology or even capital is a relatively more straightforward process. Human resource management is becoming increasingly more recognised as a managerial function and a key component of company competitiveness, particularly in management consulting.

Strategy

No business can run efficiently over the long term in a constantly changing world without a sensible strategy. A strategy in consulting was just not necessary 15–20 years ago, but businesses were nevertheless able to capitalize on new prospects. Consultants can no longer afford this luxury due to the drastic changes in market opportunity.

What solutions to the issues above does strategic management science provide? The strategies of consulting organizations rely heavily on their human resource capabilities. Successful businesses often employ one of the following three competitive strategies: customer-oriented, solution- or result-based, and creativity-based.

According to Porter (1980), these strategies are not mutually exclusive. As one of Porter's students, Lowendhal (1997) explored this area, saying that different strategies require different organizational and management solutions.

Numerous strategic alternatives have emerged in the domestic consulting industry (Kulcsár et al., 2022). So, among other things, we have seen the following possible ways in consulting practice:

"*Everything for everyone strategy*": This approach is carried out in two distinct ways: In the first, the organization provides its services across all consulting branches at the same level of intensity, standard, and cost. Niche businesses frequently strive to offer similar knowledge-based services to each client, making no distinction between big and small or services given to giant multinationals or domestic SMEs.

"*Everything for everyone*", below or above a specific size limit: The so-called boutique mindset embodied by big, international consulting companies is considerably

more widespread than what was just discussed. They provide their services throughout the consultancy board but avoid working with small businesses or orders. Another component of this approach is that the business is active across the range in consulting but, for instance, exclusively provides services to SMEs. A small business-boutique attitude is attempted to be used by attorneys, tax advisors, or financial advisors. When their clients exceed a particular scale, large worldwide speciality enterprises frequently attempt to provide one or more comparable knowledge-based services to them.

We have various strategies to set ourselves apart from the competition at the industrial level. We can focus on one of these two options in a particular market sector and attempt to outperform our rivals, for instance, by manufacturing our goods and services at the lowest possible cost or by emphasizing the highest quality or prestige of our goods and services in the market competition.

Different management requirements for consulting firms apply to the aforementioned strategic possibilities.

Each manager strives to achieve. Consultants are no different in this regard. The growth plan is, without a doubt, the most preferred approach among managers and consulting company owners. In this instance, there are two potential alternatives to corporate expansion. The first is that a business can expand inside its industry through vertical or horizontal integration. This entails reaching an increasing number of clients with products and services. For instance, industrial corporations were specific businesses for quality consulting in previous decades. Many service providers (schools, hospitals, and banks) seek specialist businesses to complete their orders for ISO system certification or TQM reform programmes. The other alternative for growth is diversification.

The company's achievement of solid growth is a crucial component of development that offers stability. Aldrich and Fiol (1994) previously called it 'fear of the reliability of the new', and the fear of classic changes also plays a part in this process when a company plays for safety. It functions with little investment and keeps within the parameters of primary corporate objectives. This action plan aims to boost productivity across all functional areas, including human resource management. For instance, enhancing performance management and consistently adhering to staff budgets might improve efficiency. This approach is typical for most consulting businesses currently operating under challenging conditions. Such businesses do not anticipate considerable growth in staff.

Realignment-downsizing is the third most frequent substitute for corporate expansion. This tactic frequently leads to the company's disintegration and insolvency. No one likes this version since it goes against the present logic of economic life, which is built on expansion, yet it does exist everywhere.

Due to the market's rapid expansion, the advising sector has, for the most part, avoided layoffs thus far. Naturally, earlier decades' expansion has ended, forcing many consulting firms to restructure or close down. Only organizational units that can operate more efficiently will be able to survive after restructuring. Even in these situations, it is likely that "slimming" will result in a significant drop in the number of departed workers.

The extensive usage of e-commerce in this sector may lead to fresh waves of outsourcing or rebuilding.

A consulting firm can create its product and service profile in various ways. Regardless of the strategy, organizational structure, or clientele, the consultant's or consulting firm's function is still the same. It is always the consultant's responsibility to bring about change in the given environment, whether human or technology, for

a specific person, a larger group, or both. The company can select a generalist or, allegedly, specialist guidance. Inquiry consulting, however, is becoming more and more common in the CEE area, according to practice (Poór, 2016). In the first situation, it accepts all assignments regardless of sector and function, but it can also specialize in functions (such as strategic management, organizational development, marketing, etc.); sectors (such as banks, the automotive industry, etc.); a method (such as BPR = Business Process Reengineering, Organization Development, etc.); organization- and country types (e.g., small businesses, developing countries, US clients abroad).

Even the most renowned global consultation businesses cannot provide the same quality of service in the field of approximately one hundred consultancy tasks, as we have previously noted. The most successful divisions of these firms include strategic, financial, organizational development, production-operation, quality, information technology, and personnel consultancy. Potential business lines might include various services besides legal consultancy (such as education, press product creation, etc.).Smaller businesses tend to specialise to a greater extent. Typically, they concentrate on one or two topics.

Prospects for the future

An international service sector that is rapidly expanding is management consulting. Its expanding role can be attributed to the fact that more and more businesses require highly skilled outside professionals to compete in a well-defined sector. Strategic consulting is likely to grow, and some services could take on more significance. Strategic consultancy will continue to play a significant role in economic life shortly as more individuals accept its use.

