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Content

The Impact of Corporate Social Responsibility on the Financial Performance of Selected Banks in the Central Europe

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Abstract
The role of Corporate Social Responsibilty (CSR) is to build consumer trust with banks and provides positive customer outreach. The aim of this paper is to investigate the impact of Corporate Social Responsibility on the Financial Performance of selected banks in the Central European countries namely Germany, Czech Republic, Austria and Switzerland base on simple random sampling. The study employed panel regression analysis. Secondary data was collected on twenty (20) banks in Central Europe with five banks selected from each country namely Austria, Czech Republic, Germany, and Switzerland using annual report from the year 2017 to 2021. The dependent variables was financial performance proxied by Return on Equity (ROE). The explanatory variable included Corporate Social Respomsibilty (CSR), Bank Size (SZ), and Capital Adequacy (CA). Fixed-effect model was fitted to the data. The regression results showed that CSR has positive but insigificant impact on the financial performance of banks. It is therefore, recommended that banks should still provide CSR activities which will enhance the socio-economic condition of their people in their society.

Keywords
Corporate Social Responsibilities, Capital Adequacy, Banks, Financial Performance

JEL Classification

1 Introduction

The topic of Corporate Social Responsibility (CSR) has developed into an important field in science and in the corporate world in recent years (Wang, George, Takeuchi and Tong 2016). CSR is now a topical concern of corporate governance as organizations are evaluated on social activities and not just on financial performance (Rhou et al. 2016). CSR has continued to develop over the decades. The majority of people are now concerned and have learned the important role of CSR. Over the past two decades, the view of CSR has mainly focused on corporate strategy (Murray and Blowfield 2011) linked to competitive and financial performance. Over the years, authors have highlighted the merits of banks in both developed and developing countries, but banks have received less attention in the CSR sector. Organisations, companies and businesses are being asked to be socially responsible for their societal activities because investors, customers and employees are now aware of their organizational environment (Kumar, 2015). Every business, including banks, must fulfill and be accountable for its societal responsibilities as an individual would for his family (Anees, Ullah, and Arshad, 2015).

Some theoretical perspectives have mainly focused on financial and economic performance. Several studies have attempted to demonstrate a significant link between bank performance and CSR. Several articles have focused on how recent quantitative studies have influenced the origin of CSR in relation to the concept of financial performance (Boaventura et al., 2012).

A number of studies report a negative, even mixed, relationship and a positive relationship between CSR and financial performance. The positive relationship justifies a for-profit CSR investment principle of the bank (Tsoutsoura, 2004; Boaventura et al., 2012;). Given this specific understanding, the corporate world sees CSR as a central part of their operational and business strategy (Naude, Rowe, Nowak and Quaddus 2014). The main aim of the work was to find out whether there is an impact of corporate social responsibility on the financial performance of banks in Central Europe or not. The paper further answered the question; What is the impact of corporate social responsibility on the financial performance of banks in Central Europe?

The paper makes an extensive contribution to the existing literature. First, the paper contributes to existing knowledge about CSR and gives new and deeper insights gained from analyzing the idea in banks in central European. Again, the results are important for corporates, banking institutions, non-banks, policymakers and leaders in emerging and developed economies looking to adopt CSR as a measure to improve bank performance.

The following is the synopsis of the paper: The next section addresses the review of the literature, research methodologies and data results and analysis are presented in sections three and four respectively. The final section contains conclusions and policy recommendations.

2 Literature Review

Corporate social responsibility was first introduced in the year 1950s. Previously, it used to be the responsibility of business people, not organizations, to conduct CRS activities. The available literature reviewed on CSR showed that it started as early as five decades ago, as claimed by Carrol (1999). However, the search for a deeper engagement with the CSR topic began in 1990 (Lee, 2008). CSR cannot be seen as a modern initiative as many companies started CRS activities showing that they are discretionary, ethically and economically responsible societal activities before CSR came into force (Matten et al. 2003). Bowen (1953) explains CSR as the desire to ensure that actions are taken that benefit the community and that business people offer insurance policies. There are several definitions of CSR. Carroll (1979) gives the most general, accepted definition, stating that corporate social responsibility encompasses the legal, economic, social, and ethical aspects of the organization. He goes on to explain that firm social responsibilities benefit both society and the company itself. On this basis, organizations are obliged to consider the interests of society or community when making decisions, since their decisions have a direct significant impact on society.

The World Bank (2004) defined corporate social responsibility (CSR) as a "corporate commitment to contribute to sustainable economic development by working with local community, families, workers, and society at large so as to improve their living standard in ways that are beneficial for development and businesses. According to the 2007 Corporate Responsibility Index, a corporation "adapts all of its business acumen to guarantee that it surpasses or meets, commercial, ethical, legal, and public requirements the community has of business." The idea of a socially responsible attitude has been promoted by a number of stakeholders and policymakers. Corporate social responsibility is the idea that firms voluntarily include social and environmental initiatives into their operational activity, according to the European Communities Commission in the year 2001.

Financial performance is defined by Kipruto (2014) as an organization's capacity and willingness to fulfill financial obligations as well as a sign of its financial health. Financial performance is the extent to which financial goals are achieved. According to Lähtinen (2009), bank financial performance can be used to gauge how well economic units are performing in terms of fulfilling their stated goals and plans. The results of a company's business operations, which are expressed in monetary terms, are the financial performance of banks. A company's ability to produce income for its shareholders and investors over a given time period is measured by its financial performance. Once more, financial success is a subjective indicator of how effectively a company can employ resources from its primary business model and produce profits.

The best way to assess the financial performance of banks is not clear-cut or directly agreed upon. There are various tools for evaluating the financial performance of banks. According to Cochran and Wood (1984), the majority of these metrics can be classified into two categories: accounting returns and investor returns. From the viewpoint of the shareholder, the investor returns are assessed. Changes in dividend income and share price are indicators of investor dividends. Accounting returns, which concentrate on how bank earnings react to various management strategies, are more often used (Cochran and Wood, 1984). The Return on Equity (ROE), Return on Investment (ROI), and Return on Assets (ROA) are the three most popular accounting indicators for banks' financial performance (ROA). These metrics reflect the overall effectiveness of a company and its internal efficiency. Accounting measures have the drawback of not taking into consideration how the external market reacts to a business. According to Moore & Spence (2006), accounting returns rather than investor returns are a more accurate predictor of bank financial performance. As a result, ROE and Capital Adequacy were utilized as measuring indicators for bank performance in this study. A measure of bank performance known as return on equity (ROE) is obtained by dividing net income by shareholders' equity. A company's shareholders' equity must equal its assets less its debt; return on equity (ROE) is used as a measure of a bank's profitability and dividend-generating efficiency. A bank's management is more effective at driving growth and revenue from equity financing as ROE rises. This formula represents ROE:

$$ROE = \frac{\text{Net Income}}{\text{Shareholder Equity}}$$

In recent years, various studies investigating the effect of CSR on bank performance were carried out with varying degrees of success. Several papers have demonstrated a significant impact of CSR on bank performance (Bani-Khaled et al., 2021; Adewale and Rahmon, 2014). Some studies yield contradictory results, with at least one finding that CSR and financial performance are positively correlated. According to Wu et al. (2017) experimental findings, CSR is positively correlated with ROE, ROA, net interest income, and non-interest income. According to a study by Shuaibu and Senyigit (2017) that was conducted in two different nations, CSR has a beneficial effect on the performance of the bank in Nigeria. In their year 2017 research, Rozanskaa and Matuszaka discovered a strong correlation between bank CSR and profitability as determined by ROE and ROA. Nwude et al.'sstudyfindings from 2020 showed that CSR has a strong positive impact on ROA but a weak positive impact on earnings per share, a soft negative impact on market price per share, and a weak negative impact on ROE.

2.1 Corporate Social Responsibility benefits in the European banking sector

Following efforts by the European Commission to implement rules, projects, and action plans that support socially responsible behavior and CSR reporting, such as Directive 2014/95/EU, Europe is a region of interest for CSR studies. The European Commission has created several CSR promotion policies since the Green Paper's 2001 release. The EU strategy 2011-2014 for corporate social responsibility is one such initiative that was approved as a result of the Europe 2020 Strategy for sustainable and inclusive growth (European Commission, 2014).

Forcadell and Arcil (2017) assert that an increase in CSR activities enhances the standing of the institutions involved while enhancing their financial performance. Through the action plan on financing sustainable growth, which aims "to connect finance with the specific needs of the European and global economy for the benefit of the planet and our society," the banking industry was given a leading position within the European Union in regards to the implementation of such practices in 2018 (European Commission, 2014).

Carroll (1999) stated that the goal of CSR is the sustainable development of economic activity and the corporate culture across three areas: social, economic, and environmental, which were previously defined as the core elements of CSR, with regard to its implementation and development. The three dimensions of sustainable development- economic growth, social inclusion, and environmental protection- as well as the central tenets of CSR are all covered by the interconnected goals, which are intended to address the most pressing global issues (Cosma, 2020).

CSR is a multifaceted concept because different nations, industries, and economic cycles have different CSR manifestations. Because it encourages several competitive advantages, including the improvement of a bank's reputation, which is a deciding factor in attracting and retaining customers, stimulating better risk management and increased employee motivation, and producing better financial results, CSR is particularly relevant to the banking industry. European Banks are motivated to implement CSR policies because their customers are becoming more concerned about social, environmental, and governance issues; this benefits both the firm and society as a whole (Polychronidou et al., 2014; Tran, 2014). CSR practices consequently become an important reputation driver that can add value over time, particularly in the financial sector. All of the bank's CRS sponsorship initiatives are directed at disadvantaged populations and charitable nonprofits. The European Banking Federation has emphasized the significance of having a clear CSR policy within European banks (EBF, 2013) in order to further emphasize the importance of CSR for banks.

Central European Banks support the growth of the CSR program for society. It is true that European banks are investing more in their CSR initiatives, but not at the same rate as their profits. Since its inception until the present, the Eurobank's involvement in Education, Culture, and Sport has been the foundation of its social contribution (Eurobank EFG, 2012). According to ElAlfy and Weber (2019), common CSR practices in the banking sector are focused primarily on healthcare, education, charitable work, cultural enrichment, youth development, and supporting sports and music. This is especially true in European nations.

3 Method, Variable Description and Data

3.1 Method

To investigate the impact of corporate social responsibility on central European banks' performance. For the period of 2017 to 2021, panel data analysis was used in the paper. According to Gujarati (2003), panel analysis, which combines time series and cross sectional data, can improve data quantity and quality in ways that would have been impractical if only one of these dimensions had been used. The panel regression model is expressed as follows:

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + ...\beta_k X_{kit} + \varepsilon_{it} \quad (1)$$

The author specify the model as follows:

$$ROE_{it} = \beta_0 + \beta_1 CSR_{it} + \beta_2 SZ_{it} + \beta_3 CA_{it} + \varepsilon_{it} \quad (2)$$

where, ROE is return on equity, CSR is corporate social responsibility, CA is capital adequacy, β_1-β_3 are coefficients, ε_{it} is the error term *and* β_0 is the intercept. The subscript *'it'* indicates the bank and time effect. There are many types of panel data models (Yaffee, 2005; Gujarati, 2003; and Johnson, 1994). However, for the purpose of this paper the author used the fixed effect models and random effect.

3.2 Data Source

Twenty (20) banks were chosen from four countries in Central Europe, namely Austria, Germany, Switzerland, and the Czech Republic (five banks from each country), and their annual reports covering the years 2017 through 2021 were used as secondary data for the analysis. For a thorough analysis, the information was gathered from income statements, cash flow statements, statement of financial position, and the notes to the various accounts. Twenty banks were chosen based on two criteria. First, during the study period, the bank engaged in corporate social responsibility at least once a year, and second, data information on the financial institution is readily available.

3.3 Variable Description

This section describes the independent and dependent variables that were used in this study. Performance in the financial sector is a dependent variable. The dependent variables were measured using a proxy, return on equity (ROE). Return on equity was used by some studies, like Adjei-Mensah (2020), to gauge performance. Net income is divided by total shareholder equity to calculate return on equity (ROE). ROE is used as a gauge of a company's profitability and dividend yield effectiveness. The management of the bank is more effective at generating income and growth from its equity financing the higher the ROE.

Bank size

It is well known that a variety of related factors influence banks' profits, and that these factors are frequently closely related to the size of the bank (Huizinga and Dermiguc 1999). A bank's business operations vary greatly depending on its size, and this can be seen in a variety of ways, including costs, services, products offered, and risk diversification. According to the idea of economies of scale, there are strong connections between bank size and dividends. With so many banking institutions, resources are frequently more plentiful and of higher quality. Large banks frequently have access to funding that comes at a low cost, according to Short (1979). This variable is taken into account because the bank's ability to diversify will be greatly influenced by its asset base and the availability of resources.

Capital Adequacy

The definition of capital adequacy (CA), which is expressed as the ratio of shares to total assets, is the ability of a financial organization to withstand any shocks that may arise. According to Kosmidou (2008), lowering the requirement for banks to seek external liquid support has the potential to raise the profitability level of the bank or company. Furthermore, a well-capitalized bank or business faces less risk of going bankrupt, which lowers funding costs. They also have the financial wherewithal to engage in other non-traditional activities. This paper therefore, expects that the bank capital adequacy ratio will have an effect on the level of profitability, hence its inclusion in the model.

4 Results and Data Discussion

4.1 Descriptive Statistics

The table 1 presents the descriptive statistics. The figures indicate that the average return on equity of the selected banks is 0.07099 and the standard deviation is 0.053076. These figures indicate that the average return on equity is low, and there is less variation in terms of return on equity of selected banks for the study period.

Table 1: Showing Descriptive Statistics

Variable	Number of obs.	Minimum	Maximum	Mean	Std. Deviation
ROE	100	-0.380	0.251	0.07099	0.053076
CSR	100	0.000	1.000	0.79000	0.4093602
SZ	100	6631.81	1125800	232139.9	281019.50
CA	100	0.023	0.0.887	0.08597	0.1146231

Source: Author's calculation

For corporate social responsibility (CSR) the values are within the range of 0 to1. That is some banks did not provide any corporate social responsibility for the study period whilst other banks provided CSR. Bank size (SZ) has a minimum of 6631.81euros and the highest value of 1125800.00 euros. This means that the sizes of certain banks are very large as compared to others within the banking sector.

Capital adequacy (CA) has a minimum value of 0.023 and maximum value of 0.0887. These figures show the maximum and lowest proportion that can be raised from total shares to take care of any upset that the banks can confront with.

Table 2: Showing Results of Hausman test

Test Summary	Chi-sq Statistic	Prob.
Hausman	11.11	0.0111

Source: Author's calculation

From the table 2 the estimated probability figure is 0.0111. The figure is below 0.05 and therefore, indicates that the fixed effect model is a better choice. The import of this result is that there are both individual bank effect and time effect in the determination of banks financial performance measuring by proxy return on equity.

4.2 Regression Results Analysis

The tables 3, and 4 indicates the regression results for the two panel models (Random and Fixed Effects). Results for the models are similar but following the Hausman test results, the analysis is based on the fixed effect report.

Table 3. Showing Fixed effect regression results - dependent variable is ROE (100 Obs.)

Variable	Coef.	Std. Err.	Prob.
CSR	0.0057931	0.282091	0.838
LNSZ	0.0064156	0.0089439	0.475
CA	0.0215235	0.0390858	0.583
CONS	-0.0105641	0.1059425	0.921
R-Square:	0.5313	Adjusted R-Square:	0.4231

Source: Author's calculation

Table 4. Showing Random effect regression results - dependent variable is ROE (100 Obs.)

Variable	Coef.	Std. Err.	Prob.
CSR	0.0142903	0.282091	0.838
LNSZ	0.0047043	0.0089439	0.475
CA	0.0419151	0.0390858	0.583
CONS	0.1111844	0.0700579	0.113
R-Square:	0.5621	Adjusted R-Square:	0.4531

Source: Author's calculation

Per the regression results from the table 4 all the explanatory variables have the expected signs. Corporate social responsibility (CSR) which is the main independent variable is statistically insignificance at 5% significance level. Furthermore, the control variables made up of bank size (SZ) and capital adequacy (CAP) are statistically insignificance.

The report shows that the CSR variable has positive coefficient (0.0057931) but statistically insignificant (0.838) relationship with return on equity (ROE) at 5% level of significance. The findings suggest that the variable of interest, corporate social responsibility even though has positive influence on financial performance measuring by proxy return on equity, that influence is not significant. That is there is no evidence that providing CSR by the banks will impact their financial performance. However, provision of CSR activities ensure that the environment or community is protected, encouraging a sustainable growth and improving the socio-economic situation of the people within a community (Turker, 2009). According to the social identity concept, firms that normally forgo their profit for the benefit of a society or community have a good reputation. This can move employees to work harder and even take risky decisions which in the long term will enhance productivity.