References

1. Aldrich, H. E., & Fiol, C. M. (1994). Fools rush in? The institutional context of industry creation. Academy of management review, 19(4), 645-670.
2. Biech, E. (2007). The Business of Consulting. San Francisco: John Wiley & Sons,
3. BKIK–TANOSZT. Surveys of the current situation of the consulting and training market. (2003, 2004, 2005, 2006). (In Hungarian) Budapest: BKIK–TANOSZT.
4. Blahó A., Czakó E.&Poór J. (2021). International management (In Hungarian). Budapest: Akadémiai Publishing House.
5. Block, P. (1981). Flawless Consulting. San Francisco: Pfeiffer Company.
6. Brooks, A., K.&Edwards, K. (2014). Consultancy in uncertainty. Routledge, New York.
7. Clark. T.&Fincham, R. (2001). Critical Consulting New Perspectives on the Management Advice Industry. Oxford: Blackwell.
8. Consultancy.uk (2021). Five trends that will redefine consulting industry models https://www.consultancy.uk/news/28335/five-trends-that-will-redefine-consulting-industry-models (Accessed: August 20, 2022)
9. Czerniawska, F. (2018). What consulting service could you sell to 90% of US senior executives? https://www.linkedin.com/pulse/what-consulting-service-could-you-sell-90-us-senior-fiona-czerniawska?articleId=6448604974149570560#comments-6448604974149570560&trk=prof-post (Accessed: September 23, 2018)
10. Czerniawska, F.&May, P. (2004). Management Consulting in Practice. London: Kogan Page.
11. Day, J. (2004) Dynamics of the Client-Consultant Relationship. In: Thommen, J.P.–Richter, A.: Management Consulting Today. Wiesbaden: Gabler.

12. Drucker, P. (2008). Management. New York: Collins.
13. FEACO (2013). Annual Report 2012/2013. Brussels: Federation of European Consulting Associations (FEACO), Brussels.
14. Geffroy, E.K. &Schulz, B. (2015). Goodbye, McK... & Co. Which consultants we need in the future. And which not. (In German) Offenbach: Gabal Verlag.
15. Ginevri, W. & Trilling, B. (2017). Project Management for Education: The Bridge to 21st Century Learning. Project Management Institute.
16. Greiner, L. E.&Metzger, R. O. (1983). Consulting to Management. New York: Englewood Cliffs.
17. Jimenez, A., Boehe, D. M., Taras, V., & Caprar, D. V. (2017). Working Across Boundaries: Current and Future Perspectives on Global Virtual Teams. Journal of International Management, 23(4), 341–349.
18. Kadlečíková, M., Kapsdorferová, Z., Krajčírová, R. & Šafáriková, J. (2017). Manažérske poradenstvo. Poľnohospodárska univerzita v Nitre
19. Kipping, M. (2002): Trapped in Their Wave: The Evolution of Management Consultancies. In: Timothy, C.-R. Fincham: Critical Consulting. Blackwell Business, Oxford.
20. Kipping, M.&Clark, T. (2012): The Oxford Handbook of Management Consulting. Oxford University Press, Oxford.
21. Kubr, M. (1996). Management Consulting A Guide to the Profession. Geneva: International Labor Office.
22. Kulcsár, P., Matolcsy, J., & Németh, G. (2022) Strategic Consulting. pp112-133 In: J. Poór, E.J. Sanders, G. Németh, E. Varga, (eds) Management Consultancy in Central and Eastern Europe in Global View. Budapest: Akademia Kiadó-Wolters Kluwer.
23. Løwendahl, B&Løwendahl, B. R. (1997). Strategic Management of Professional Service Firms. Berklej: Handelshøjskolens forlag, University of California
24. Maister, D. (1993). Managing Professional Service Firm. New York: Free Press.
25. Markham, C. (1999). The Top Consultant. London: Kogan Page.
26. Miles, I., Coombes, R.&Metcalfe, S. (1999): Services and Innovation Background. Paper for the 6 Countries Program Workshop. 22–23 April, Manchester, 3.
27. Niedereichholz, Ch.- Niedereichholz, J. (2012). Das Beratungsunternehmen. München: Oldenbourg Verlag.
28. Poór J., Sander E., Németh G.&Varga E. (2022). Management Consultancy in Central and Eastern Europe in Global View. Budapest: Akademia Kiadó-Wolters Kluwer.
29. Poór J. (ed.) (2016). Management Consulting Handbook. (In Hungarian) Budapest: Akadémiai Publishing House.
30. Poór J.&Csapó I. (2015). Changes in management consulting methods Hungary - 2015 (research report) (In Hungarian) Budapest: Budapest Chamber of Commerce and Industry -Tanoszt –TOP- SZIE MHR.
31. Porter, M. (1980). Competitive Strategy. New York: Free Press.
32. Schein, E. H. (2002). Consulting: What Should it Mean? In: Clark, T.R. Fincham: Critical Consulting. Oxford: Blackwell Business, Oxford.
33. Schein, H. E. (2016). Humble consulting. Oakland: Berrett-Koehler Publisher Inc.
34. Sedmina, R. (2016). Manažérske poradenstvo pre komerčné spoločnosti. Bratislava.
35. Sturdy, A. (2011). Consultancy's Consequences? A Critical Assessment of Management Consultancy's Impact on Management. British Journal of Management, 22: (3), 517–530.

36. Susskind, R. & Susskind, D. (2015). The Future of the Professions: how technology will transform the work of human experts. Oxford: Oxford University Press.
37. Szeiner Zs., Poór J & Sanders, E. (2022). Consulting Market in the Light of Global and Regional Trends. In: Poór J., Sanders, J.E., Németh G.&Varga E. (eds.) Management Consultancy in Central and Eas tern Europe. Budapest: Akadémiai Publshing House.
38. Tavoletti, E., Kazemargi, N., Cerruti, C., Grieco, C. and Appolloni, A. (2022), "Business model innovation and digital transformation in global management consulting firms", European Journal of Innovation Management, Vol. 25 No. 6, pp. 612-636. https://doi.org/10.1108/EJIM-11-2020-0443
39. Thomas, H., Lee M., Thomas, L., &Wilson, A. (2014). Securing the Future of the Management Education. Brigley: Emeralda.
40. Wesel, Ch. (2013). Basiswissen Consulting. Heidelberg: MitpVerlaggruppe, Heidelberg.
41. Zubka, A. (2007). Managing International Project – Managers' Training Program IV. Dubrovnik: FEACO Annual Conference, 3–5 October

Correspondence address:

Prof. Dr. József Poór, DSc., Department of Management, Faculty of Economics and Informatics, J. Selye University, Bratislavská cesta 3322, 945 01 Komárno, email: *poorj@ujs.sk*
ORCID: https://orcid.org/0000-0002-6873-0646

PhDr. Zsuzsanna Szeiner, PhD., Department of Management, Faculty of Economics and Informatics, J. Selye University, Bratislavská cesta 3322, 945 01 Komárno, email: *poorj@ujs.sk*
ORCID:https://orcid.org/0000-0003-3051-9674

Dr. Zoltán Szira Department of International Regulation and Business Law, Institute of Agriculture and Food Economics, Hungarian University of Agriculture and Life Sciences, 2100 Gödöllő, Páter K. u. 1., Hungary. email: *szira.zoltan@uni-mate.hu*
ORCID: https://orcid.org/0000-0002-7299-4695

Dr. Erika Varga Department of Foreign Languages, Institute of Rural Development and Sustainable Economy, Hungarian University of Agriculture and Life Sciences, 2100 Gödöllő, Páter K. u. 1., Hungary. email: *varga.erika@uni-mate.hu*
ORCID: https://orcid.org/0000-0001-5105-7187

CLIMATE CHANGE ADAPTATION MEASURES IN AGRICULTURE

Michaela ROLINCOVA

Institute of Economic Policy and Finance, Faculty of Economics and Management, Slovak University of Agriculture in Nitra, Slovakia

Miroslava RAJCANIOVA

Institute of Economic Policy and Finance, Faculty of Economics and Management, Slovak University of Agriculture in Nitra, Slovakia

Received: 16. April 2022 Reviewed: 29. May 2022 Accepted: 06. June 2022

Abstract

This paper aims to investigate the impact of changing climate on agricultural production and to provide an overview of possible adaptation measures to cope with changing climate. To estimate the impact of climate indicators on wheat yields the multivariate regression model was used and to describe the ways of adaptation to changed climate, information obtained through a guided interview with the representatives of an agricultural farm operating in Slovakia was analysed. All data represent the Levice District in Slovakia, covering the period between 1997 and2019. Our analysis revealed that climate change indeed has a significant impact on agricultural production. The highest positive impact on yield is attributed to the average maximum temperature, while the inverse effect was observed in the case of the average minimum temperature. On the other hand, the impact of wind did not prove to be significant.

Keywords: *climate change, time series analysis, adaptation measures*

JEL Classification: O13, Q54, Q57

Introduction and theoretical background

Our climate is constantly evolving and undergoing many changes. These changes result in the loss of diversity, the extinction of various plant and animal species, population migration, significant changes in the earth's surface and in ocean circulation (Wolff et al., 2020). Climate changes are caused by several factors, including natural processes as well as increasingly frequent human activities (Singh, 2021). Even if no human activities affected the climate, natural processes would continue to cause natural climate variability, weather changes and the occurrence of climatic extremes

(Seneviratne, 2012). However, it is not natural processes alone that cause the high rate of warming that has occurred since the 1950s (Stocker et al., 2013). Global warming caused by human activities mainly results from greenhouse gas emissions, from the use of fossil fuels, deforestation and land use changes (US Global Change Research Programme, 2018). In Slovakia, over the last 100 years, we have seen a gradual increase in the average annual air temperature by 1.1 degrees Celsius and a decrease in the annual total of atmospheric precipitation by an average of 5.6%. Regionally, these changes are not distributed evenly: while e.g. in the south of Slovakia, atmospheric precipitation decreased by about 10%, in the north and northeast only by 5%. In addition, humidity has also dropped significantly, by up to 5%, and the amount of snowfall has decreased in almost the entire territory of Slovakia (Slovak Hydrometeorological Institute, 2021).

Agriculture and climate change

Climate change is very closely related to agricultural production. One of the main factors by which agriculture affects climate change is the emission of greenhouse gases, such as methane and nitrous oxide. EU agriculture contributed between 8.3% and 10.1% of all greenhouse gas emissions between 2008 and 2019. The share of Slovak agriculture in greenhouse gas emissions was slightly lower and ranged between 5.3% in 2008 and 6.9% in 2019 (Eurostat, 2021). Another factor is that agriculture, as a production sector, requires the largest amount of water and also produces a large amount of wastewater from crop and animal production (Wreford, Moran and Adger, 2010). Its contribution to soil erosion and the imbalance of nitrogen and phosphorus in the soil is also a problem (Lu and Tian, 2017). Phosphorus and nitrogen that enter the soil through fertilization are removed from the soil during crop harvesting, residue removal, and runoff (Lu and Tian, 2017). An imbalance in the amount of phosphorus and nitrogen in the soil can cause the degradation of soil fertility and erosion in the case of their deficiency, while in the case of an excess, pollution of surface and of underground waters (including drinking water) and eutrophication can occur (Enviroportál, 2021).