As regard bank size (SZ), table 3 indicates that it has positive but statistically insignificant effect on banks financial performance proxy by return on equity (ROE). That is from the data report in table 3 the SZ has positive coefficient (0.0047043) but statistically insignificant (0.475). This implies that the size of the bank does not influence its financial performance. This is in contrast with Adjei-Mensah (2020) who noted that bank size has positive significant effect on financial performance proxy by ROE.

It can be seen from the regression report that capital adequacy has positive insignificant relationship with ROE. That is, positive coefficient of 0.0215235 but statistically insignificant (0.583) to performance (ROE). This implies that high CAP does not mean that the performance of the banks will increase. Normally, a bank with an increase ratio of capital adequacy has a better cushion against risk. Higher ratio means the bank's asset composition is financed by its shareholders and this will reduce the amount of money paid to either "firms, depositors or creditors. This therefore, will increase the firm's net return which therefore will boosts the firm's return on equity and assets. An increase in the ratio, thus, helps banks to increase the relative returns that are attributable to the firm in general as the liability of the firm reduces given an increase in the ratio. This finding is in support of the findings by Adjei-Mensah (2020).

5 Conclusion and Policy Implication

The main objective of this paper was to examine the impact of corporate social responsibility on the performance of banks in central Europe. Secondary data was obtained from the annual reports of twenty banks in central Europe; five banks each from the country: Austria, Czech Republic, Germany, and Switzerland. Fixed-effect model was applied to data spanning the year 2017-2021. Return on equity was used as proxy for measuring financial performance. Corporate social responsibility (CSR) is the main independent variable. The paper again used bank size and capital adequacy as control variables.

The results in table 3 show that there is a positive but insignificant correlation between corporate social responsibility and return on equity of selected banks in central Europe.

Indeed the findings have a significant policy implication for banks in central Europe and the entire region of Europe. Even though CSR has no significant effect on banks financial performance. However, provisions of CSR activities enhance socio-economic conditions of the people within a community. As the banks forgo their profit

benefits of society build a higher reputation. The organizational identity will motivate employees at banks to work and even take a risky decisions which in the long term will enhance productivity.

Therefore, I will still recommend banks to perform CSR in their communities which will enhance the socio-economic condition of the people.

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The Role of Sentiment in the Financial Market

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Abstract
Trading biases is understood as a key for explaining the market anomaly. On the other hand, market anomaly itself is for proving that asset pricing models are not a precise way to explain the financial market. The market sentiment understands as the investor sentiment for the market movement. To find out the relationship between the market sentiment and stock pricing could explain the market anomaly. The standard market sentiment is presented as bullish, bearish, and neutral (Lee,2002). Once market sentiment starts to influence investors, more and more studies are using sentiment factors to explain stock pricing. This paper is to study the relationship between the financial market and individual investor sentiment with the 19 airline companies in the airline industry during the year 2019-2022. We used daily stock data and investor sentiment from an investor sentiment survey. The sentiment data is weekly, each week the member needs to vote one between three choices which are bullish, neutral, and bearish. We construct the data bullish and bearish into two sentiment indices. From the CAPM model test, 18 out of 19 airline companies are significant. But from the CAPM - sentiment indices model test, 1 out of 19 airline company is significant. The finding shows that individual market sentiment is not related to the airline industry stock pricing.

Keywords
Efficient market, Market sentiment, CAPM model, Airline industry, Anomaly.

JEL Classification
G19, G40.

1 Introduction

In 1952, Harry M. Markowitz (Markowitz,1952) introduced modern portfolio theory (MPT). The idea of MPT is often considered by academics as the beginning of the standard financial theory. Markowitz laid the base for the study of financial theory and portfolio theory in particular. Based on his research, later researchers started to develop some important financial theories, such as the capital asset pricing model (CAPM). Among these prominent theories, the efficient market hypothesis (EMH), developed by Eugene M. Fama (Fama,1970) is the key to asset pricing theory. The EMH assumes that investors in the market are rational and risk-averse. Also, investors can get any information they want in the market for free and react rationally based on the information they get. As more and more investors enter the capital market and more anomalies appear in the market, the efficient market hypothesis and the investor rationality hypothesis are increasingly challenged by reality. This theory considers market risk as the only source of equity risk. Along with the fast development of the economy and society, both financial products and the market are growing fast thus the CAPM model is not able to explain the variation in stock returns.

With more investors enter in the capital market. We assume the stock price could perform better with more investors involvedness. The efficient market hypothesis and investor rationality hypothesis are challenged by the realities. After Black (1986) published his theory of noise traders (i.e., those who do not have access to insider information and make wrong choices by considering noise as valid information), many researchers began to focus on the behavior of traders. The behavior of traders is closely related to market sentiment. Due to the existence of market sentiment with different levels of greed and fear at different times, some abnormal returns in the market are not considered in the traditional asset pricing model. Since covid-19 the travel industry has been suffering from a large impact in recent years. Therefore, this paper provides a test of the CAPM model in the airline industry to examine whether the CAPM model can be applied. Moreover, a sentiment factor is added to this test of its effectiveness. From the result, we will know the relationship between the sentiment of the market and stock return.

The paper is structured as follows. In the next section, we do the literature review. In section 3, we introduce the data and methods from the calculation and tests. In section 4, we show the results of all the tests. In the last section, there will be the conclusion for this paper.

2 Literature Review

From the expected utility theory, Neumann (1944) mentions that investors will make a rational decision after analyzing all potential alternatives according to their utility and involved risk. In the subsequent theory, the Efficient Market Hypothesis, Fama (1970) built on the assumption that investors act rationally in the stock market. It means the investors have to decide among many variables' impact. These two theories build up the whole financial decision-making studies. It is also known as the early stage of behavioral finance. But from the other point of view, Kahneman et al. (1979) argue that utility theory "as it is commonly interpreted and applied, is not an adequate descriptive model." Behavioral finance combines psychological and behavioral elements in financial decision-making. It can explain abnormal results and trading behaviors. With the research increasing in recent 20 years, more results are showing that investors' decisions could be influenced by different elements. For example, the herding bias (Banerjee,1992) and the overconfidence bias (Kahneman,1993).

In financial sentiment studies, Kenneth et al.(2000) showed that individual investors' sentiment is negatively correlated with the S&P500, which is statistically significant. From Baker et al.(2006) research we found that from the beginning-of-period the sentiment indices are negatively related to the subsequent returns of these categories of stock. If the sentiment indices are low from the beginning, subsequent returns are high, and vice versa. Chung et al.(2012) results demonstrate that when in the expansion state sentiment does have predictive power, but in the other state the sentiment factor is nonsignificant. With the CAPM model analysis, Antoniou et al. (2016) found that during the optimistic sentiment period, the noise traders are seeking high beta stocks for high returns, but once the sentiment becomes pessimistic, they remain on the sidelines. An interesting study about sin stock portfolio return Liston(2016) showed that the result demonstrates whether individual or institutional investors' sentiments are the factor for asset pricing. Additionally, the test showed that abnormal returns disappear after controlling for the sentiment factor. In Apergis et al.(2018) study, they examine how investor sentiment affects asset pricing. Moreover, the sentiment of investors is an asset pricing component. This discovery has challenged the traditional assets pricing models, for future financial decision-making provides another perspective.

3 Methodology and Data

According to the capital asset pricing model (CAPM), the calculations need market-free risk rate, market risk premium, stock return, and sentiment indices. In our study, all the data is daily data or resampled into daily data from 2019 December to 2022 December. For stocks, we choose filtered in the industry as airlines. The result of all 21 airline companies was included. But two airline companies' stock data are less than a year in history, hence we removed those two companies. Finally, there are 19 airline companies. We used the CAPM model and CAPM with sentiment factors.

3.1 Models and tool

We will first create a CAPM model to test whether the airline company returns can be explained by market risk-free rate and risk premium. For the main calculation, we will use the CAPM model formula as follows:

$$E(r_i) - r_f = \alpha_i + \beta_i(E(r_m) - r_f), \tag{1}$$

where $E(r_i)$ is the expected stock return for asset *i,* r_f is the market-free risk rate, β_i is a measure of the volatility of a stock compared with the market as a whole, $E(r_m) - r_f$ is the market risk premium.

Next, we extend the CAPM model to consider with the sentiment index. The model is as follows,

$$E(r_i) - r_f = \alpha_i + \beta_i\big(E(r_m) - r_f\big) + \gamma_i \cdot sentiment, \tag{2}$$

where $E(r_i)$ is the expected stock return for asset *i,* r_f is the market-free risk rate, β_i is a measure of the volatility of a stock compared with the market as a whole, $E(r_m) - r_f$ is the market risk premium, γ_i is the coefficient for the sentiment index, *sentiment* is the sentiment index.

All the calculations are performed in Python Jupyter Notebook.

3.2 Risk premium and market-free risk

All the data for risk premium ($E(r_m) - r_f$) and the market risk-free rate (r_f) are from Kenneth R. French - Data Library (Kenneth, 2023). In this paper, the French calculate the market risk-free rate by taking the return on Treasury bills and dividing it by the number of trading days in a given month. The data are shown in Table 1.

Table 1. The example of data for market risk-free rate and risk premium daily data. (%)

date	$E(r_m) - r_f$	r_f
20191202	-0.0087	0.0070
20191203	-0.0066	0.0070
20191204	0.006	0.0070
20191205	0.0013	0.0070
…	…	…
20221128	-0.155	0.0140
20221129	-0.0018	0.0140
20221130	0.030012	0.0140

Source: Kenneth (2023)

3.3 Historical stock price

Historical stock price daily data for all 19 airline companies are from yahoo finance (Yahoo, 2023). An example of the data is shown in Table 2.

Table 2. The example of American Airlines Group Inc. stock price daily data (Currency in USD).

Date	*Open*	*High*	*Low*	*Close*	*Adj Close*	*Volume*
2019/12/2	28.790	28.990	28.010	28.080	27.977	6850800
2019/12/3	27.730	27.770	26.960	27.290	27.190	7736600
2019/12/4	27.420	27.760	27.220	27.380	27.279	4805300
…	…	…	…	…	…	…
2022/11/28	14.340	14.440	13.820	13.830	13.830	21313800
2022/11/29	13.890	14.160	13.830	14.140	14.140	17335300
2022/11/30	14.120	14.450	13.930	14.430	14.430	21241800

Source: Yahoo (2023)

For CAPM model calculation we need the daily stock return, we use the adjusted close price as today's stock price to calculate the return, formula as follows:

$$stock\ return = \frac{stock\ price_t - stock\ price_{t-1}}{stock\ price_{t-1}} \times 100\% \quad (3)$$

where the $stock\ price_t$ is adjusted daily stock price of the date t, $stock\ price_{t-1}$ is the adjusted daily stock price from the day before the date t hence t -1.

And after calculation, the result of the stock daily return is shown in Table 3.

Table 3. American Airlines Group Inc. stock return daily data (%).

date	*Stock return*

2019/12/3	-0.028134
2019/12/4	0.003298
2019/12/5	-0.005113
…	…
2022/11/28	-0.046207
2022/11/29	0.022415
2022/11/30	0.020509

Source: own calculation

3.4 The sentiment indices

The sentiment indices are from the Investors Intelligence (II) survey (American Association of Individual Investors, 2023). Every member of the sentiment survey will receive an email each week to vote for one of three choices. It means each member can only vote once. All three-sentiment indexes of the week sum up will be 100%. The sentiment indices are shown in Table 4.

Table 4. Sentiment Survey historical weekly data.

date	*Bullish*	*Neutral*	*Bearish*	*Total*
2019-12-21	34.24%	36.72%	29.03%	100%
2019-11-29	33.64%	36.09%	30.28%	100%
2019-12-05	31.72%	39.16%	29.13%	100%
…	…	…	…	…
2022-12-15	24.30%	31.08%	44.62%	100%
2022-12-22	20.31%	27.38%	52.31%	100%
2022-12-29	26.49%	25.89%	47.62%	100%

Source: American Association of Individual Investors(2023)

Since all the other data are daily data. We resample the weekly data of sentiment factor into daily data. The fundamentals are simplified to match the weekly index into all same week. To compare the bullish and bearish, we use bullish minus bearish as one sentiment index (Bullish_min_Bearish), and bullish divide bearish as another sentiment index (Bullish_div_Bearish). The resampled data is in the Table 5.

Table 5. Generated sentiment survey indices historical daily data (%).

date	$E(r_m) - r_f$	r_f	*stock_return*	*Bullish_min_Bearish*	*Bullish_div_Bearish*
2019-12-03	-0.0066	0.00007	-0.028134	0.0336	1.110964
2019-12-04	0.0060	0.00007	0.003298	0.0336	1.110964
...	...	...	...	...	...
2022-11-29	-0.0018	0.00014	0.022415	-0.1137	0.717375
2022-11-30	0.0312	0.00014	0.020509	-0.1137	0.717375

Source: own calculation

4 Empirical Results

4.1 CAPM Model

We create a CAPM with stock return minus market risk-free rate as the dependent variable and find the correlation with risk premium. By using the formula (1), the result of all 19 airline companies are shown in Table 6.

Table 6. CAPM model result.

company	α_i	*P-value*	β_i	*P-value*
UAL	-0.00071	0.60825	1.53176	$p < 0.001$
SKYW	-0.00124	0.39535	1.56506	$p < 0.001$
ATSG	0.00012	0.88294	0.78022	$p < 0.001$
RYAAY	-0.00018	0.84529	0.96792	$p < 0.001$
SAVE	-0.00037	0.81339	1.55632	$p < 0.001$
JBLU	-0.00104	0.40868	1.30681	$p < 0.001$
HA	-0.00069	0.6429	1.43499	$p < 0.001$
AZUL	-0.00142	0.42623	2.05057	$p < 0.001$
GOL	-0.00136	0.44286	2.07525	$p < 0.001$
ALGT	-0.00098	0.35217	1.48532	$p < 0.001$
ZNH	-0.00012	0.89717	0.80009	$p < 0.001$
ALK	-0.00053	0.59521	1.34089	$p < 0.001$
AAL	-0.00055	0.7089	1.38701	$p < 0.001$
CPA	-0.00007	0.95765	1.28363	$p < 0.001$
CEA	-0.00042	0.60286	0.68275	$p < 0.001$
LUV	-0.00058	0.49474	1.05253	$p < 0.001$
DAL	-0.00062	0.56097	1.30698	$p < 0.001$
MESA	-0.00173	0.30095	1.60051	$p < 0.001$
VLRS	0.00008	0.94453	1.59738	$p < 0.001$

Source: own calculation (2023)

From the Table 6, we can find out that all the α_i is nonsignificant. The risk premium is significant for all airline companies. Hence, we can get the result that for all the airline companies the CAPM model can be applied. And from the risk premium, we can get the airline companies' beta is high. Only four companies' beta is lower than 1: ATSG, RYAAY, ZNH, and CEA. And for all other 15 companies have a beta higher than 1. This means that the airline industry has a high beta in the selected period.

4.2 CAPM Model with sentiment index (bullish minus bearish)

Generate the CAPM model with a sentiment factor index bullish minus bearish, we continue with the left side of the formula as stock return minus the market risk-free rate. To find the ordinary by formula (2), we can get a least square model with the result in the Table 7.

Table 7. CAPM model with sentiment factor (bullish minus bearish) result.

company	α_i	*P-value*	β_i	*P-value*	γ_i	*P-value*
UAL	-0.00112	0.43565	1.53235	$p < 0.001$	-0.00749	0.29683
SKYW	-0.00154	0.30944	1.56549	$p < 0.001$	-0.00549	0.46781
ATSG	-0.00042	0.60891	0.78098	$p < 0.001$	-0.00964	0.01759
RYAAY	-0.00020	0.83053	0.96796	$p < 0.001$	-0.00046	0.92310

SAVE	-0.00059	0.71479	1.55664	$p < 0.001$	-0.00407	0.61408
JBLU	-0.00119	0.36192	1.30703	$p < 0.001$	-0.00279	0.66817
HA	-0.00097	0.52937	1.43539	$p < 0.001$	-0.00515	0.50464
AZUL	-0.00135	0.46900	2.05046	$p < 0.001$	0.00137	0.88301
GOL	-0.00149	0.41780	2.07544	$p < 0.001$	-0.00244	0.79079
ALGT	-0.00091	0.40653	1.48522	$p < 0.001$	0.00128	0.81571
ZNH	-0.00044	0.63526	0.80056	$p < 0.001$	-0.00594	0.20299
ALK	-0.00068	0.51782	1.34110	$p < 0.001$	-0.00258	0.62033
AAL	-0.00053	0.72731	1.38699	$p < 0.001$	0.00028	0.97094
CPA	-0.00022	0.86335	1.28385	$p < 0.001$	-0.00281	0.65956
CEA	-0.00078	0.35419	0.68327	$p < 0.001$	-0.00654	0.12143
LUV	-0.00066	0.45564	1.05265	$p < 0.001$	-0.00144	0.74343
DAL	-0.00076	0.49244	1.30719	$p < 0.001$	-0.00258	0.64205
MESA	-0.00152	0.38236	1.60021	$p < 0.001$	0.00380	0.66078
VLRS	0.00033	0.79237	1.59703	$p < 0.001$	0.00442	0.47497

Source: own calculation (2023)

We find out from the result that all 19 airline companies' α_i is insignificant. All 19 airline companies' risk premium is significant as in the previous calculations. It means the stock return is correlated with the risk premium. From the result of the sentiment index (bullish minus bearish), only one company ATSG is significant. The other 18 companies' sentiment index is not significant. We can understand here the sentiment index (bullish minus bearish) is nonsignificant in the airline industry in the selected period.