However, the relationship between climate and agriculture is not only one-sided. Climate change also has a significant impact on the productivity and profitability of agricultural production through changing precipitation, temperatures, soil changes and water reserves (Yohannes, 2016). Higher concentrations of CO2 in the atmosphere, higher average annual air temperature, changes in the annual course and timing of precipitation and the frequency of extreme climatic events all affect water resources, soil, pests and diseases. This has a consequent impact on the quality, quantity and stability of agricultural production (Arora, 2019). An increase in average air temperature can have a positive effect on extending the growing season in areas where cold springs and autumns used to prevail. On the other hand, it can also negatively affect the cultivation of crops that are already threatened by the summer heat, since it will limit their production, increase the intensity of soil evaporation and bring severe droughts. Pests and thermophilic weeds may also increase (Hatfield and Prueger, 2015). The situation is the same with the supply of water. Higher atmospheric precipitation can have a positive effect on crop growth in one area, but it can also create drought zones and increase the risk of erosion elsewhere. In addition, soil absorbs CO2 from the atmosphere (carbon sequestration) and mitigates global warming, but increased temperatures can, in turn, promote biomass decomposition, increasing CO2, nitrous oxide and methane emissions (Hoegh-Guldberg et al., 2018).

As can be seen from the previous discussion, the effects of climate change on agriculture can be both positive and negative. The positive effects of climate change on Slovakia's agriculture include: increased plant photosynthesis and biomass growth, an increase in CO2 concentration also has an effect on increasing the production of some crops depending on the amount of water (Takáč, Šiška and Nováková, 2011); transfer of growing areas to the north of Slovakia (Ministry of Environment of the Slovak Republic, 2018); new possibilities for growing more thermophilic crops (European Environment Agency, 2021); extension of the main growing season (European Environment Agency, 2021).

However, Slovak agriculture is also exposed to the negative effects of climate change, which include: changes in the diversity, number and places of occurrence of harmful organisms (diseases, pests, weeds); changes in the distribution and amount of precipitation and humidity; changes in the thermal security of plant production; changes in phenological conditions and agroclimatic production potential; changes in wintering conditions and absence of snow cover; changes in physical and chemical properties of soil and soil diversity; increased wind erosion; changes in crop production or loss of production of some crops due to droughts (Ministry of Environment of the Slovak Republic, 2018).

Adaptation measures

In 2018, the Ministry of the Environment of the Slovak Republic published an updated the Strategy for the Adaptation of the Slovak Republic to Climate Change, the aim of which is to "improve Slovakia's readiness to face the adverse consequences of climate change, to bring the widest possible information about the current adaptation processes in Slovakia, and based on their analysis to establish an institutional framework and coordination mechanism to facilitate the effective implementation of adaptation measures at all levels and in all areas, as well as to increase overall awareness of this issue." In this report, the ministry gave examples of adaptation measures that can be used in agriculture. They include various adaptation measures for plant protection and varietal testing, irrigation, animal production, beekeeping and pollinator protection.

Plant protection and varietal testing measures include for example: adjustment of sowing procedure; eco-friendly cultivation technologies; use of resistant varieties and use of certified propagating material; promotion of biological protection and integrated production; support of crop diversity to ensure the sustainable production and introduction of integrated management of plant protection against pests; reduction of chemicals used in agriculture; support for breeding and production of seeds suitable for changed climatic conditions; support of Slovak breeding and subsequently the creation of domestic varieties adaptable to our climatic conditions (heat-loving and drought-resistant) to achieve more stable harvests; and other. Irrigation measures include: retarding the runoff, or regulating the level of underground water to influence the water regime of the soil aeration zone; use of irrigation with an emphasis on irrigation efficiency; application of micro-irrigation technologies; multi-purpose use of reconstructed or newly built irrigation systems, securing funds for the reconstruction of irrigation systems and hydromelioration facilities; reconstruction, or modernization of built irrigation systems to systems with micro-irrigation elements; precision agriculture in irrigation system. In case of animal production the adaptation measures include for example: increasing the adaptability of farm animals; development of methods of cooling animals and housing facilities; design of stables eliminating temperature extremes of the weather; proposals for feeding during extreme temperatures; development of

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

procedures for the rescue and handling of animals during floods and fires; analysing the consumption of technological water and drinking water for individual species, breeds and categories of animals and other. In the last category of adaptation measures related to beekeeping and pollinator protection, there is a proposal to: use system measures in monitoring the movement of bee colonies and queens; mapping of dangerous bee diseases and monitoring of chemical plant protection; use of technical facilities to eliminate the adverse consequences of climate change on bee colonies; protection of plants and landscape elements in connection with the protection of bees and other pollinators; support for the nesting of wild insect pollinators and the diversity of food sources; integrated pest control methods, investigating the consequences of climate change on food sources for bees; or monitoring the impacts of changes in brood resources on the health status of bee colonies (Ministry of Environment of the Slovak Republic, 2018).

Material and methods

The impact of climate change on agriculture is indisputable. The discussion of the aforementioned literary sources shows that the impact of climate change can manifest itself through rising temperature, changes in the frequency and strength of rainfall, and increased frequency of extreme climatic events. Empirical evidence also shows that the impact of these changes on agricultural yields in the world is highly variable. However, specifically in Slovakia the expected short-term impact could be also positive, leading to increased yields. Even though, possible negative impacts urge for the implantation of adaptation practices that would diminish their negative consequences. Using a case study of a typical agricultural farm in the Levice District in Slovakia, we aimed to examine a farmer's perception of the climate change, its impact on agriculture and the possibilities of adaptation measures. The aim of the case study was to bring the i) general views on climate change, ii) positive and negative impact of climate changes on the business, and iii) ways to mitigate or to adapt to climate change.

To assess the impact of changing climate on agricultural production, time series analysis was used to confirm either the positive or the negative impacts of climate change on agricultural yields of wheat in the area of Levice District in the period between 1997 and 2019The analysis was started by using the unit root tests to check the stationarity properties of time series. Omission of this step might lead to the choice of an improper econometric model. One of the tests used for the verification of stationarity of time series data is the Augmented Dickey-Fuller test (ADF) with the following hypothesis set:

H_0: There is a unit root in the time-series, the data series is non-stationary.
H_1: There isn't a unit root in the time-series, the data series is stationary.

The Augmented Dickey-Fuller test equation is the following:

$$\Delta Y_t = \alpha + \beta t + \gamma Y_{t-1} + \sum_{j=1}^{p} (\delta_j \Delta Y_{t-j}) + e_t \quad (1)$$

Where:
Y is the observed time series, t refers to the time index, α is an intercept constant called a drift, β is the coefficient of a time trend, y is the coefficient presenting process root, i.e. the focus of testing, p states for the lag order of the first-differences autoregressive process, and e_t is an independent identically distributes residual term.

Once we are sure that the analysed times series are stationary, we can opt for a multiple linear regression model that uses several explanatory variables in order to predict the outcome of a response variable. We use the logarithmic transformation of our variables so the coefficients in the model represent the elasticity of the dependent variable in respect of independent variables.

The general formula is:

$$lny_i = \beta_0 + \beta_1 lnx_{i1} + \beta_2 lnx_{i2} + \ldots + \beta_p lnx_{ip} + \varepsilon \quad (2)$$

Where:

lny_i is the natural logarithm of the dependent variable, lnx_i represents explanatory variables expressed in natural logarithms, namely the area in hectares, average temperature and rain, wind and humidity during the growing period for the years 1997-2019, β_o is the intercept, β_p refers to the slope coefficient for each explanatory variable, and ε is the model's error term.

Table 1 Descriptive statistics

	Mean	St. dev.	Max	Min
Yield	1.523	0.192	1.852	1.109
Area	10.311	0.127	10.481	9.961
Average min. temp	2.320	0.062	2.448	2.177
Average max. temp	3.065	0.053	3.146	2.989
Av. rain	1.553	0.239	2.010	1.227
Wind	1.143	0.047	1.232	1.053
Humidity	4.197	0.059	4.327	4.067

Source: own processing

Results and discussion

The first step in our analysis is the time series stationarity test. Possible non-stationarity of the variables could lead to misspecification of the model. Therefore, we decided to test the data using the Augmented Dickey-Fuller test. The results of the unit root test are shown in Table 2. We can conclude that all variables are stationary at the 5% significance level.

Table 2 Augmented Dickey-Fuller test (in logarithms)

Variables	Test statistics	5% Critical value	Interpretation
Yield	-4.520	-3.600	I(0)
Area	-5.217	-3.600	I(0)
Av. min. temp	-4.617	-3.600	I(0)
Av. max. temp	-5.517	-3.600	I(0)
Av. rain	-4.144	-3.600	I(0)
Wind	-3.975	-3.600	I(0)
Humidity	-5.360	-3.600	I(0)

Source: own processing

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

Based on the results of the stationarity test, it is possible to perform a regression analysis for the analysis of the impact of climate change on wheat harvest. Regression analysis will serve us to estimate the relationship between the dependent variable, in our case wheat yields, and the independent variables. The results of the regression analysis show that 58.9% of the variation in wheat yield per hectare is explained by the independent variables. The significance of F at 0.015 indicates that the model is not statistically insignificant. As can be seen from the results of the regression model, the change in the average maximum temperature has the highest positive effect on the yield. A one percent increase in average maximum temperature would increase wheat yield per hectare by 5.884%. On the other hand, the coefficient of average minimum temperature is equal to -3.515, which means that if the average minimum temperature were to increase by one percent, the wheat yield per hectare would decrease by 3.515%. It is only the effect of wind change that is statistically insignificant, as its p-value of 0.758 is higher than 0.05, so we do not reject the null hypothesis (H_0).

Table 3 Regression results

	coeff.	st. error	t stat	p-value	lower 95%	upper 95%	lower 95%	upper 95%
Intercept	-30.330	8.423	-3.601	0.002	-48.186	-12.475	-48.186	-12.475
Area	0.942	0.325	2.899	0.010	0.253	1.631	0.253	1.631
Av. min. temp	-3.515	1.501	-2.342	0.032	-6.698	-0.333	-6.698	-0.333
Av. max. temp	5.884	2.211	2.662	0.017	1.197	10.571	1.197	10.571
Av. Rain	0.457	0.193	2.364	0.031	0.047	0.867	0.047	0.867
Wind	-0.284	0.907	-0.313	0.758	-2.206	1.638	-2.206	1.638
Humidity	2.828	1.134	2.494	0.024	0.424	5.233	0.424	5.233

Source: own processing

Based on our results, we can conclude that the current impact of climate change on wheat yields per hectare is mostly positive. The effect of the increased temperature was mainly positive, as was the effect of increased humidity. However, the negative impact of insufficient rains on yields per hectare should also be mentioned. The effect of wind, which causes wind erosion, came out to be insignificant from our concrete results. In the next part of our analysis, we focused on verifying these impacts on the specific case of an agricultural farm operating in the Levice district in Slovakia. With the help of this case study, we try to show the way a farmer copes with the impact of climate change on agricultural production. The company was founded in 1993, they manage 500 hectares of agricultural land located at an altitude of 188 meters above sea level. The company primarily focuses on the cultivation of various agricultural crops, such as wheat, rapeseed, corn, and milk thistle. In addition to primary agricultural production, cultivation, processing and sale of protected plants, the farm also focuses on providing services in agriculture and horticulture, production of feed mixtures, production of mill products, rental of movable property and storage.