4.3 CAPM Model with sentiment index (bullish divide bearish)

We change the sentiment factor index from (bullish minus bearish) to (bullish divide bearish). And calculate the correlation between stock return minus market risk-free rate and risk premium with the sentiment index. The result is in the Table 7.

Table 7. CAPM model with sentiment factor (bullish divide bearish) result.

company	α_i	*P-value*	β_i	*P-value*	γ_i	*P-value*
UAL	0.00159	0.57744	1.53277	$p < 0.001$	-0.0023	0.35804
SKYW	0.00051	0.86642	1.56582	$p < 0.001$	-0.00174	0.50853
ATSG	0.00337	0.03725	0.78165	$p < 0.001$	-0.00325	0.02161
RYAAY	0.00029	0.87757	0.96813	$p < 0.001$	-0.00047	0.77672
SAVE	0.00108	0.73639	1.55696	$p < 0.001$	-0.00145	0.60675
JBLU	-0.00034	0.8947	1.30711	$p < 0.001$	-0.00069	0.7606
HA	0.00131	0.66962	1.43587	$p < 0.001$	-0.00199	0.45741

AZUL	-0.00107	0.77329	2.05073	$p < 0.001$	-0.00036	0.91247
GOL	-0.00015	0.96815	2.07578	$p < 0.001$	-0.00121	0.70559
ALGT	-0.00079	0.71836	1.48541	$p < 0.001$	-0.00019	0.91923
ZNH	0.00219	0.23793	0.80111	$p < 0.001$	-0.0023	0.15587
ALK	0.00044	0.8337	1.34132	$p < 0.001$	-0.00097	0.59409
AAL	-0.00057	0.85116	1.387	$p < 0.001$	0.00002	0.99331
CPA	0.00129	0.61087	1.28422	$p < 0.001$	-0.00136	0.54155
CEA	0.00177	0.2935	0.68372	$p < 0.001$	-0.00219	0.1371
LUV	-0.00014	0.9372	1.05273	$p < 0.001$	-0.00044	0.77433
DAL	0.00049	0.82372	1.30747	$p < 0.001$	-0.00111	0.56516
MESA	-0.0023	0.50583	1.60026	$p < 0.001$	0.00057	0.84987
VLRS	-0.00141	0.56821	1.59672	$p < 0.001$	0.00149	0.49006

Source: own calculation (2023)

From the Table 7. We find out that all the α_i is not significant. And all risk premium is significant. From the sentiment index (bullish divide bearish), the same as the result of the sentiment index (bullish minus bearish), there is only one company's sentiment index that is significant. The other 18 companies' sentiment index is insignificant. We can say that the sentiment index cannot explain the airline industry.

5 Conclusion

From the result, we find out that no matter which sentiment factor we added, all 3 models' risk premiums are significantly correlated with stock return and the market risk-free rate. It means the CAPM model can be applied in the airline industry. In our selected period, the beta is high, 15 out of 19 companies' beta is higher than 1. From the CAPM model with sentiment index (bullish minus bearish), the result shows only one company return ATSG, which can be explained with the sentiment factor. The other 18 companies' sentiment factor's p-value is higher than 0.05. It means a low probability of chance sentiment index can explain the stock return. From the second result of the CAPM model with the sentiment index, we can see the same results for both indices (bullish divide bearish, and bullish minus bearish).

However, the sentiment factor is not significantly correlated with the stock return in the airline industry. Even though there is a lot of research that shows that sentiment analysis can be an important role to explain stock return. However, in this paper, we test the result is not as expected. We assume there are two main reasons for the result. The first is the sentiment index represents the whole market. But airline company is only a small part of the market. The sentiment of the whole market cannot represent the airline industry precisely. The second one is the time period of the paper is during the covid-19, and the airline industry is highly related to traveling and commuting. During this period the investors may have opposite sentiments for the airline industry than other markets. These two points of view can be the insignificant reason for the sentiment factor in the airline industry.

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Selection of an Automated Solution in Logistics Using DEA Models

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Abstract
In today's progressive era, when everything is constantly developing dynamically and moving forward at breakneck speed, society is increasingly resorting to digitization and automation. This is a much-discussed topic, mainly in the area of connecting industry and artificial intelligence, known as Industry 4.0. Currently, it is a big problem for many industrial companies to choose a suitable automated solution, either for them or their customers. There are many methods for evaluating the efficiency of individual solutions. One of them is Data Envelopment Analysis (DEA), comparing a set of admissible solutions formed by homogeneous production units, also referred to as Decision Making Units (DMU). The aim of this paper is to measure efficiency of logistics solutions using DEA CCR models assuming constant returns to scale. The application of DEA CCR models on a specific case demonstrates the possibility of solving the problem of choosing the most suitable solution. The results of CCR models are compared and, based on the achieved results, the company's previous decision is also evaluated. At the end, the (in)appropriateness of using these models was pointed out due to the large number of effective DMUs, and the use of a different model was recommended for future logistics solutions evaluation.

Keywords
CCR, DEA, Logistics, Optimization, Warehouse Automation

JEL Classification
C61, O14, O3

1 Introduction

In today's progressive era, when time is money, everyone strives to be the best in their field. Therefore, many industries are moving towards automation and digitization to increase efficiency and effectiveness. Combining innovative solutions with artificial intelligence (AI) can indeed be a very big step forward, but if the chosen solution is not efficient, it may not bring the expected and desired benefit as a result. Therefore, choosing the right logistics or intralogistics solution may not always be easy and cannot be taken lightly. Choosing an efficient solution can be helped by many auxiliary, decision-making or optimization methods that can compare individual variants with each other. These methods can also be used in project management, where they can help the project manager not only to achieve the selection of the best solution, but also to optimize the time of project management due to the reduction of the time required for comparison and selection from a set of available solutions. One of these supporting methods is also Data Envelopment Analysis (DEA), which is a method used to evaluate and determine the efficient of the researched decision-making units (DMU) based on their mutual comparison. Data Envelopment Analysis is used across many industries, whether it is healthcare, banking or industry. This method is able to compare given decision-making units that have multiple inputs and outputs, based on the possibility/ability to influence those inputs/outputs, it is also necessary to choose the right DEA model.

The main objectives of this study will be the evaluation of the analysis of the efficiency of the examined variants represented by individual DMUs, for which the DEA optimization method will be used. Within the study, individual DEA models will be presented, as well as the data that will be used for the subsequent analysis performed by the application of the mentioned models. At the end, an evaluation of the individual models and a comparison of the obtained results will be carried out.

The article is structured into several parts. First, a literature review related to automated warehouse and intralogistics. Subsequently, the methodology is described, i.e. the DEA method itself is presented, and individual DEA models for future analysis. Next, the data that will be the subject of evaluation and analysed using DEA models are presented. After the data analysis itself, the obtained results are interpreted and evaluated. At the end,

the most important findings based on the performed analyses are summarized and also the appropriateness of using individual DEA models is evaluated.

2 Literature Review

This part of the article deals with the literature review, focusing on the main areas occurring in this research, which are automated warehouse and intralogistics. DEA will be introduced in the following part of the thesis. This initial survey of the literature, which was mainly indicative in nature, will also continue to serve for future research.

2.1 Automated Warehouse and Intralogistics

Effective logistics processes have become the basic building block of the economy. Logistics involves getting the right product, in the right way, quantity and quality, in the right place at the right time and cost for the right customer. In other words, logistics, which can be defined as part of the supply chain, is a comprehensive process which includes planning, implementing and controlling procedures for the effective and efficient transportation and storage of goods as well as services and related information. (Mangan, 2016; Myerson, 2015). As part of intralogistics, solutions integrating trends that prevail in various areas of modern socio-economic life are applied. One of them is automation, where selected technological solutions are used, mainly in the area of storage. However, the use of the most modern technological solutions in the field of warehousing should not represent a threat to jobs, but should primarily be about providing support in order to improve results and increase efficiency. (Wagner et al., 2021) Smart logistics and the revolution in this area, where e.g. information and communication technologies, the Internet of Things or artificial intelligence are used to enable more efficient functions in logistics operations, is becoming a promising solution for the ever-increasing demands, requirements and quantity of logistics operations. (Feng et al., 2021) One of the main factors responsible for the fourth industrial revolution is intralogistics. The development of intralogistics as a form of automation, optimization and integration enables the transformation of warehouses and production units into smart environments that can be controlled and managed through a single system. (Fernandes et al., 2019)

Due to the increasingly dynamic market requirements in the field of automated storage technologies, as well as the more advanced needs of smart factories and Industry 4.0, it is necessary to constantly develop more efficient and innovative solutions and models in order to constantly increase automation and thus push individual solutions to a new level. Automated warehouse solutions, also known as Automated Storage and Retrieval Systems (AS/AR), are increasingly used in smart factories for product storage and retrieval in both production and distribution solutions. (Fernandes et al., 2019; Roodbergen et al., 2009) Industry 4.0 and the topic of the new industrial revolution have attracted considerable attention in recent years. Industry 4.0 connects the physical, digital and virtual worlds through emerging technologies. However, the literature in this area is still limited. (Ponis et al., 2020)

3 Methodology

In this section, the data used for the subsequent analysis will be presented, as well as the Data Envelopment Analysis itself and its individual models, which will be further used for the analysis of this data.

3.1 Data Envelopment Analysis

DEA, as a non-parametric optimization method of mathematical programming, is used to measure the relative efficiency of DMUs with multiple inputs and outputs. Based on Koopmans' concept of activity analysis (Koompans, 1951) and the research dealing with the measurement of radial and productive efficiency by Debreu and Farrell (Debreu, 1951; Farrell, 1957), a basic DEA model was presented by Charnes et al. (1987). This model brings many advantages. The first already mentioned advantage is multiple inputs and outputs. Furthermore, the fact that this method uses empirical data and does not require the a priori existence of a production function. Last but not least is the fact that, thanks to the mathematical optimization model, there is no need to weight individual factors, since their weighting is carried out endogenously thanks to this model. (Loske et al., 2020)

Loske et al. (2020) in their research defined 4 characteristics for the implementation of new technology, which justify the use of the DEA method as a key research method, based on the research of Charnes et al. (1978), Cooper et al. (2007) and Cooper et al. (2011). These four characteristics are:

- no a priori information or knowledge is required,
- enabling the integration of several input and output factors, as well as the possibility of increasing them,
- mutual comparison of empirical observations only with each other,
- if the factors are constant, the results are comparable between several periods.

Within the scope of the literature survey, one can find a wide application of the DEA method across many different industries, whether it is healthcare, education, banking, agriculture, production planning, geography and many others.

The Data Envelopment Analysis optimizing method is used to evaluate the efficiency of homogeneous production units, called decision-making units (DMU), based on predetermined input and output data. Therefore, the selection of appropriate input and output data is essential for developing a DEA model. (Loske et al., 2020) DEA models are based on the principle of the existence of a set of admissible solutions, which is formed by all combinations of inputs and outputs. (Debasish, 2006). The efficiency of individual DMUs is determined by the so-called efficient frontier, which defines the set of admissible solutions. It is created on the basis of data analysis by the identification of relatively efficient units, so-called reference points. Shape of efficiency frontier is influenced by returns to scale, which can be constant, corresponding to the CCR model introduced by Charnes, Cooper and Rhodes in 1978 (Charnes et al., 1978) or variable, corresponding to the BCC model introduced by Banker, Charnes and Cooper in 1984 (Banker, 1984). This efficient frontier divides the used DMUs into relatively efficient and relatively inefficient ones. There are many DEA models, but probably the most basic division of models is their division into input- and output-oriented models. Subsequently, 2 models will be presented, which will then be used in this work.

3.2 Charnes – Cooper – Rhodes model (CCR)

The first CCR model, based on Farrell's model (Farrell, 1957) for measuring the efficiency of single-input, single-output units, was proposed by Charnes, Cooper and Rhodes. (Charnes et al., 1978) The CCR model, which assumes constant returns to scale, is based on the principle of optimizing input and output weights in order to achieve the highest possible efficiency of a given production unit. The goal is therefore to find the maximum value of the efficiency rate of the analysed unit, which is obtained by the ratio of weighted inputs and outputs, when the efficiency rates of the other units do not exceed 100% efficiency and are therefore less than or equal to 1. By fulfilling all the assumptions, it is possible to define the model as a linear curve programming task, which it is subsequently necessary to linearize using the Charnes-Cooper transformation. If the efficiency value of DMU is equal to one, the DMU is efficient and thus lies on the efficiency frontier. Otherwise, the unit is not efficient and therefore its value less than 1 means that it is below/outside the efficiency limit. (Charnes et al., 1978, Debasish, 2006)

When deciding whether to choose an input-oriented or output-oriented CCR model (CCR-I or CCR-O), we must consider which of these units we are able to influence, whether inputs or outputs. (Debasish, 2006) If we consider an input-oriented model, the goal is to identify such units that excessively use resources, and the effort is to minimize inputs and fix outputs. In case of output-oriented models, the goal is to maximize the efficiency of the unit by maximizing outputs. Often, however, choosing the right model is a very demanding and very specific topic, and therefore a clear and precise specification of the goals and formulation of the purpose of the analysis is always needed. It should be noted that by applying both of these models (CCR-I and CCR-O) we get the same efficient frontier, since the CCR model only tells us the relative distance of the given unit from the efficient frontier. (Cook et al., 2014) It should also be noted that we are not always and, in all cases, only concerned with reducing inputs or only expanding outputs, but there are also models whose goal is a combination of both. However, we will not deal with this case in this article.

For the CCR-I model (1–3), the following maximization objective function, self-constraint condition and non-negativity condition apply. The known inputs and outputs are represented by y, x, where yik represents the value of the ith output for the kth unit, xjk represents the value of the jth input for the kth unit and ui, vj are variable weights. Using the objective function, we measure the maximal efficiency of the unit using the ratio of the summation of weighted outputs and the summation of weighted inputs. The self-constraint condition applicable to all DMUs means that the efficiency can range from 0 to 1. The non-negativity condition cannot be neglected, i.e., that all weights of both inputs and outputs must be positive. Therefore, a positive lower bound on the weights was established, where the parameter $\varepsilon > 0$ represents the non-Archimedean infinitesimal. (Charnes et al., 1978; Toloo, 2014)

$$\max z = \frac{\sum_{i=1}^{r} u_i y_{io}}{\sum_{j=1}^{m} v_j x_{jo}} \quad (1)$$

$$\frac{\sum_{i}^{r} u_i y_{ik}}{\sum_{j}^{m} v_j x_{jk}} \leq 1, \; k = 1, 2, \dots, n \quad (2)$$

$$v_j, u_i \geq \varepsilon, \; i = 1, 2, \dots, r \; ; j = 1, 2, \dots, m \quad (3)$$

Since the model is defined as a linear fractional programming problem, it is necessary to convert it to a linear programming problem using normalization (4 – 7). After normalization, the objective function, self-constraint conditions and non-negativity conditions are expressed as follows

$$\max z = \sum_{i=1}^{r} u_i y_{io} \quad (4)$$

$$\sum_{i=1}^{m} v_j x_{io} = 1 \quad (5)$$

$$\sum_{i=1}^{r} u_i y_{ik} - \sum_{j=1}^{m} v_j x_{jk} \leq 0, \; k = 1, 2, \dots, n \quad (6)$$

$$v_j, u_i \geq \varepsilon, \; i = 1, 2, \dots, r \; ; j = 1, 2, \dots, m \quad (7)$$

On the other hand, the minimization objective function applies to the CCR-O model (8–11), since, assuming constant inputs, we want to achieve their maximum use by maximizing the outputs that we are able to influence in this model to achieve the desired efficiency results.

$$min \; e_Q = \sum_{j=1}^{m} v_j x_{jk} \quad (8)$$

$$\sum_{i=1}^{r} u_i y_{ik} = 1 \quad (9)$$

$$\sum_{j=1}^{m} v_j x_{jk} - \sum_{i=1}^{r} u_i y_{ik} \geq 0 \quad (10)$$

$$v_j, u_i \geq \varepsilon \quad (11)$$

4 Data and Empirical Results

This part of the research is dedicated to the presentation of the data for which their effectiveness will be examined. Furthermore, the analysis of the effectiveness of the individual decision-making units will be carried out using DEA models, more precisely the CCR input-oriented and CCR output-oriented models.

4.1 Data

For this research, data was provided by a company dealing with warehouse automation and intralogistics, which supplies automated storage solutions not only within the Czech Republic. This company also deals with warehouse intralogistics and tries to provide customers with the best, most cost-effective and, above all, most efficient solutions in order to meet the specific requirements and needs of the customer. Individual DMUs in this study will represent permissible variants that were proposed and considered for a previously implemented project. Based on the analysis of individual DMUs using the DEA method, it will therefore be possible to evaluate whether the previously chosen solution was efficient or not.

In this paper, 14 homogeneous DMUs will be worked with (see Table 1), each of which consists of 3 input variables and 2 output variables. The individual variables are explained below.

Input variables (*I*):

- I_1, *Total solution price* – the final price for the total solution of the proposed combination of different types of machines,
- I_2, *Amount of person* – the number of people necessary to operate the machines of the chosen solution,
- I_3, *Built-up area* – the built-up area indicates the sealed area within the storage area in m^2.

Output variables (*O*):

- *O_1, Machine performance* – the performance of the solution is given in units of orderline/hour units,
- *O_2, Stored material* – amount of stored material for location 600x400.

Table 1. Data used in this study

DMU	I_1	I_2	I_3	O_1	O_2
DMU01	1700	9	440	1840	15000
DMU02	1900	13	470	3360	15000
DMU03	1500	7	380	1080	15000
DMU04	1400	10	370	1840	15000
DMU05	1600	14	400	3360	15000
DMU06	1200	8	310	1080	15000
DMU07	1500	5	410	1700	13500
DMU08	1200	6	360	1700	13500
DMU09	1600	5	410	1900	12500
DMU10	1300	6	360	1900	12500
DMU11	2100	5	330	2000	13000
DMU12	1800	6	310	2000	13000
DMU13	1900	5	330	2200	13000
DMU14	1600	6	310	2200	13000

Source: own elaboration

4.2 Empirical Results

The first of the models that was worked with is the DEA CCR-I model, which is an input-oriented model considering constant returns to scale, according to Charnes, Cooper, and Rhodes. (Charnes et al., 1978) The goal of this model is to maximize the output variables. This condition is met for DMUs whose efficiency is equal to 1. Thanks to the comparison of all DMUs and the subsequent selection of efficient units, it is then possible to determine by how much which inputs of a given DMU would have to be reduced in order to reach the efficient frontier without changing the required outputs. The Data Envelopment Analysis method was carried out as part of the evaluation of the previous selection of the most suitable delivered automated logistics solution for a customer in a company dealing with the automation of storage solutions and logistics. For evaluation, 14 homogeneous DMUs representing the individual considered variants were provided. The software program GAMS Studio 41 was used for the calculation, and the DEA-solver Software with MS Excel were also used to display broader results and values.

The goal of this model was to find the most efficient evaluated unit or units based on obtaining the greatest possible outputs, which are invariable, and minimizing inputs. 8 of these 14 DMUs were evaluated as efficient, i.e., their efficiency was equal to 1 (eCCR-I = 1), the remaining 6 DMUs were evaluated as inefficient (see Table 2). The specified input weights (v_1, v_2, v_3) indicate how the values of the given inputs would have to change in order for the given inefficient units to reach the efficiency frontier. *Table 2* shows the optimal weights for individual inputs and outputs.

Table 2. Results of the CCR input-oriented model

CCR-I						
DMU	e_{CCR-I}	v_1	v_2	v_3	u_1	u_2
DMU01	0,8279	0,0002	0,0166	0,0010	0,0001	0,0000
DMU02	0,9699	0,0002	0,0419	0,0000	0,0003	0,0000
DMU03	0,9785	0,0001	0,0721	0,0009	0,0000	0,0001
DMU04	0,9511	0,0007	0,0000	0,0001	0,0001	0,0000
DMU05	1,0000	0,0006	0,0000	0,0001	0,0001	0,0000
DMU06	1,0000	0,0008	0,0000	0,0001	0,0001	0,0001
DMU07	1,0000	0,0001	0,0838	0,0010	0,0000	0,0001
DMU08	1,0000	0,0001	0,0838	0,0010	0,0000	0,0001
DMU09	0,9915	0,0003	0,0968	0,0000	0,0003	0,0000
DMU10	1,0000	0,0004	0,0547	0,0003	0,0004	0,0000
DMU11	1,0000	0,0000	0,0649	0,0020	0,0000	0,0001
DMU12	0,9917	0,0000	0,0465	0,0023	0,0000	0,0001
DMU13	1,0000	0,0000	0,0465	0,0023	0,0000	0,0001
DMU14	1,0000	0,0000	0,0465	0,0023	0,0000	0,0001

Source: own elaboration

Figure 2. Projection of changes for individual DMU values of the CCR-I model

CCR-I											
DMU	e	Rank	I1			I2			I3		
			Data	Project.	Diff.(%)	Data	Project.	Diff.(%)	Data	Project.	Diff.(%)
DMU01	0,8279	14	1700	1407,49	-17,21	9	7,45	-17,21	440	364,29	-17,21
DMU02	0,9699	12	1900	1842,76	-3,01	13	12,61	-3,01	470	421,14	-10,40
DMU03	0,9785	11	1500	1467,73	-2,15	7	6,85	-2,15	380	371,83	-2,15
DMU04	0,9511	13	1400	1331,57	-4,89	10	9,29	-7,10	370	351,92	-4,89
DMU05	1	1	1600	1600,00	0,00	14	14,00	0,00	400	400,00	0,00
DMU06	1	1	1200	1200,00	0,00	8	8,00	0,00	310	310,00	0,00
DMU07	1	1	1500	1500,00	0,00	5	5,00	0,00	410	410,00	0,00
DMU08	1	1	1200	1200,00	0,00	6	6,00	0,00	360	360,00	0,00
DMU09	0,9915	10	1600	1586,42	-0,85	5	4,96	-0,85	410	337,69	-17,64
DMU10	1	1	1300	1300,00	0,00	6	6,00	0,00	360	360,00	0,00
DMU11	1	1	2100	2100,00	0,00	5	5,00	0,00	330	330,00	0,00
DMU12	0,9917	9	1800	1570,71	-12,74	6	5,95	-0,83	310	307,41	-0,83
DMU13	1	1	1900	1900,00	0,00	5	5,00	0,00	330	330,00	0,00
DMU14	1	1	1600	1600,00	0,00	6	6,00	0,00	310	310,00	0,00

Source: own elaboration

Figure 1 above is a projection of DMUs onto the efficient frontier analysed by CCR-I model. It shows the original data values (Data), the optimized data values (Project.) and the percentage change difference (Diff (%)). If we take a look at the least efficient *DMU01*, according to this model it would be necessary to reduce all 3 inputs by 17,21 % to move this DMU to the efficient frontier.

Subsequently, an analysis was performed using the CCR-O model, i.e., an output-oriented model, which aims to maximize the use of fixed inputs by increasing influenceable outputs. The results of this analysis, which are shown in *Table 3*, turned out as expected, that is, all the efficient units from the previous CCR-I model also remained efficient. In this case, the listed output weights (u_1, u_2) indicate how which inputs of the given inefficient units would have to change to make the given DMUs efficient.

Table 3. Results of the CCR output-oriented model

CCR-O						
DMU	e_{CCR-O}	v_1	v_2	v_3	u_1	u_2
DMU01	1,2078	0,0003	0,0201	0,0012	0,0002	0,0000
DMU02	1,0311	0,0002	0,0432	0,0000	0,0003	0,0000
DMU03	1,0220	0,0001	0,0736	0,0009	0,0000	0,0001
DMU04	1,0514	0,0007	0,0000	0,0001	0,0001	0,0001
DMU05	1,0000	0,0006	0,0000	0,0000	0,0003	0,0000
DMU06	1,0000	0,0008	0,0000	0,0000	0,0000	0,0001
DMU07	1,0000	0,0000	0,2000	0,0000	0,0001	0,0001
DMU08	1,0000	0,0008	0,0000	0,0000	0,0001	0,0001
DMU09	1,0086	0,0003	0,0976	0,0000	0,0003	0,0000
DMU10	1,0000	0,0004	0,0833	0,0000	0,0003	0,0000
DMU11	1,0000	0,0000	0,1683	0,0005	0,0000	0,0001
DMU12	1,0084	0,0000	0,0469	0,0023	0,0000	0,0001
DMU13	1,0000	0,0000	0,0465	0,0023	0,0000	0,0001
DMU14	1,0000	0,0000	0,0465	0,0023	0,0000	0,0001

Source: own elaboration

Figure 3. Projection of changes for individual DMU values of the CCR-O model

CCR-O								
DMU	*e*	Rank	*O1*			*O2*		
			Data	Project.	Diff.(%)	Data	Project.	Diff.(%)
DMU01	0,8279	14	1840	2222,40	20,78	15000	18117,40	20,78
DMU02	0,9699	12	3360	3464,37	3,11	15000	16906,25	12,71
DMU03	0,9785	11	1080	1838,44	70,23	15000	15329,79	2,20
DMU04	0,9511	13	1840	1934,55	5,14	15000	15770,82	5,14
DMU05	1	1	3360	3360,00	0,00	15000	15000,00	0,00
DMU06	1	1	1080	1080,00	0,00	15000	15000,00	0,00
DMU07	1	1	1700	1700,00	0,00	13500	13500,00	0,00
DMU08	1	1	1700	1700,00	0,00	13500	13500,00	0,00
DMU09	0,9915	10	1900	1916,27	0,86	12500	12607,02	0,86
DMU10	1	1	1900	1900,00	0,00	12500	12500,00	0,00
DMU11	1	1	2000	2000,00	0,00	13000	13000,00	0,00
DMU12	0,9917	9	2000	2016,82	0,84	13000	13109,34	0,84
DMU13	1	1	2200	2200,00	0,00	13000	13000,00	0,00
DMU14	1	1	2200	2200,00	0,00	13000	13000,00	0,00

Source: own elaboration

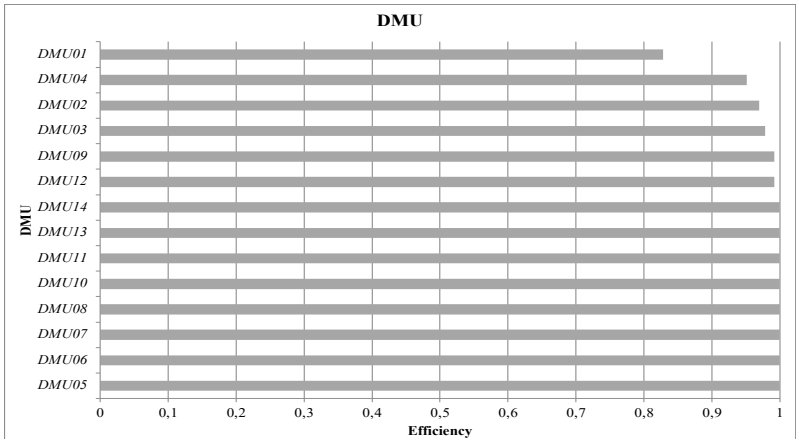
Figure 2 is a projection of DMUs onto the efficient frontier analysed by CCR-O model. It shows the original data values (Data), the optimized values (Project.) and the percentage change difference (Diff (%)). In this case, if we also take a look at the least efficient *DMU01*, according to this model it would be necessary to increase both its outputs by 20.78 % to move this DMU to the efficient frontier.

By analysing and comparing the CCR-I and CCR-O models was confirmed, that the efficiency values of the CCR-O model represent the invers values of the CCR-I model (12) and thus, the resulting efficient and inefficient DMUs are identical for both models.

$$\boldsymbol{CCR_I = \frac{1}{CCR_O}} \qquad (12)$$

As you can see in the efficiency chart of individual DMUs below (*Figure 3*), which ranks the DMUs in ascending order of their efficiency value, 5 of the 6 inefficient DMUs are very close to the efficiency frontier. The furthest from the efficiency frontier and therefore the unit with the smallest efficiency value is *DMU01* with the efficiency $e_{CCR\text{-}I} = 0{,}8279$.

Figure 4. Efficiency chart



Source: own elaboration

Based on the identification of many DMUs as efficient and the problem that CCR model is unable to further rank them, it should be considered for the future research to choose different DEA model that would allow subsequent ranking of the efficient DMUs to obtain more efficient solution selection.

5 Conclusion

As part of this research, the literature in the areas of Data Envelopment Analysis and Automated Warehouse and Intralogistics was reviewed. Subsequently, the DEA method and individual models, further used in this work, as well as the data, were presented. In the next part, 2 DEA models were used for data analysis: CCR input-oriented and CCR output-oriented models operating with constant returns to scale. Using these models of the DEA method, 14 decision-making units were compared. Each of the given homogeneous compared decision-making units had 3 inputs and 2 outputs, the values of which were non-zero. Analyses were performed in the order CCR-I, CCR-O.

The results obtained by the CCR analyses were consistent, which indicates the correct programming of the models. Based on the results obtained by programming individual methods in the GAMS Studio 41 program, it was analysed that the 8 of DMUs (which equals to 57 % of DMUs) can be considered efficient, the remaining 6 as inefficient. However, 5 inefficient DMUs were approaching the efficient frontier with efficiency values from 0,9917 to 0,9511. The last and least efficient was *DMU01* with efficiency $e_{CCR\text{-}I} = 0.8279$. By comparing the analysed DEA models, the relationship of inverse efficiency values for the CCR-I and CCR-O models was confirmed, as well as the related selection of the same efficient and inefficient DMUs. However, the amount of the efficient DMUs seems to be very unsatisfactory if we want to select a smaller number (or 1) of efficient solutions, as it will not serve its purpose and will not help us in our decision-making.

The outcome of this research is the realization that sometimes we are not able to influence some inputs or outputs, or we are only able to change their amount by some part, which may not be enough. This finding means that in the future for the analysis of such DMUs, it will be more appropriate to choose another DEA model, such as the Andersen-Petersen super-efficiency method, which allows ranking all compared DMUs regardless of whether they are efficient or not. This model would therefore be able to rank the efficient units obtained by us and should thus have a greater informative value. (Zýková, 2018) For the future research, another option for the improvement, in addition to choosing other models, could also be to expand the current amount of DMUs by additional units if logistically possible.

In conclusion, I would like to compare the data obtained from analyses performed using CCR models of the DEA method with the information from the company, that provided data for this research, regarding the already implemented variant chosen by the client. From the offered variants, the client chose the one represented by *DMU01*. Based on the analyses carried out, when this DMU was evaluated as the most inefficient of all compared DMUs, it can be concluded that the customer chose the least efficient variant from the solutions for his automated warehouse.

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Research on M&A Pricing Issue Based on Real Options and Game Theory

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Abstract
Making the right M&A decision is essential for the enterprise. One of the key aspects of the decision-making process is determining the price of M&A in a reasonable and scientific way. Since traditional decision-making methods do not take into account the competitiveness and uncertainty of M&A, this paper applies theories and methods related to real options and game theory to conduct an in-depth study on the pricing of corporate M&A. The goal of this paper is to estimate the price of M&A by applying the combination of real option methodology and game theory. We define the total price as the sum of the target company value and the M&A added value of M&A. Each part of the value is estimated. Additionally, the negotiation process can affect the final price. Therefore, we construct a four-round bargaining game model for M&A negotiation. Finally, a case study is conducted to verify the validity of the model.

Keywords
Real Option, Game Theory, M&A, Pricing

JEL Classification
G12, G34

1 Introduction

Since the 19th century, mergers and acquisitions have been in rapid development around the world. There have been five global booms. M&A can effectively promote the optimal allocation of resources among companies and becomes an important tool for companies to enhance their competitiveness and sustainable development. We consider mergers and acquisitions have the characteristics of real options. Real options and game theory can better analyse the uncertainty and competition faced by M&A, which overcomes the shortcomings of traditional pricing and decision-making methods. Therefore, this paper uses real options and game theory to discuss the pricing problem in M&A deals.

The aim of this paper is to estimate the price of M&A by applying the combination of the real option methodology and the game theory. The valuation process can be described in three steps. First, the M&A pricing model is constructed, in which M&A price is the sum of the entity value of the target enterprise and the real option value of the M&A. In the first phase, the two-stage DCF method is used to value the target company. In the second phase, the real option value is obtained by the Black-Sholes model. Then, based on the M&A pricing model, this paper makes certain assumptions about the negotiation game between the M&A parties. The strategy of the pricing game is examined in the case of incomplete information to determine the M&A equilibrium price. Finally, the paper tests the pricing model with a M&A example. LVMH's acquisition of Tiffany case study demonstrates that the M&A model based on real options and game theory can price the target company scientifically and reasonably.