From the information obtained via the interview, we gained an insight into how climate change is perceived by the agricultural enterprise itself. According to them, while the amount of precipitation has not changed significantly in recent years, the distribution has changed significantly. Rainfall no longer occurs at regular intervals, but occurs at shorter intervals and is more intense. The same applies to temperatures,

when the winters are not so cold, there are no significant frosts in the winter, and winters are much milder and postponed. Windy weather is more pronounced and, as a result, wind erosion causes the upper, finest, most fertile part of the soil to be blown away. Sudden rains are much more frequent and, as a result, water erosion occurs and the best soil drains away. The soil does not freeze and moisture is generally absent. There is little moisture from the snow, which used to be a problem in the past if there was insufficient snow cover. Nowadays, however, plants are bred in a way so that they adapt and do not freeze. The soil can more or less cope with the lack of winter, since it is a living material, so it can partially adapt, even if it takes longer.

Due to these changes, it was necessary to change the cultivation technology as well as operations. Fertilizers and nutrients now need to be applied more regularly so that plants can absorb them. In warmer areas and longer periods, the plants must be treated at night because they would not receive nutrition or fertilizers during the day, which would cause a lot of evaporation and cause quite large economic and ecological losses.

When we look at the yields and quality of production on the selected farm in the Levice region, the impact of climate change is so far more positive than negative, which also corresponds to the result of our previous analysis using time series. It should be remembered that this can also be due to the timely adaptation of technology and overall processing, whether it is soil or crop treatment, which helped to improve it to a higher level than it was in the past. The farm has been affected by all of the following impacts of climate change:

- increased plant photosynthesis and higher amount of biomass due to higher CO_2 concentrations in the atmosphere
- moving the production cultivation areas towards the north
- cultivation of new, more thermophilic crops
- extension of the main growing season.

However, the farm does not only face the positive effects of climate change, but also has to deal with its negative effects. One of the adverse effects is a change in the species composition, number and places of occurrence of harmful organisms (diseases, pests, weeds). Since winters are no longer as intense, but warmer, weeds are also growing, and therefore it is necessary to choose herbicide sprays that are different from those used in the past. Pests and insects survive in the soil. Although the farm was not forced to stop growing any of the crops, the agro technical terms were changed. The producer usually plants early in the spring or later in the fall. Sometimes they sow the seeds in cold soil if rainfall is expected.

Application of adaptation measures

The farm has several options to adapt to climate change. One example of adaptation in production is shifting planting dates, diversifying into other crops, using crop rotation, changing the timing or the amount of chemical inputs, or using irrigation. The analysed farm opted for crop diversity, since the same crop cannot be grown on the same plot every year, except for corn. There was no change in the individual varieties, but the farm cannot grow wheat after wheat, as there are similar pesticides used, which may not work on weeds and insects. It is also a one-way depletion of nutrients. There is also diversification between crops such as wheat, where a farm does not grow all wheat with one length of vegetation, but a part that matures earlier and another later that year. This caters for at least an average harvest.

First of all, crop rotation is important, as it is necessary to grow some spring crops as well as some winter ones. It is necessary to adapt the timing and dosage of fertilizers to this, since rainfall does not come gradually. During hot spells, fertilizers dissolved in water can be applied foliarly, reducing the amount of the fertilizer needed to only half the normal amount, and essentially having an even better effect on the plant. When a solid, granular fertilizer is applied to the soil, it may not dissolve and reach the plant. In terms of reducing the need to use chemicals in agriculture, the farm was able to reduce the amount of fertilizer by applying it to the leaf rather than the soil. However, it is not possible to fertilize in this way throughout the season.

Because the farm is far from water sources that would be sufficient for irrigation, the farm is not considering changes to the irrigation system. Irrigation concerns more special crops, i.e. vegetables. It also happens that if several farmers use irrigation, since several of them are close to each other, when one irrigates, the others cannot, because there is not enough water. One way to influence irrigation is to increase the ability to hold more surface water. Instead of about 30 cm deep ploughing, the manufacturer can use the so-called subsoil, which reaches up to 40-50 cm and because the soil is swollen, it is like a sponge. Therefore, it can better absorb water that falls in the form of precipitation. And basically the roots of the plants still have access to moisture and this has a positive effect on the decomposition of post-harvest residues and those plants can then better survive the drought period caused by climate change. Instead of traditional tillage, the farm crushes post-harvest residues, works them in with a cultivator to create a mixture, so the soil is not turned over. In this way, evaporation of water during rotation is prevented. It depends on the weather, but on average 40 mm of water can evaporate this way. In such a case, if the seed is sown in such dry soil, it will not grow until the next rain and the deadlines will not be met. Another problem would be that it could freeze. Although it should be added that with the current varieties it is not likely any more. Instead, there is missed growth, which causes diminishing returns. This will subsequently require the excessive use of fertilizers, which is no longer economical or ecological.

Sowing procedures must also be adjusted (change in the species composition of sowing procedures, ecological cultivation technologies), including resistant varieties and the use of certified material. Biological protection and integrated production can also be successful.

The introduction of these adaptation measures is of course also reflected in the workforce. Thus each measure has a social impact in the sense of its impact on employment. Crop rotation, fertilization and tillage would not require any additional labour according to the company. On the other hand, intercropping, mixed cropping and mainly irrigation would require additional labour in certain parts of the season. For example, in the main season, it may be necessary to provide another set of tractors for sowing the second crop. There are several irrigation alternatives. One option is to use a tractor to drive the pump. This option is more labour-intensive, requiring more people to operate, control and move the irrigation applicator. Another option is a fully automated line, which, however, has the disadvantage of a higher initial investment, but on the other hand, it is fully automated and does not require constant supervision by employees, it is enough to ensure maintenance and control.

As mentioned above, crop rotation, fertilization and tillage would be the most beneficial when deciding which adaptation measures to use when considering costs. Crop rotation requires minimal implementation and maintenance costs and results in improved soil quality and reduced pest and disease incidence. The impact of the introduction of intercropping would have only a negligible temporary effect on

yield increase. However, in the long run, this would lead to a reduction in costs (of pest and disease control), leading to an overall increase in profits. Crop rotation is one of the main principles of cultivation in agriculture. It prevents one-sided draining of nutrients from the soil, and each additional crop suppresses a different type of weed. Therefore, it is not necessary to apply such a large amount of herbicides, it leads to cost savings and the possible increase in yield would be up to 10% to 80%. Another adaptation measure, mixed cultivation, is more often applied in agricultural enterprises that also focus on animal production. Therefore, it would not bring significant advantages to a company that focuses exclusively on plant production.

Fertilizing, especially using foliar-applied fertilizers, can improve nutrient uptake and also halve the amount of fertilizers needed. Adaptation measures in tillage allow the farm to reduce soil evaporation and the amount of fertilizers used.

As for the least appropriate measure, we can mention irrigation here. The costs associated with this measure are extremely high, and given the insufficient water resources near the farm, investing in an irrigation system would be very risky. However, it is true that irrigation systems in Slovakia would clearly benefit companies that focus on growing special crops such as vegetables.

When we look at the problem of soil erosion, intercropping, mixed cropping, crop rotation and fertilization using manure as fertilizer all lead to a reduction in soil erosion. For example, in the case of intercropping, the additional ground cover provided by the second crop would help retain excess water and nutrients. The improvement of soil biodiversity in the case of the first three adaptation measures and minimal tillage would be achieved mainly through the decomposition of organic matter. Crop biodiversity would be improved by the implementation of intercropping, mixed cropping, and crop rotation.

Conclusion

Climate change has an increasingly significant impact on our daily lives. Extreme weather events, such as intense droughts, heat waves, rising sea levels and storms are becoming more frequent or more severe. Together with temperature changes and the frequency and intensity of precipitation, this leads to a more significant impact of climate change on agricultural production. There are many studies examining the impact of climate change on agriculture and although the current effects are not the same for agriculture worldwide, climate change is expected to lead to food insecurity in the future.

The main objective of this study was to analyse the impact of climate change on agriculture and evaluate the adaptation measures that need to be taken to adapt to changing climate conditions. In the first part of our analysis, we focused on confirming the impact of climate change on agriculture using a regression model that captured the impact of average maximum temperature, average minimum temperature, average precipitation, wind and humidity on wheat crops in the Levice District for the period 1997 - 2019. The results showed that our model was statistically significant, as well as the effect of the variables area, average minimum temperature, average maximum temperature, average precipitation and average humidity. While the increase in the average maximum temperature has the highest, positive impact, the most negative impact is attributed to the increase in the average minimum temperature. This indicates that, according to our results, the currently observed impact of climate change on wheat yields per hectare in the Levice District is positive. Despite this, agricultural enterprises must adapt to changing climatic conditions, and therefore, in the second part of our

ACTA OECONOMICA UNIVERSITATIS SELYE 2022, VOL. 11, NO. 1.

analysis, we focused on the evaluation of possible adaptation measures and their impact on the economy. Our case study confirmed that in recent years there have been changes in climatic conditions, changes in the intensity and frequency of precipitation, temperatures, and more frequent occurrence of windy weather. Climate change has so far had a positive impact mainly due to the rapid implementation of adaptation measures in the field of technology and crop treatment. However there are also some negative impacts including an increase in weeds, the occurrence of pests and insects as well as water and wind erosion. The company has already introduced measures such as shifting planting dates, diversifying crops, crop rotation, changing the timing and dosage of fertilizers used, but also adjusting the method of applying fertilizers or adjusting the method of tillage.

Acknowledgement
This publication is the result of the project implementation: „Scientific support of climate change adaptation in agriculture and mitigation of soil degradation " (ITMS2014+ 313011W580) supported by the Integrated Infrastructure Operational Programme funded by the ERDF and the project VEGA 1/0225/22 "European Green Deal's Impacts on Agriculture, Food Production and Consumption Patterns".