This paper divides M&A pricing into two dynamic processes of valuation and gaming. Combined with real options and game theory, the pricing methodology proposed in this paper provides new theoretical perspectives for corporates. This has practical value for corporate M&A activities.

2 Literature Review

For development of research on real options and game theory in M&A, Dixit et al. (1994) build a Stacklberg game model for continuous real options under imperfect competition. This is used to study the investment problem of participants in a competitive relationship. The literature extends a large number of studies on option game theory. Xiao et al. (2008) develops a game negotiation model to control the risk of information asymmetry in price negotiations. The pricing strategies of both parties under information asymmetry are studied using game theory. Then Yu (2009) creates a dynamic model for pricing target firms in M&A from the perspective of real options and

game theory. Jiang et al. (2016) analyses M&A behaviour under incomplete information, including subgame perfect Nash equilibrium and Bayesian Nash equilibrium.

In recent years, some academics have used real options as a complementary method. Sean (2017) uses real options to study high-tech corporate M&A cases. The research shows that the M&A premium of high-tech firms can be explained by the value of hidden real options. Lucas et al. (2019) combines the dynamic game model with real options approach to explore uncertainty and strategic choices in M&A cases. With basic methods of corporate value assessment, Čirjevskis (2020) constructs a model for measuring the value of corporate M&A based on real options theory and assessed the synergy effect of enterprise M&A.

The study of literature suggests that many scholars have now applied the real option theory to price analysis. The hidden value of real options in M&A has been recognized. However, competition, information, and other factors can have an impact on the final price. There is relatively less literature that considers these factors to modify the real options approach. Meanwhile, some scholars have also incorporated real options theory with game theory to analyse the M&A strategies of major merging firms. But current research stays in decision making. So, research has focused primarily on the acquirer, which has led to less attention to the interests of the target firm. Therefore, game theory still needs to be expanded in the field of M&A pricing.

Hence, this paper takes full account of the competitive nature of the negotiation game and the information asymmetry between the M&A parties. We modify the pricing results by building an M&A pricing model based on real options and game theory.

3 Methodology

This chapter explains the details of the methodologies we used in our research. In this section, we give the description of the M&A pricing model, DCF method, Black-Scholes model, and the negotiation game we designed.

3.1 Construction of M&A pricing model

Myers (1977) points out that the value of a company consists of two parts: the present assets and the value of growth opportunities, that is, all the enterprise's own intrinsic value. The M&A activity itself has the characteristics of real options, such as the option to expand and the option to abandon. In the M&A case, in addition to the intrinsic value of the target company, the premium value of the synergies generated by M&A is also an important consideration. Based on the analysis, we construct the M&A pricing model as follows.

$$V = V_A + V_M, \tag{1}$$

where V_A represents target company's own value, V_M refers M&A added value.

3.2 DCF valuation for V_A

We choose the two-stage DCF method to estimate the value of the target company. The two-stage DCF method divides the life of the company into two phases. The value can be calculated as follows:

$$V_A = V_1 + V_2, \tag{2}$$

where V_1 represents company's value in first stage and V_2 represents company's value in second stage.

$$V_1 = \sum_{t=1}^{T} \frac{FCFF_t}{(1+R_1)^t}, \tag{3}$$

$$V_2 = TV \cdot (1+R_1)^{-T}, \tag{4}$$

where T is the length of time in first stage, R_1 represents the cost of capital in first stage, $FCFF_t$ is the free cash flow to the firm in time t, TV is the terminal value, R_2 represents the cost of capital in the second stage.

It is worth mentioning that Hitchner (2017) states that the terminal value is the value of the company after the explicit or forecast period. The expanded value driver formula is as follows:

$$TV = \frac{NOPAT_{T+1} \cdot \left(1 - \frac{g}{ROIC}\right)}{R_2 - g}, \tag{5}$$

where $NOPAT_{T+1}$ is net operating profit after tax in time $T+1$, g is growth rate at which the company's $NOPAT$ and cash flows grow each year. $ROIC$ is return on invested capital. R_2 is cost of capital in second stage.

3.3 Real option pricing model for V_M

Mun (2012) demonstrated that real options can be calculated in different ways, including using path-dependent simulation, closed-form models, partial-differential equations, and multinomial and binomial approaches. This paper selects the closed-form solutions, the Black-Scholes model, to calculate the M&A added value V_M. First, we explain the assumptions of the model.

(a) Pricing in continuous time.
(b) Perfect capital market.
(c) The price of an underlying asset follows the geometric Brownian motion.
(d) The option price does not depend on expected returns.
(e) European options are valued.
(f) The riskless return is constant.
(g) Volatility is constant.
(h) There is no dividend payment considered.

Hull (2009) explains the Black-Sholes formulas for the prices at time 0 of a European call option on a non-dividend-paying stock and a European put option on a non-dividend-paying stock.

$$c = S_0 \cdot N(d_1) - K \cdot e^{-r \cdot T} \cdot N(d_2), \tag{6}$$

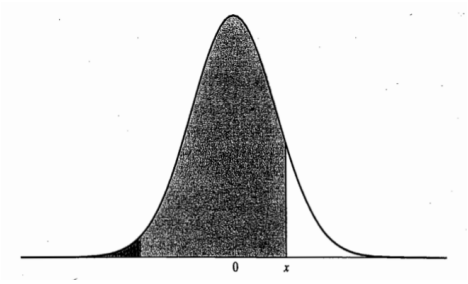
$$p = K \cdot e^{-r \cdot T} \cdot N(-d_2) - S_0 \cdot N(-d_1), \tag{7}$$

$$d_1 = \frac{\ln\left(\frac{S_0}{K}\right) + \left(r + \frac{\sigma^2}{2}\right) \cdot T}{\sigma \cdot \sqrt{T}}, \tag{8}$$

$$d_2 = d_1 - \sigma \cdot \sqrt{T}, \tag{9}$$

where c and p are prices of call and put option, S_0 is the initial price of the underlying assets, K is the strike price, r is the continuously compounded risk-free rate, T is the time to maturity of the option, $N(x)$ is the cumulative probability distribution function for a standardized normal distribution. Figure 1 plot the $N(x)$ visually.

Figure 5. The Shaded area represents $N(x)$



Source: Hull (2009)

The shaded area represents the probability when $x < d$, if $d = 1$, the probability represented by the blue area is 84.13%. $N(x)$ can be calculated by $\left(NORM.S.DIST(x, TRUE)\right)$ function in Excel.

3.4 Game Theory in M&A Negotiation

After the two parties have separately evaluated the acceptable price, they will start bargaining. This interactive negotiation process between the dominant company and the target company is a game process. Finally, both parties reach an equilibrium price between the lowest and highest price, and then the game equilibrium is reached. Table 1 specifies the classification of game theory.

Table 1. Classification of games

	Static State	Dynamic State
Complete Information	Nash equilibrium Nash（1950,1951）	Subgame-refined Nash equilibrium Selten（1965）
Incomplete information	Bayesian Nash equilibrium Harsanyi（1967,1968）	Perfect Bayesian Nash equilibrium Selten（1975）

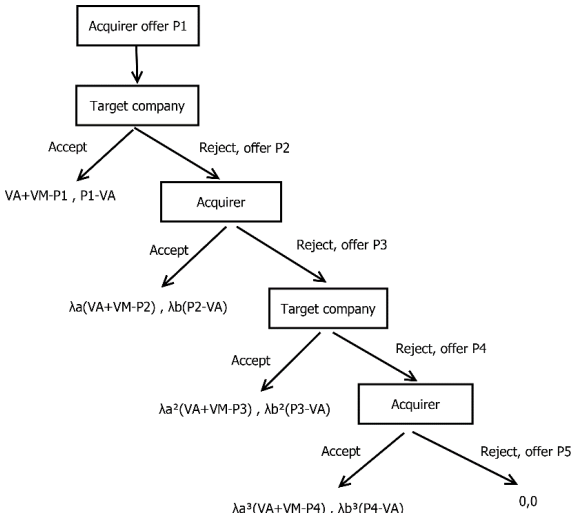
Source: Jiang et al. (2016)

This paper focusses on constructing a bargaining model in game theory under incomplete information to examine the pricing decision process. To better analyse the negotiation process, we make the following assumptions about the model.

(a) There is only one main and target company in the market and no other competitors.
(b) Both parties are perfectly rational people acting according to their own maximum interests.
(c) Negotiations are costly for companies, including direct costs and indirect costs. Based on this, we set the negotiation loss coefficient λ. λ_a represents the coefficient of acquirer and λ_b represents the coefficient of the target company.
(d) The intrinsic value V_A of the target company is the public information. At the same time, this is the lowest price the company can accept.
(e) The target firm knows only that the option value V_M follows a uniform distribution on $(0, M]$.

The negotiation process we have constructed is presented in Figure 2.

Figure 2. Negotiation Game Tree



Source: Author

As can be seen in Figure 2, in the first stage, the acquirer firm offers price P_1. If the target firm agrees to the offer, the payoff matrix is $(V_A + V_M - P_1, P_1 - V_A)$. If the target company rejects, the negotiations move to the second stage.

Similarly, in the second stage, the target firm offers P_2. If the acquirer accepts that price, the benefit is $[\lambda_a \cdot (V_A + V_M - P_2), \lambda_b \cdot (P_2 - V_A)]$. If the acquirer rejects, the negotiations move to the third round.

In the third round, the target company offers price P_3. If the acquirer accepts the price, then the negotiations are successful. The payoff will be $[{\lambda_a}^2 \cdot (V_A + V_M - P_3), {\lambda_b}^2 \cdot (P_3 - V_A)]$. If the target company rejects, the negotiations move to the fourth round.

In our game model, the fourth round is the last round. So, if the acquirer accepts the price, the negotiation ends. The payoff is $[{\lambda_a}^3 \cdot (V_A + V_M - P_4), {\lambda_b}^3 \cdot (P_4 - V_A)]$. If the acquirer rejects the price, the negotiation fails.

4 Empirical Results

The section shows the process of the case study and interprets the results. We briefly introduce the background of the case and then calculate value V_A and value V_M according to models mentioned before. Finally, we solve the negotiation model we established and put the parameters to derive the final M&A price.

4.1 Case background

On 7 January 2021, LVMH Mot Hennessy Louis Vuitton SE, the world's leading luxury products group, completed the acquisition for $15.8 billion and immediately announced staff changes. After acquisition, Tiffany joins Bvlgari, Tag Heuer, Hublot, and Chaumet in the company's watch and jewellery reporting segment. Figure 3 shows the whole process of this acquisition.

Figure 3. Acquisition Process

Source: Author

4.2 Measurement of V_A

The first part of the analysis is to use a discounted cash flow model to assess the physical value of the target firm Tiffany. In this paper, Tiffany's financial reports from 2014 to 2019 are selected as initial data. Table 2 displays key financial parameters from 2014 to 2019.

Table 2. Tiffany Key Financial Parameters 2014-2019 ($ in millions)

	2014	2015	2016	2017	2018	2019
Sales	4249.90	4104.90	4001.80	4169.80	4442.10	4424.00
EBIT	737.50	709.90	676.60	760.50	743.50	690.30
Current assets	3508.8	3508.4	3573.6	3983.3	3759.5	3875.5
Current liabilities	658	729.9	632.8	724.8	718.1	970.4
Investment	44.50	36.30	-4.00	58.70	36.20	72.10
Depreciation	194.20	202.50	208.50	200.80	223.60	253.80
Free Cash flow		799.32	584.71	425.20	991.87	863.34

Source: Tiffany & Co, Annual Report 2014-2019

By applying the two-stage DCF method, we define 2020 to 2023 as the first phase and 2024 to infinity as the second phase. First, free cash flows to the firm from 2020 to 2024 is estimated in Excel according to Table 2. We decide the forecast ratio of each item and then multiply the forecast ratio by an estimate of its driver. Table 3 shows the estimated values of each element and FCFF.

Table 3. Estimation of FCFF from 2020 to 2024 ($ in millions)

	Economic driver	forecast ratio	2020	2021	2022	2023	2024
EBIT	Sales	16.51%	750.22	770.65	791.63	813.19	835.33
CA	Sales	87.31%	3968.00	4076.05	4187.04	4301.05	4418.17
CL	Sales	18.61%	845.56	868.59	892.24	916.53	941.49
INV	Sales	1.12%	50.92	52.31	53.73	55.19	56.70
DEP	Fixed assets	23.3%	267.94	280.13	292.65	305.51	318.72
FCFF			592.36	751.61	776.97	803.02	829.78

Source: Author

Next, based on formula (3), formula (4), and formula (5), the measurement of relevant parameters is processed to obtain the final valuation. Table 4 shows all related parameters and how they are obtained.

Table 4. Measurement of related parameters

Parameters	Calculation method	Value
$\boldsymbol{R_{f1}}$	Market Yield on U.S. Treasury Securities - 10 Years	2.72%
$\boldsymbol{R_{f2}}$	Market Yield on U.S. Treasury Securities-30 Years	3.13%
$\boldsymbol{\beta}$	Linear regression of TIF stock return and NYSE composite index	1.53
$\boldsymbol{R_{e1}}$	CAPM model	6.39%
$\boldsymbol{R_{e2}}$	CAPM model	6.17%
$\boldsymbol{R_d}$	$\frac{Interest\ payment}{total\ debt}$	4.42%
$\boldsymbol{WACC_1}$	$WACC = R_e \cdot \frac{E}{A} + (1-t) \cdot R_d \cdot \frac{D}{A}$	5.66%
$\boldsymbol{WACC_2}$	$WACC = R_e \cdot \frac{E}{A} + (1-t) \cdot R_d \cdot \frac{D}{A}$	5.49%
Growth rate	Average US GDP growth rate from 2015 to 2021	2.13%
ROIC	$\frac{NOPAT}{Invested\ Capital}$	14.74%

Source: Author

With all the above parameters, we can calculate the intrinsic value V_A of Tiffany & Co as:

$$V_A = \sum_{t-1}^{T} \frac{FCFF_t}{(1+R_1)^t} + \frac{NOPAT_{T+1} \cdot \left(1 - \frac{g}{ROIC}\right)}{R_2 - g} \cdot (1+R_1)^{-T}$$

$$= \frac{592.36}{(1+5.66\%)} + \frac{751.61}{(1+5.66\%)^2} + \frac{776.67}{(1+5.66\%)^3} + \frac{803.02}{(1+5.66\%)^4}$$

$$+ \frac{835.33 \cdot (1-21\%) \cdot (1 - \frac{2.13\%}{14.74\%})}{5.49\% - 2.13\%} \cdot (1+5.49\%)^{-4} = \$16084.05\ million.$$

4.3 Measurement of V_M

As a supplement to the traditional method of valuing a business entity, the real options method is used to value the premium generated by the acquisition of an investment project or business. In this case, this component is represented as an option to expand.

LVMH is the world's largest luxury goods giant, but the market for jewellery and watches has always been a weakness for LVMH. The addition of Tiffany will help LVMH expand the jewellery industry and allow it to

occupy a larger position in the hard global luxury market. At the same time, Tiffany's own development and business approach can also give LVMH good reference and experience in jewellery business expansion. Tiffany is also expected to have more room for growth in the future. LVMH has strong capital, retail expertise, and a large network of its own, which could help Tiffany upgrade its stores and complete its expansion around the world.

We select the Black-Scholes model to measure the option to expand. Here we specify the parameters needed in Table 5.

Table 5. Measurement of related parameters of real options

Parameters	meanings	Numerical value
S_0	Tiffany's Current Value	$ 16084.05 million
K	exercise price, M&A price	$15990.4 million
T	Time to expiration of the real option	1
σ	Standard deviation of the historical price return of financial assets	32.02%
r	risk-free rate	2.72%

Source: Author

According to formula (6), formula (8) and formula (9), we obtain the real option value.

$$d_1 = \frac{\ln\left(\frac{S_0}{K}\right) + \left(r + \frac{\sigma^2}{2}\right) \cdot T}{\sigma \cdot \sqrt{T}} = \frac{\ln\left(\frac{16084.05}{15990.4}\right) + \left(0.0272 + \frac{0.3202^2}{2}\right) \cdot 1}{0.3202 \cdot \sqrt{1}} = 0.26.$$

$$d_2 = d_1 - \sigma \cdot \sqrt{T} = 0.12 - 0.3202 \cdot \sqrt{1} = -0.06.$$

$$c = S_0 \cdot N(d_1) - K \cdot e^{-r \cdot T} \cdot N(d_2) = 16084.05 \cdot 0.6 - 15990.4 \cdot e^{-0.272 \cdot 1} \cdot 0.48 = \$2284.77\ million.$$

After the calculation, we obtain that the static value $V_A$of Tiffany based on the discounted cash flow method is $16084.05 million and the real option value V_M based on the B-S model is $2284.77 million. We then use these two valuation results to perform a game-equilibrium analysis to obtain the final price.

4.4 M&A negotiation process

According to Figure 2, the entire dynamic game process is analysed using backward induction to solve the subgame perfect Nash equilibrium. The equilibrium solution is as follows:

(a) When $\frac{1}{4} m {\lambda_b}^3 \leq V_M < \frac{m}{2}$ or $V_M \geq \frac{m \cdot {\lambda_b}^3 - 2 \cdot m \cdot {\lambda_a}^3}{4 \cdot (1 - {\lambda_a}^3)}$ and $V_M \geq \frac{m}{2}$, acquirer bids in third round and the price is $P_3 = \frac{1}{4} \cdot m \cdot {\lambda_b}^3 + V_A$. At the same time, the target company accepts this price.

(b) When $\frac{m}{2} \leq V_M < \frac{m \cdot {\lambda_b}^3 - 2 \cdot m \cdot {\lambda_a}^3}{4 \cdot (1 - {\lambda_a}^3)}$, the game moves to the fourth round, where the target company makes a bid. The price is $P_4 = \frac{m}{2} + V_A$.

For purpose of analysis, we need to clarify the assumptions set up for negotiation process in section 3.4. The assumption is as follows:

(a) The target firm knows that the option value V_M follows a uniform distribution on $(0, m]$. Here, we set m directly to the price of the real option.
(b) The acquirer, LVMH, has the initiative and the dominant position in the bidding, which means that LVMH's negotiation consumption factor is lower compared to that of Tiffany. Therefore, we assume that λ_a is 0.4 and λ_b is 0.6.

For comparison purposes, we display the required parameters in the Table 6.

Table 6. Measurement of Bayesian Nash equilibrium

Parameters	Value
$\boldsymbol{V_A}$	\$16084.05 million
$\boldsymbol{m}$	\$ 2284.77 million
$\boldsymbol{\lambda_a}$	0.4
$\boldsymbol{\lambda_b}$	0.6
$\boldsymbol{\frac{1}{4}m{\lambda_b}^3}$	\$123.38 million
$\boldsymbol{\frac{m}{2}}$	\$1142.39 million
$\boldsymbol{\frac{m\cdot{\lambda_b}^3-2\cdot m\cdot{\lambda_a}^3}{4\cdot(1-{\lambda_a}^3)}}$	\$53.70 million

Source: Author

Compared with Table 6 and the equilibrium solution, we find that the real option value of \$2284.77 million is much higher than \$53.7 million and \$1142.39 million. It implies that equilibrium is $V_M \geq \frac{m\cdot{\lambda_b}^3-2\cdot m\cdot{\lambda_a}^3}{4\cdot(1-{\lambda_a}^3)}$ and $V_M \geq \frac{m}{2}$, which mean the final price is $P_3 = \frac{1}{4}\cdot m\cdot{\lambda_b}^3 + V_A = \$16207.42$ million.

So, the price for LVMH's acquisition of Tiffany is $P = \frac{16207.42}{121.6} = \$133.28$ per share. This price is close to the final M&A price of \$131.5 per share, which proves the applicability of our model. Here we summarise the valuation results in Table 7.

Table 7. Summary of valuation

Parameters	Value
$\boldsymbol{V_A}$	\$16084.05 million
$\boldsymbol{V_M}$	\$ 2284.77 million
$\boldsymbol{V}$	\$ 18368.82 million
$\boldsymbol{P}$	\$16207.42 million

Source: Author

With this acquisition, Tiffany has found a suitable platform for its development. Meanwhile, LVMH has gained Tiffany's support in the process of achieving its business plan. From the perspective of both parties, this merger is a win-win business move for both sides.

5 Conclusion

This paper outlines the price of M&A by applying the combination of the real option methodology and the game theory. Combining the traditional valuation methods of discounted cash flow method and the real option model valuation method, the real value of the target company is assessed by constructing the M&A pricing model. This paper then goes on to focus on the impact of the competitive game process between the acquirer and the target firm on the M&A price. This process is subsequently applied to a real-life case, and the following results are obtained.

With the two-stage DCF method, value V_A of Tiffany & Co is \$16084.05 million and M&A added-value V_M is \$2284.77 million. Combined with game theory analysis, we determine that the final price of acquisition is \$16207.42 million and then transfers to \$133.28 per share. This price is close to the real M&A price of \$131.5 per

share. Through the interpretation of a real case of LVMH's acquisition of Tiffany in the market environment, validation of the rationality of the M&A pricing model established in this paper is confirmed.

Furthermore, the proposed pricing models are based on a series of assumptions for the interpretation of complex and dynamic corporate processes. These assumptions are used to estimate the many factors that affect the pricing of M&A, which is likely to lead to inaccurate results. Moreover, this paper is a relatively brief discussion of the types of options in target business acquisitions. In the reality of many companies, there are compound real options due to specific differences in the composition of the product assets and the current state of business management of the target company.

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The ECSI Model Applied in the Fast Food Industry in the Czech Republic

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Abstract

Competition can be found in almost every market in every sector. There are big automotive players, leaders in banking, and even in the case of fast food, we can find dominant companies. Some have a long tradition, others have been around for a little while and although some of these companies may seem to compete sometimes they have the same owner or history. In the Czech Republic, three fast food outlets have been compared using the ECSI satisfaction method KFC, Burger King, and McDonald's.

Keywords
ECSI, customer, customer satisfaction, satisfaction, satisfaction index

JEL Classification
L15, M21, L26, F60.

1 Introduction

If there were a single customer who would shop with one single company for a single product to address satisfaction, loyalty, quality, or value, there would be no point (Oliver, 2015). However, we currently live in an age where even a commodity such as a roll can be found in a variety of forms, and choosing a customer has never been more difficult. Especially when they are trying to find a really good value product that suits them. Analysis in each segment, for each product, could take hours and one would do nothing but analyze products, markets, companies, and opportunities.

For a person entering a particular market for the first time with an interest in trying to reduce or eliminate their deficit, it can be difficult to navigate. However, in the age of social media, if we become interested in a particular area, the Internet's algorithm adapts to our search and recommends products or introduces us to companies we might be interested in. By doing this, they can influence the customer through marketing and create certain expectations in the potential customer. On the other hand, people working in direct contact with the customer can create a pleasant environment and positively influence satisfaction, but the main product should keep certain promised and claimed parameters and cause the consumer's deficit to be solved. This article focuses on the main three fast-food chains in the Czech Republic. Where its main objective is to use the ECSI method to measure the customer satisfaction index and then to address the subobjective of whether the ratings of people who have or have not had fast food in the last 30 days differ, using ANOVA to continue to evaluate the hypotheses.

2 Literature Review

According to Koudelka (2018), satisfaction is a purely subjective area, having purely individual content and its evaluation is on the subjective scale of each customer. [1] This theory is also supported by Oliver (2015) who further states that satisfaction is a state at the end of a process, not during the use of a product, and it is an aggregate state of a psychological process. However, to the overall definition of satisfaction, we need to add the word gratifying or pleasurable fulfillment. This is because even if the consumer is satisfied, it does not mean that he experiences positive emotions, since a given level of satisfaction can only bring him to neutrality, and there are situations that the consumer has to do but does not enjoy (paying taxes).

The word satisfaction can be expressed, for example, as:

1. the customer's overall evaluation of a product or service after he or she has purchased it (Choi, La, 2013).

2. According to ISO, customer satisfaction is defined as "the customer's perception of the degree to which his requirements have been met" (Blecharz, 2015).

The word satisfaction can be further divided into several parts of satisfaction or emotions such as:

- relief (This product gives me relief.),
- joy (This service brings me great and lasting joy.),
- and pleasure (Using this product is a pleasure for me.) (Oliver,2015).

Since some companies have satisfaction as one of their goals, we can consider satisfaction as a measure or indicator of company performance, so it is often examined what exactly influences satisfaction and what affects satisfaction. Some of the influences on this consumer state may include brand trust, customer service, brand image, brand value, or brand quality. Interestingly, these areas are found in the ECSI (European Customer Satisfaction Index) method, which will be introduced in the next part of the article (Stribble, Somsit 2022).

Monitoring and striving to create an environment for customer satisfaction have several benefits for the company and the company. A satisfied customer is more likely to receive positive feedback, is willing to try new products in the range, and is also more willing to interact with the company when receiving feedback, where the company can pick up early indications of dissatisfaction. However, it is found that despite customer satisfaction, the customer may leave if there is an absence of emotional attachment (Dick, Basu 1994; Fornell, 2007; Pervaiz, Sankaran, 2010). Additionally, according to Oliver (2015), different consequences occur for the four subjects.

1. The consumer does not have to spend time and effort to find an alternative, by not having to take corrective action due to dissatisfaction. Satisfaction also helps the consumer in his confirmation ability, he has found a product that brings him satisfaction and reduces or eliminates his deficit altogether; thus he has understood the complexity of the market and thus he gains motivation to acquire new information and to be further interested in other parts of his life.

2. There are some advantages for the company in the financial component, where it does not have to spend money on remediation, and customer churns analysis and can focus on product improvement and innovation. Customer satisfaction also creates some free advertising through positive word of mouth or WOM.

3. The industry in which the company is located does not have to deal with various changes in legislation based on dissatisfaction and complaints and the associated costs of corrective and improvement measures, thus not creating additional costs for the company.

4. society itself is positively affected as happier customers have better life outcomes – better jobs, greater well-being, and overall a more enjoyable life. This also has an impact on government, where satisfied customers thrive and can reach out to future and existing voters during elections to get reelected.

Therefore, a satisfied customer is a really desirable outcome in different markets for different companies. However, finding out customer satisfaction can have some problems if the information is collected using some satisfaction tool, there is the problem that it is past information. The firm may have identified a problem during that time and corrected it and therefore the information based on the survey may be out of date or incomplete. In addition, some measures may take time to implement. Thus, it is advisable to conduct a questionnaire survey regularly to monitor trend and development (Oliver, 2015).

There are many ways in which satisfaction can be measured whether it is about products or services. Methods and tools include a position map, satisfaction pyramid method, SERVQUAL method, ECSI, ACSI, lost customer analysis, mystery shopping, or importance-satisfaction model. These range from simple tools and techniques to more complex ones that can be applied internationally. SERVQUAL, ECSI, and ACSI are methods that can be used for both national and international comparisons, between branches or even companies fulfilling the same need or deficit (Kozel 2006; Kozel, Mynářová, Svobodová, 2011; Tahal, 2017; Oliver, 2015; Spáčil, Tvrdý & Martiník, 2003).

However, it is important that the firm already has a comparative element. All these indicators such as financial, quality, perceived value, or satisfaction alone do not have predictive value. Everybody perceives values differently, for someone a quality value of 80% will be a lot, for another a little, but if there is a possibility of comparison such as Benchmarking, it adds certain metrics that can be better interpreted. Our company has a bigger/better rating than.

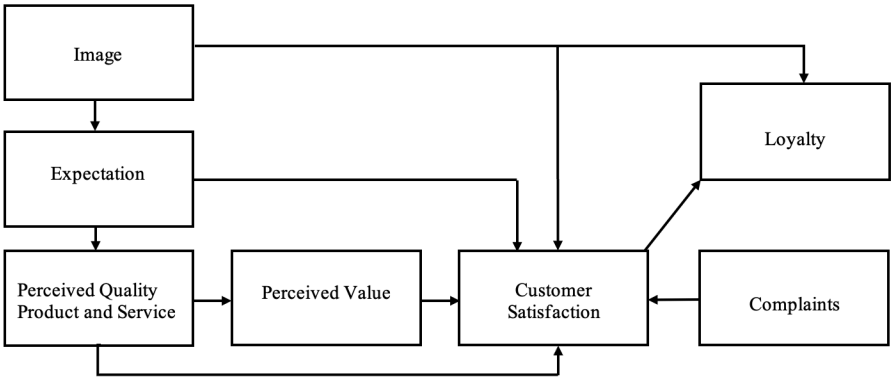
The word "Benchmarking" is explained differently by different authors. For example, the American Society for Quality defines the term as an approach in which an organization measures its performance against other firms that represent market leaders. In the Dictionary of Controlling, it is defined as an analytical and planning tool for comparing a firm with the best firm in the industry. So, we can say that benchmarking is an effective and efficient way to learn from a better reality than our own (Nenadál, Vykydal, Halfarová, 2011).

The method of questioning is a well-known qualitative research technique in which a questionnaire with open, closed, and combination questions is used to obtain opinions and facts from respondents. The data are then recorded and can be measured using verbal, numerical, or graphical scales such as the ECSI model, which uses a 1-10 scale to measure dissatisfaction and satisfaction (Hague, 2003).

3 Methodology and data

The Customer Satisfaction Index is a model that was created in Sweden in 1989 in response to the decline in GDP since 1970. The model uses 5 basic variables (Perceived performance, customer expectations, customer satisfaction, customer complaints, and Loyalty). The American Customer Satisfaction Index (ACSI) was created in 1994 and there are also other national indices around the world such as Norway, Switzerland, Taiwan, Mexico, Korea, and Germany. The ECSI model, which was created in 1996, is compatible with the ACSI and adds the image variable. All of these indices share common characteristics such as boundaries that form national specifications or economic regions, the inclusion of different economic sectors and industries, the production of periodic analyzes and the measurement of not only satisfaction but also key success factors (Kozel, Mynářová, Svobodová, 2011 ; Fornell, 1992; Anderson, Fornell, 2000).

Figure 1 ECSI Model (European Customer Satisfaction Index)



Source: Kozel, R. Modern methods and techniques of marketing research, 243

In Figure 1, we can see the different hypothetical variables, including the arrows that show the inalienability and which variable affects which. Interestingly, complaints only affect overall satisfaction, which in turn affects whether a customer will be loyal. The customer satisfaction index in the ECSI method is then calculated using formula (2.1):

$$\varepsilon_j = \frac{\sum_{i=1}^{n} v_{ij} \cdot x_{ij}}{10 \sum_{i=1}^{n} v_{ij}} \qquad (2.1)$$

where

- ε_j … customer satisfaction index j;
- v_{ij} … the weight of the i-th measurable variable for the j-th value;
- x_{ij} … the value of a measurable variable;
- n … number of measurable variables.

The constant 10 in formula (2.1) is derived from the point scale 1 to 10, which the respondents fill in the questionnaire survey in the ECSI method (Blecharz, 2015, p.67).

When respondents or customers consider what they consider to be critical, there may be a situation where all areas are rated as the most important, thus causing each area to have the same weight. Therefore, in the ECSI method, a different calculation is used to determine the weights (v_ij). The weight is calculated indirectly using covariance (2.2) (Johnson, et al., 2000). The literature from Blecharz 2015 page 67 was used for the calculation.

$$v_{ij} = \mathrm{cov}(X, Y) = \frac{1}{n}\sum_{i=1}^{n}(x_i - \mu_x)(y_i - \mu_y) \qquad (2.2)$$

where

- cov … covariance;
- n … number of measurable variables;
- x_i … the value of a measurable variable;
- μ_x … the average of the i-th variable for all respondents;
- y_i … the average of the responses for all measurable variables within one hypothetical variable for the j-th respondent;
- μ_y … average of averages y_i for all respondents.

The covariance method is used to analyze the relationship between two variables, x and y. It can also be used to assign weights based on expert estimates (Foret, Stávková, 2003).

3.1 Image

Corporate image could be defined as the general impression of customers based on the perceived quality and professionalism of a company in providing products and services. The image in the ECSI model represents the starting point of the whole analysis, where not only the service or product is evaluated, but also the brand, the company, and the people who represent the company. In the 21st century, influencer marketing and ambassadors are also part of the image due to the influence of social media (Grönroos, 1984; Brown, Dacin, 1997; Ryglová, Vajčnerová, 2005, Ni, Zhang, Hu, Lu, Li, 2020) . The measurable variable here is:

- trust, stability, and quality,
- innovation, flexibility to respond to market changes,
- the reason for the first purchase from a company,
- promotion (social networks, competitions, influencers, collaborations, collaborations, etc.),
- logo design, store layout, and orientation, website, apps,
- tradition, reputation and company history.

3.2 Expectation

The word expectancy can be defined by Oliver (2015) as the anticipation of future consequences that have been formed based on prior experiential, current, or other sources of information. Several studies have already shown that consumers perceive multiple levels of expectations. There may be prior expectations in which the consumer anticipates the outcome but may be satisfied with a lower outcome. Expectations can be influenced by external sources, such as advertising, third-party information, product attributes (price, rarity, brand, image, advertising expenditure), or word of mouth. According to Bagozzi and Dholakia (2006), the weight and acceptance rate of word of mouth are determined by how close the person is. The second part that affects satisfaction is internal resources, which are influenced by the ability to recall memories and how easy this recall is. Therefore, internal resources are determined by our own past experience. The problem with expectations is that there is the possibility of creating high expectations without ever having tried the product. The measurable variables for expectations are:

- availability,
- flexibility,
- probability of not meeting expectations,

- expectations,
- and expected quality and price (Kozel, Mynářová, Svobodová, 2011; Foret, Stávková 2003, Oliver, 2015),

3.3 Perceived Quality Product and Service

According to Oliver (2015), a consumer does not have an innate capacity for quality unless he or she has a comparator to use as a standard. These are values based on design, scientific, technical, or engineering production standards and, therefore, are not consumer judgments. In general, then, quality exists only if I have something to compare the values with. Another interesting point is to look at the question "Why is the consumer not concerned with performance?". There are three basic explanations here.