Bibliography

1. Arora, K. N. (2019). Impact of climate change on agriculture production and its sustainable solutions. In Environmental Sustainability, Vol. 2. 95-96 p. DOI: <https://doi.org/10.1007/s42398-019-00078-w>.
2. Enviroportal. (2021). Bilancia dusíka a fosfore v poľnohospodárskej pôde. In Enviroportal. Retrieved from: <https://www.enviroportal.sk/indicator/detail?id=742>.
3. European Environmental Agency. (2021). Poľnohospodárstvo a zmena klímy. Retrieved from: <https://www.eea.europa.eu/sk/signaly-eea/signaly-2015/clanky/polnohospodarstvo-a-zmena-klimy>.
4. Greenhouse gas emissions from agriculture. (2021). In Eurostat. Retrieved from: <https://ec.europa.eu/eurostat/databrowser/view/tai08/default/table?lang=en>.
5. Hatfield, L. J., Prueger, H. J. (2015). Temperature extremes: Effect on plant growth and development. In Weather and Climate Extremes, Vol. 10, Part A. 4-10 p. ISSN 2212-0947. DOI: <https://doi.org/10.1016/j.wace.2015.08.001>.
6. Hoegh-Guldberg, O. et al. (2018). Impacts of 1,5°C Global warming on natural and human systems. In: Global Warming of 1,5°C. An IPCC Special report on the impacts of global warming of 1,5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Retrieved from: <https://www.ipcc.ch/site/assets/uploads/sites/2/2019/02/SR15_Chapter3_Low_Res.pdf>.
7. Lu, Ch., Tian, H. (2017). Global nitrogen and phosphorus fertilizer use for agriculture production in the past half century: shifted hot spots and nutrient imbalance. In Earth System Science Data, Vol. 9, Issue 1. 181-192 p. DOI: <https://doi.org/10.5194/essd-9-181-2017>.
8. Ministry of Environment of the Slovak republic. (2018). Stratégia adaptácie Slovenskej republiky na zmenu klímy. Retrieved from: <https://www.minzp.sk/files/odbor-politiky-zmeny-klimy/strategia-adaptacie-sr-zmenu-klimy-aktualizacia.pdf>.

9. Seneviratne, I. S. et al. (2012). Changes in climate extremes and their impacts on the natural physical environment. In: Managing the risks of extremes events and disasters to advance climate Change Adaptation. A special report of Working Groups I and II of IPCC. Cambridge: Cambridge University Press. 109-230 p. Retrieved from: <https://www.ipcc.ch/site/assets/uploads/2018/03/SREX-Chap3_FINAL-1.pdf>.
10. Singh, S. et al. (2021). Global climate change. Amsterdam: Elsevier. 442 p. ISBN 978-0128229286.
11. Slovak Hydrometeorological Institute (a). Prejavy klimatickej zmeny na globálnej úrovni. In Slovak Hydrometeorological Institute. Retrieved from: <https://www.shmu.sk/sk/?page=1379>.
12. Slovak Hydrometeorological Institute (b). Scenáre budúcej klímy. Retrieved from: <https://www.shmu.sk/sk/?page=1069>.
13. Stocker, F. T. et al. (2013). Climate change 2013: The physical science basis summary for policymakers. The report of Working Group I of the IPCC. 203 p. Retrieved from: <https://www.ipcc.ch/site/assets/uploads/2018/03/WG1AR5_SummaryVolume_FINAL.pdf >.
14. Takáč, J., Šiška, B., Nováková, M. (2011). Možné dôsledky zmeny klímy na potenciál úrod poľných plodín na južnom Slovensku. In Rosliny v podmínkách měnícího se klimatu. 612-622 p. ISSN 0139-6013. Retrieved from: <http://www.cbks.cz/rostliny2011/prispevky/TakacSiskaNovakova.pdf>.
15. US Global Change Research Program. (2018). Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II. Washington, DC: U.S. Global Change Research Program. 1515 p. Retrieved from: <https://nca2018.globalchange.gov/downloads/NCA4_2018_FullReport.pdf>.
16. Wolff, E. et al. (2020). Climate change evidence & causes. Washington, DC: The National Academies Press. DOI: <https://doi.org/10.17226/25733>.
17. Wreford, A., Moran, C. D., Adger, W. N. (2010). Climate change and agriculture. In Researchate. ISBN 978-92-64-08687-6. Retrieved from: <https://www.researchgate.net/publication/51996928_Climate_Change_and_Agriculture>.
18. Yohannes, H. (2016). A review on relationship between climate change and agriculture. In Journal of Earth Science and Climatic Change, Vol. 7, Issue 2. DOI: <http://doi.org/10.4172/2157-7617.1000335>.

Correspondence address:

prof. Ing. Miroslava Rajcaniova, PhD., Institute of Economic Policy and Finance, Faculty of Economics and Management, Slovak University of Agriculture in Nitra, Tr. A. Hlinku 2, Nitra, Slovakia, email: *miroslava.rajcaniova@uniag.sk*
ORCID: https://orcid.org/0000-0003-4688-7690

Ing. Michaela Rolincová, Faculty of Economics and Management, Slovak University of Agriculture in Nitra, Tr. A. Hlinku 2, Nitra, Slovakia, email: *xrolincova@uniag.sk*

Name of the publication: **ACTA OECONOMICA UNIVERSITATIS SELYE**
International scientific journal
Editor – in – Chief: **Ladislav Mura**
Authors:

Year: 2022
Volume 11.
No. 1
The Journal is published twice a year.
This issue was published in June 2022.
Publisher: J. Selye University, Faculty of Economics and Informatics, Bratislavská cesta 3322, 945 01 Komárno, www.ujs.sk, IČO: 37961632

Prepared and printed by: Grafis Media, s.r.o.
ISSN 1338-6581, e-ISSN 2644-5212, EV 4538/12 MK SR
Price: 12,- EUR