- Measurement - It may be difficult to measure performance, there are products where objective performance cannot be observed, or it may be an ambiguous concept. The measurement itself may be technically challenging and the consumer does not know how to make the measurement. These are products such as health foods or high-tech.
- Impracticality – in this situation, it may be a light bulb, for example, even though it has a certain amount of light on it, the consumer does not record how much it is on every moment.
- Reluctance – the consumer may have an idea and if he measured the output, his ego could be compromised as his inaccuracy of measurement would be exposed.

Satisfaction is an encounter phenomenon. This means that a consumer may think a product is of high quality based on image and expectation without having tried the product. Therefore, satisfaction and quality may be related, but they can exist independently of each other. In the ECSI model, it can be a measurable variable:

- level of accompanying services,
- customer service,
- the quality of the information provided (clarity and transparency of the information),
- choice and variety of offers,
- the quality of the overall product/service
- and the quality of the implementation of the online purchase process (website, application, payment option) (Oliver 2015; Kozel, Mynářová, Svobodová, 2011; Foret, Stávková 2003).

3.4 Perceived Value

Value could be defined as a utility in the true sense of the word. It is how much the customer would suffer in the absence of the product, i.e. the scarcity he experiences before buying the product. Again, for a product or service to have value it must have a comparative element, this can be of two types - intrinsic (difference between costs and benefits) and extrinsic (comparison with alternatives in the market). In this case, value is positively related to quality, functionality, emotions such as pleasure, and high-level abstractions that include personal values. On the contrary, it is negatively related to the feeling of sacrifice. Value is also related to concepts such as utility, quality of life, and universal human values. Again, value is quite individual, and there are elements in the market that may have high value (a rarity) but bring no satisfaction to the user (art that we inherit) while we may have products and services that bring satisfaction to the consumer but not value (puzzle). The measurable variable in such a case may be:

- the level of the advertising campaign and the outreach to the customer,
- communication,
- position about competitors (direct and indirect),
- the expertise of the supplier or staff,
- the appearance and willingness of staff,

- rarity, usefulness, ease of life (Oliver, 2015; Kozel, Mynářová, Svobodová, 2011; Foret, Stávková 2003).

3.5 Customer Satisfaction

Satisfaction in the ECSI model is a combination of five other variables and includes the product and service that the customer experiences after purchasing and using that product. Customer satisfaction also includes accompanying services. The measurable variables are as follows:

- satisfaction with the buying process,
- overall satisfaction with the product or service,
- the level of accompanying services,
- customer service, advice given,
- clarity and transparency of information,
- reliability, flexibility, and punctuality of service,
- satisfaction with sub-products (Kozel, Mynářová, Svobodová, 2011; Foret, Stávková 2003).

3.6 Complaints

For consumers, it is not only the price or the importance of the product/service that matters but also the cost of complaints, including time and effort. A dissatisfied customer has the option to go, spread their dissatisfaction, complain to the company, or demand compensation. The worst for the company, however, are the people who choose the invisible option, i.e. doing nothing. Nothing in such a submission may look like negative word of mouth, changing the company, or being offended, even though the consumer may expect the situation to recur and thus live under some tension. In such a case, the company should make an effort to reveal this hidden dissatisfaction, otherwise, the decline in market share may lead to a crisis in the company. Complaints in the ECSI model are depicted as the part that affects satisfaction. Despite a defect, a bad product, or missing parts, a company can still influence satisfaction by its speed, willingness, or by adding some compensation and thus win the customer. A measurable variable for complaints can be for example:

- complaint frequency,
- satisfaction with the handling of complaints,
- flexibility in handling complaints
- speed and willingness to communicate back,
- staff attitude towards the customer (Oliver, 2015; Kozel, Mynářová, Svobodová, 2011; Foret, Stávková 2003).

3.7 Loyalty

According to Pervaiz, and Sankaran (2010), loyalty is a psychological commitment to a firm or a particular brand. Other authors such as Oliver (2015) define loyalty as a deep-seated commitment to a firm to buy or patronize a product/service in the future despite the efforts of other firms, situational influences, or marketing by other companies that can cause a change in consumer behavior. Loyalty is one of the most enduring assets a company can acquire (Toufaily, Ricard, & Perrien, 2013). According to Oliver (2015), loyalty can have 4 developmental stages.

- Cognitive loyalty - loyalty based only on brand beliefs, one product is better than alternatives. This is a very superficial relationship. A relationship based solely on performance.
- Affective loyalty - affect or cognition towards the company and product. Cumulative satisfaction results in liking and attitude towards the brand. However, it is still possible to lose a customer at this stage.
- Conative loyalty - repeated episodes of positive affect towards the firm. This customer state creates a commitment to repeat purchases. This kind of loyalty is similar to motivation to purchase again and

therefore is still incomplete and even in this kind of loyalty the company still does not fully have the customer on its side.

- Action loyalty - based on behavioral attitudes - is an action state of inertia for repeat purchases. The difference here is that in this attitude there is already a commitment to action to buy the product. Conative loyalty was just a motivation, a socially engaged intention of the consumer to buy the product or another product from the brand.

A loyal customer has several benefits for the company. For example, profitability is influenced not only by repeat purchases but also by positive word of mouth, which is not paid by the company, but will also attract other customers who are willing to pay. If prices increase, the consumer will be willing to pay more or buy various other products, even new products that have a higher purchase price. In addition, positive word of mouth, or WOM, alone has an incredible advantage for a company and saves money. So, the measurable variable is:

- service usage time,
- the likelihood of receiving regular newsletters,
- the likelihood of repeat purchases,
- frequency of contact,
- reasons for possible compensation,
- the probability of recommendation (Kozel, Mynářová, Svobodová, 2011; Foret, Stávková 2003).

The ECSI method is an effective tool for businesses to compare their own performance with both competitors in their own country and multinational companies in the same industry. It can help them identify areas where they need to improve and develop strategies to improve market operations. It also allows multinational companies to track performance changes in different areas and adjust offerings to better meet customer needs.

ANOVA

ANOVA, or analysis of variance, is a statistical tool that is used to analyze the relationship between independent and dependent variables. It follows a linear model and involves the calculation of P-values to assess the null/alternative hypothesis and to determine the alpha level. This alpha level is then used to determine the probability of rejecting Hypothesis H0 even if it is valid. The alpha level (error a) is usually set at 5%, but there are cases where the value is set at 1% or 10%. The lower the alpha level, the less chance of rejecting H0. (Roy, 2001; Blecharz, 2015; Hendl, 2009).

- The P-value < 5% would reject the null hypothesis H_0, that is, everything is given by interference and an alternative hypothesis would be accepted.
- The P-value > 5% would be accepted by the null hypothesis H_0 and the influence of the factor is considered unfounded (Hendl, 2009).

The second option to evaluate the test is to compare the value of F. If the value of F calculated from the data is greater than the table value (critical), the alternative hypothesis is preferred. So the relationship Fcal > Fcrit is valid (Dienová, 2007).

DATA

The main focus of the paper is the overall satisfaction index for all three fast food outlets and their comparison using ANOVA. First, two main hypotheses are established.

- Hypothesis 0: There is a significant difference between the averages for the individual hypothetical variables between McDonald's, KFC, and Burger King.
- Hypothesis A: There is no significant difference between the averages for the individual hypothetical variables between McDonald's, KFC, and Burger King.

A total of 182 people participated in the survey. Interestingly, 113 women participated and the most represented age group was 22 years and younger respondents, which can be called Generation Z, which according to the literature is sometimes reported as 1995 and above, sometimes 2000 (McCrindle, Wolfinger, 2010; Combi, 2015).

The data was collected online, using Google forms, and uploaded to social networks, mainly Facebook. The minimum number of respondents was 50 for each fast-food restaurant, which was met. For McDonald's there were 58 answers, KFC presented 74 answers, and Burger King got 54 respondents. The most frequent respondents were people with a high school education, in the Moravian-Silesian region. The results for all three fast food outlets can be seen in Table 3.1. The statements from the ECSI questionnaire can be seen in Table 6.1, including the average values for each fast food outlet. Each hypothetical area had four statements that were accompanied by the name of the fast food restaurant in the blank spaces marked "_____".ta

Table 3.1 Values of particular ECSI scores

	Burger King	KFC	McDonald's
Image	55%	62%	75%
Expectation	77%	76%	82%
Perceived Quality Product and Service	67%	67%	71%
Perceived Value	65%	66%	66%
Customer Satisfaction	68%	70%	76%
Complaints	77%	76%	78%
Loyalty	38%	50%	52%
ECSI	**64%**	**67%**	**71%**

Source: own calculations [Excel]

The resulting values from Table 3.1 for the ECSI come out highest for McDonald's. However, it is interesting to note that the only value that is the highest for this fast food restaurant is the expectation. And no other value comes close to this one. It is also interesting to note that for Burger King and KFC, no value exceeds the expectation value. And for Burger King, the lowest value is loyalty. In a cursory questioning of the students of Banyan College if they consume Burger King out of a total of 77 students, only 5 students raised their hand. According to their opinion, Burger King is not so widespread in our country. Therefore, the overall ECSI score ended up being the lowest for this chain. The closest value for all chains is the value that reaches 65-66%. The image of Burger King is the lowest among all chains. In contrast, McDonald's achieves the highest value. Burger King has been in the Czech Republic since 2008, KFC since 1994, and McDonald's since 1992. This means that Burger King has been in the country for the least amount of time. Therefore, the recommendation for this chain is to improve its image and try to get closer to potential customers (McDonald’s 2023, KFC, 2023, Dohnal, 2008).

The second subobjective is to divide the respondents into two parts. The first part of the respondents is those who have had fast food from either company more than 30 days ago. The second group of respondents are those who had fast food less than 30 days ago. Again two hypotheses were set for this sub-goal.

- Hypothesis 0 - According to the ECSI method, there was no significant difference in the ratings between people who had fast food more than 30 days ago and respondents who had fast food less than 30 days ago.
- Hypothesis A – According to the ECSI method, there is a significant difference in the ratings between people who had fast food more than 30 days ago and respondents who had fast food less than 30 days ago.

Table 3.2 ECSI scores for respondents based on fast-food consumption.

	More than 30 days	Less than 30 days
Image	60%	66%
Expectation	75%	80%
Perceived Quality Product and Service	68%	69%
Perceived Value	64%	67%
Customer Satisfaction	69%	74%
Complaints	75%	79%
Loyalty	38%	54%
ECSI	**64%**	**70%**

Source: own calculations [Excel]

In total, 85 people answered the questionnaire without having had the fast food in question more than 30 days ago. An additional 97 respondents had ingested the fast food in question that they rated less than 30 days ago. When comparing, we see that the ECSI value is higher overall for people who had fast food less than 30 days ago. For this group, all the scores are higher; the largest difference is in the loyalty scores, as it is usually a difference of 1 to 6%. However, loyalty shows a difference of 16% in total.

4 Results and Discussion

Based on the mean responses for each statement, a one-factor ANOVA was performed to evaluate the significant difference between the responses of the respondents. The first results on significance are presented in Table 4.1. These results are for the first main objective. As a reminder, the null hypothesis was "There is a significant difference between the averages for the individual hypothetical variables between McDonald's, KFC and Burger King". The alternative hypothesis is the opposite.

Table 4.1 ANOVA single factor McDonald's, KFC, and Burger King

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Mcdonalds	28	201,35	7,19	1,53
KFC	28	187,69	6,70	1,43
Burger King	28	180,11	6,43	2,17

ANOVA

Source of variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	8,27	2	4,14	2,421	0,095	3,11
Within Groups	138,40	81	1,71			
Total	146,67	83				

Source: own calculations [Excel]

The results of Table 4.1 are evaluated based on both p-value and critical F versus F cal. The value set for alpha was 5% in the table the lowest level of significance at which we can reject the null hypothesis is 9.45%. This value is higher. Therefore, to reject the null hypothesis we would have to set the alpha to at least 10%. For the F cal value of 2.421, this value is lower than the F critical value of 3.991. Thus, both main indicators point to a rejection

of the alternative hypothesis in favor of the null hypothesis. Therefore, based on the calculated means for all individual variables, there is currently no significant difference between McDonald's, KFC, and Burger King.

The sub-objective of this research was to further divide the respondents according to the criterion of their last visit to a fast food restaurant. These research respondents answered the question of whether they had been to a given fast-food restaurant in the last 30 days or not. Then again, the analysis was done using the ECSI method and the results regarding the significance of the difference between the two groups can be seen in the form of one-factor ANOVA in Table 4.2.

Table 4.2 ANOVA single factor more/less than 30 days.

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
More than 30 days	28	180,929	6,462	1,772
Less than 30 days	28	197,474	7,053	1,437

ANOVA

Source of variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	4,8881	1,0000	4,8881	3,0467	0,0866	4,0195
Within Groups	86,6367	54,0000	1,6044			
Total	91,5247	55,0000				

Source: own calculations [Excel]

The final Table 4.2, calculated from the means of the responses, again evaluates the alternative hypothesis as unconfirmed. The calculated p-value reaches 8.66% and the chosen value of 5% remains the same as in the first case. The calculated F is again lower than the critical critical F and in in this way, as in the first case, the null hypothesis is accepted.

5 Conclusions

The data obtained from the ECSI method accompanied by the ANOVA tool reject the alternative hypothesis and thus confirm the null hypothesis. This means that, in the main objective, there is no difference between the three fast-food restaurants. The subobjective that split the respondents into consumers who consumed one of the fast food restaurants more or less than thirty days ago will once again find no significant difference. Options for future satisfaction ratings are as follows.

1. Possibility of getting more respondents from more countries. Expanding the survey to more countries could create an international comparison. The difficulty and complexity of this research depend on the choice of country or country and language proficiency. If the researcher targets online surveys or face-to-face surveys with the vendors in question, there may be a language barrier problem, as not every person on the planet speaks English. In such a scenario, it is advisable to translate the questionnaire into the vernacular language of the country (Germany, Japan, Poland, England, Hungary, etc.).
2. Deeper and more specific questions. For example, for loyalty, there is the possibility to select questions according to levels of loyalty, as described by Oliver (2015) in his book. More in-depth questions by developmental stages can be as follows:
    a. cognitive – „McDonald’s has for me more benefits than others.“
    b. Affective - " I like Mcdonald's more than other fast food chains".
    c. Conative - " I intend to visit Mcdonald's in the future"

   d. Action - "When I was interested in eating fast and enjoyable, I only bought food from Mcdonald's"

3. One of the fundamental limitations of the ECSI questionnaire may be its length. If examined in detail, the duration of the questionnaire can be demotivating. A quality questionnaire needs precise direction and a goal of what information the company wants to obtain. With whom are competitors compared and for what purpose does this questionnaire serve. Yet it is impossible to find everything. For someone, a specific chain may be an additional feature, an occasional pleasure, or it may be a regular place they visit. Satisfaction for each customer manifests itself differently, where one is satisfied at level 8 some may not even be satisfied at level 9.

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Appendix

Table 6.1 Average claim value for McDonald's, KFC and Burger King with

Claim. Hypothetical variables are marked with parentheses at the end. Example (1)- Image	Mcdonalds	KFC	Burger King
_____ stores have a pleasant and uniform appearance. (1)	7,86	7,13	7,09
_____ has a clear app/website. (1)	7,53	6,30	6,74
_____ keeps up with trends (breakfast menu, organic, types of toys). (1)	7,60	6,15	6,23
I know the _____ mascot. (1)	7,19	5,62	3,09
I expect fast ordering and order processing. (2)	8,84	8,27	7,98
I expect a wide and varied menu at _____. (2)	7,72	7,42	7,40
I expect long opening hours at _____. (2)	9,05	8,07	8,02
I expect to be able to customize my meal at _____. (2)	7,58	6,80	7,55
The quality of the food about the preparation time is excellent. (3)	7,26	7,20	6,91
I don't notice a difference in quality between _____ locations. (3)	6,95	6,72	6,66
The food at _____ is well packaged. (3)	7,60	7,63	6,89
The selection of coupons at _____ is satisfactory. (3)	6,37	5,75	6,43
The prices of the products concerning their quality are satisfactory. (4)	6,37	6,63	6,25
I leave _____ satiated for a long time for good money. (4)	5,81	6,31	6,02
The discount promotions at _____ are convenient. (4)	6,67	6,01	6,45
The opening hours at _____ are satisfactory. (4)	8,30	8,06	7,43
I am completely satisfied with the taste of the food at _____. (5)	7,53	7,52	6,70
I am also satisfied with the other services of _____ (food delivery , playground for children, children's menu). (5)	7,47	6,66	6,51
I am satisfied with the seasonal variation of the menu. (5)	7,39	6,56	6,75
I am satisfied with the ordering system and the possibility to customize the food. (5)	8,19	7,42	7,25
The number of my complaints at _____ is very small. (6)	8,79	8,21	8,40
In the case of a complaint at _____, it is handled without any problems. (6)	7,96	7,55	7,53
The food I received was always hot and properly prepared. (6)	7,53	7,14	7,60
The behavior of the staff during a complaint at _____ is professional and pleasant. (6)	7,42	7,46	7,25
I use the _____ app. (7)	5,18	4,97	3,70
When considering buying fast food, _____ is the first place that comes to mind. (7)	5,88	5,76	3,55
Despite the price increase, I like to visit _____. (7)	6,37	5,87	4,70
If McDonald's sold clothing and accessories with the _____ logo, I would buy the product. (7)	2,96	2,48	3,06

Source: own calculations [Excel]

Well-being Oriented HRM and Performance

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Abstract
Human resource management is a vital asset for an organization to meet its goals. Human resource, together with employee effort and performance, determines business success. However, customer experience has been studied in depth while the employee experience is seldom explored as an important aspect. The aim of this article is to review recent publications, to analyse them and to provide an insight on the employee well-being, to provide a better understanding on the relationship between Human Resource Management, Well-being and Performance. By providing a comprehensive review of quantitative, qualitative and theoretical studies published in journals, this study is important through provide theoretical contributes to the HRM literature and practical implications to the businesses.

Keywords
HRM, employee well-being, performance

JEL Classification
M10, M12, M50

1 Introduction

Over the past 20 years or so, there has been growing interest in the effect that human resource management (HRM) systems have not only on organisational performance but also on employee outcomes including, in particular, various aspects of employee well-being (WB; Appelbaum, Bailey, Berg, & Kalleberg, 2000; Godard, 2001; Guest, 2002; Jackson, Schuler, & Jiang, 2014; Wright & Boswell, 2002). As part of this growing strand of so-called employeecentred HRM research (Peccei & Van De Voorde, 2019), HRM scholars have focused not only on the effect that HRM systems have on as an important issue in its own right (Guest, 1999) but also on well-being as a key mechanism that may help to explain the effect of HRM systems on various aspects of both individual and organisational performance (Peccei, 2004). Our interest here is in that important and growing body of HRM research that focuses explicitly on the relationship between HRM, well-being, and individual and/or organisational performance (IOP). A shortcoming of reviews to date is that they focus solely on the associations between HRM and employee well-being, or between HRM and individual and/or organizational performance. Therefore, these reviews reveal little on the simultaneous effects of HRM on both out comes. This lack of knowledge raises difficulties for management because it remains unclear as to how HRM can be designed and implemented in such a way that these outcomes are influenced independently and/or such that both outcomes are optimized.

2 Literature Review

2.1 Human resource management (HRM)

The concept of HRM is one of the fields of management that gained popularity in the last 30 years or so. Although HRM is the most popular research area, there is no universally accepted and generally acknowledged single definition (Paauwe, 2009). According to Boxall and Purcell (2008), HRM refers to: ‘all those activities associated with the management of people in firms’. This definition stresses the inclusion of multiple management activities, in contrast to a focus on the effects of a single management activity in isolation from other management activities. It is important to combine multiple HR practices, as employee and organizational outcomes are influenced by many management activities rather than by just one (Wright and Boswell 2002). Saridakis et al. (2016) conceptualized High-Performance Work Practices (HPWP) as a set of different but interconnected, mutually reinforcing HR practices. Datta et al. (2005) define it as a system of practices aimed to enhance the skills,

commitment, and productivity of employees. In his book, Armstrong (2009) clearly explained that the HRM system as "an integrated and coherent bundle of jointly reinforcing practices". Also, Lepak et al. (2006) classified the HRM system into high-performance work systems, high involvement system, high-commitment systems, the control system of HR, occupational safety and for customer service. While review of the empirical studies, it was realized that there are various phrases given for HRM System such as a High-Performance Work System (Boxall and Macky, 2009) or High involvement Work Practices (Huselid, 1995) or High-Performance HR practices (Kehoe and Wright, 2013) or High Commitment (Huselid, 1995; Gould-Williams, 2003; Alfes et al., 2013). Nevertheless, they can be a substitution of one other and their ultimate essence is to affect performance outcomes (Wall and Wood, 2005). Scholars in Strategic HRM have advocated that an organization can use HR practices in its system form to drive organizational performance (MacDuffie, 1995; Huselid, 1995; Boselie et al., 2005; Jiang et al., 2012; Katou, 2017). In HRM literature, it is suggested that High Commitment HR practices are suitable in service settings (Boxall and Purcell, 2008). To this end, the present study used the term HRM System to refer High Commitment HR Practices, suggesting as a bundle of HRM Practices combined as a coherent system that ultimately affects organizational performance which is consistent with previous studies (Lepak et al., 2006; Vermeeren, 2014; Jiang and Messersmith, 2018). In their empirical review, Boselie et al. (2005) point out four HR practices utilized by several scholars (Recruitment and Selection, Training and Development, Performance Appraisal, Compensation and Reward). In strategic HRM research, Batt (2002) argued that the top four HR practices 4 (Recruitment and Selection, Training and Development, Performance Appraisal, Compensation and Reward) can reflect the major objectives of strategic HRM. Despite the varying number of HRM practices, Combs et al. (2006) suggested that on average intellectuals can include five to six HR practices in building the HRM System. Following prior studies, the present study comprised of six utmost widely used HR practices in the service settings (Recruitment and Selection, Training and Development, Performance Appraisal, Compensation and Reward; Autonomy and Employee Participation). These HR practices are selected using AMO theory (Appelbaum et al., 2000) rather than following random procedure (Boxall and Purcell, 2008; Lepak et al., 2006; Jiang et al., 2012). With the help of AMO model, the present study grouped Recruitment, Selection, Training, and Development as clustered into Ability-enhancing practices; Performance appraisal, compensation, and Reward congregated the motivationenhancing practice whereas autonomy and employee participation formed the opportunityenhancing practices and eventually combined all practices to establish the HRM system, which is consistent with previous studies (Subramony, 2009; Jiang et al., 2012; Mostafa, 2013).

2.2 Performance

In the theory of performance, Dyers and Reeves (1995) posited that the outcomes of HR are categorized into employee, operational, financial, and marketing outcomes. They argued that HRM first affects the proximal outcomes (HR and operational) which in turn affects the distal outcomes (financial and market). This is because the distance between HRM and Performance is stretched (Paauwe, 2009). Following this concept, different conceptual models were formulated to understand the black-box issues (Paauwe and Richardson, 1997; Boseile et al, 2005; Armstrong and Taylor, 2014). In their review, Boseile and colleagues argued that HR practices affect HR, internal, and financial performance respectively. Similarly, Armstrong and Taylor (2014) posited out that HRM first affects employee characteristics such as engagement, commitment, and motivation and if employees have such characteristics then it leads to operational performance such as productivity, quality and customer satisfaction and finally to financial performance. Considering the above arguments, the present study build a conceptual model of performance, we also take quite a broad view and consider studies that have focused on any major form of either individual performance (e.g., in-role and contextual job performance) or organisational level performance (e.g., unit productivity and financial performance).

2.3 Employee well-being

Employee well-being at work can broadly be described as the overall quality of an employee's experience and functioning at work (Warr 1987). Since theories and empirical studies on relationships between HRM, employee well-being, and organizational performance have included employee well-being dimensions related to happiness (e.g. Appelbaum et al. 2000; Gould-Williams 2003; Whitener 2001), health (Appelbaum et al. 2000; Orlitzky and Frenkel 2005; Ramsay et al. 2000) and relationships (e.g. Bartel 2004; Gelade and Ivery 2003; Tzafrir 2005), we consider all these three dimensions of employee well-being (Grant et al. 2007) in our review. It is important to take this distinction between dimensions of well-being at work into account because it is possible that tradeoffs exist between the different dimensions of wellbeing (Grant et al. 2007). Appelbaum (2002) argued that HRM might have contradictory effects on well-being: HRM might positively influence commitment, satisfaction, and

trust, but this might be at the expense of increased stress levels. In the first type of well-being, happiness, employee well-being is focused on subjective experiences and functioning at work (Grant et al. 2007). In the current review, we focus on satisfaction, commitment and engagement as dimensions of happiness at work because these are frequently used in conceptual models and empirical studies (e.g. Appelbaum et al. 2000; Gould-Williams 2003; Whitener 2001). Secondly, within the organizational context, a health-related type of well-being is distinguished (Grant et al. 2007). In line with the dominant approach in the occupational health literature, we differentiate between stressors and strain (Spector and Jex 1998). Stressors (e.g. workload, work intensification) refer to events or situations that give rise to stress, whereas strain (e.g. stress, burnout) refers to responses to stressors. Both dimensions are seen in the current HRM literature including in the AMO framework (Appelbaum et al. 2000) and labour process theory (Godard 2001; Ramsay et al. 2000). More recently, Grant et al. (2007) recognized social well-being as a third important type of employee well-being. It should be noted that this type is somewhat distinct from happiness and health. Whereas the original two types are focused on the individual, social well-being is focused on interactions and the quality of relationships between employees or between employees and their supervisor or the organization they are working for. We included this well-being type because it is increasingly being incorporated in conceptual models (e.g. Appelbaum et al. 2000; Boxall and Purcell 2008; Purcell and Kinnie 2007). A distinction is made between indices reflecting interactions and relationships between employees (e.g. co-operation) and indices that refer to interactions and relationships between employees and their supervisor or organization (e.g. organizational support, social exchange within an 6 organization, organizational trust). Hence, in this review, empirical articles are classified using the following three types of work-related well-being: health, happiness and relationship related (Grant et al. 2007).

2.4 HRM and Employee Well-being

As noted by Peccei et al. (2013), there are a variety of theories that underpin this mutual gains type of model. Some research on employee perceptions of high performance work systems supports this premise and shows that HRM bundles increase positive attitudinal and behavioural outcomes, including job satisfaction and performance (e.g. Macky and Boxall, 2007; Alfes et al., 2012; Piening et al., 2013), although there is variation within (e.g. Kinnie et al., 2005; Kooij et al., 2010) and across (e.g. Piening et al., 2014) contexts. Indeed, HRM-attributions are likely influenced by individual-level factors, such as employees' personality and/or the quality of the relationships that employees hold with managers, as they often carry out key HRM activities, such as selection interviews and performance appraisals (Bos-Nehles et al., 2013; Nishii et al., 2008; Purcell and Hutchison, 2007). However, attributions of HRM are different from perceptions of HRM; although employees may share the belief that an HRM practice exists in the organisation, or that it is implemented fairly, they may disagree as to what they believe motivated management to design the HRM practice in first place. According to HRM attribution theory, it is this belief or attribution that is associated with important outcomes (Nishii et al., 2008). This mainstream perspective on the effects of HRM on employee wellbeing and on performance holds that HRM has positive outcomes for both the organization and the employees. On other word, both employees and thr organisation are expected to benefit from HRM. One of the theories that has been most commonly invoked in extant studies to explain the potential positive effect of HRM on IOP, through WB, is social exchange theory (Blau, 1964). Here, employees interpret HRM activities as indicative of organizational support and care for them, and reciprocate accordingly with commitment, satisfaction and trust (Whitener 2001). In line with the norm of reciprocity (Gouldner, 1960), employees are then expected to repay this positive treatment by the organisation by working harder and putting more effort into their job, as well as by engaging in various forms of citizenship behaviour, thereby directly contributing to enhancing both individual and organisational performance (e.g., Tsui, Pearce, Porter, & Tripoli, 1997). An alternative view of the role of employee well-being in the relationship between HRM and organizational performance is the conflicting outcomes perspective. HRM is assumed to have 7 a negative effect on and to lower WB, which, in turn, is then expected to be associated with and to result in increased levels of performance. Boxall and Purcell (2008) argue that employee well-being and organizational performance are two distinct goals and that they are influenced by different sets of HR practices. According to Peccei (2004), HR practices that maximize employee well-being might not be the ones that maximize organizational performance. Hence, organizations may need to make a trade-off in terms of which outcomes to prioritize. The pessimistic view of employee well-being and organizational performance as conflicting outcomes holds that there is a trade-off between employee well-being and organizational performance: enhancements in organizational performance are achieved at the cost of reduced employee well-being. Based on labour process theory, Godard (2001) concluded that the benefits of HRM tend to diminish because of higher stress levels. In an organization aiming for higher

financial performance, employees can experience increasing levels of work intensification and job strain (Ramsay et al. 2000).

2.5 HRM and Performance

HRP are key elements for building human capital and achieving employee and organizational goals (Bello-Pintado, 2015; Jiang et al., 2012). They serve as a source of competitive advantage (Huselid, 1995) and regulate the relationship between employees and their organization. Testing the existence of a causal effect between HRP and performance has been a constant endeavour for academics. Since Huselid's work (1995) showing that HRP can enhance productivity and financial performance, a large number of scientific articles and meta-analyses have found empirical evidence for this relationship (e.g. Rauch & Hatak, 2016), operationalized as organizational or individual performance. Theories such as Social Exchange (Blau, 1964) explain these positive results when HRP are applied to maximize utility. In recent years, more research has focused on employee-level outcomes in order to understand the mechanisms between HRP and performance (Boxall, Guthrie, & Paauwe, 2016). This is an important challenge in the field because individual performance is considered a key factor in the comprehension of organizational performance (Van de Voorde et al., 2012); without the former, we could not have the latter. First, the impact of HRM on performance is also expected to be positive and to be fully mediated by employee well-being. Theoretically, in the idea that HRM, and especially the adoption of what are said to be more progressive sets of high commitment, high involvement, or high performance HR practices, helps to enhance individual and organisational performance 8 through people, that is to say, by enhancing employee positive attitudes and well-being at work (Appelbaum et al., 2000; Guest, 2002) One of the theories that has been most commonly is social exchange theory (Blau, 1964). In particular, it is the idea that the type of progressive sets of HR practices have important positive symbolic effects, as well as material benefits for employees at the workplace. In line with the norm of reciprocity (Gouldner, 1960), employees are then expected to repay this positive treatment by the organisation by working harder and putting more effort into their job, as well as by engaging in various forms of citizenship behaviour, thereby directly contributing to enhancing both individual and organisational performance (e.g., Tsui, Pearce, Porter, & Tripoli, 1997). Second, HRM is assumed to have a negative effect on and to lower well-being, which, in turn, is then expected to be associated with and to result in increased levels of performance. Theoretically, this type of conflicting outcomes model is primarily rooted in labour process theory (Delbridge & Turnbull, 1992; Thompson & Newsome, 2004). In particular, central to this model are two key arguments. First is the idea that in order to compete more effectively and maintain and/or increase profitability, management is under constant pressure to, for example, reduce costs, improve quality, raise productivity, and lower unit labour costs. And second is that progressive HR practices are a key means through which management strives to achieve its goals at the workplace. From this perspective, therefore, the self-same more progressive HR practices and systems that in mutual gains models are said to enhance WB, in conflicting outcomes models are considered to have just the opposite effect and to harm rather than benefit employees. The last, HRM is assumed to have a negative effect on well-being and performance. The set of progressive HR practices are seen as leading to greater work intensification and strain. Hence, in line with JD-R arguments, they are expected to undermine well-being resulting, in particular, in lower levels of health-related well-being in the form, for instance, of increased job stress and burnout (Van De Voorde et al., 2012). The lower levels of well-being that result from increased work intensification and strain are hypothesised to undermine rather than boost individual and organisational performance. Overall, therefore, HRM in this model is hypothesised negatively to affect well-being and, consequently, eventually also to negatively impact performance. To be included, from collecting emperical studies since 2010, we would like to explore the impact of HRM on one or more WB indicators (happiness, health and relationship), as well as on one or more individual and/or organisational performance indicators. In terms of HRM, our 9 interest here is in studies that focus on multiple sets or systems of HR practices, rather than on individual practices

3 Methodology and Data

A systematic literature search with the articles in fields of management, HRM, organisational behaviour work and organizational psychology and applied psychology was conducted. These journals included Jounal of business research, Human Resource Management, The International Journal of Human Resource Management, International Journal of Hospitality Management, A Cell Press Journal, Personnel Psychology Journal, European Management Journal, European research on management and business economics, Safety Science Journal, Journal of vocational behavior, Journal of Organizational Behavior. These articles related to HRM, well-being indicator

as well as individual or organisational performance, which were published between 2010 and 2022 inclusived. The focus in this review related concepts of HRM, employee well-being as well as individual or organizational performance. This focus allows us to address the competing perspectives of well-being in the HRM–performance link by synthesizing the evidence of a diverse sample of empirical studies, and by examining and discussing in detail the extent to which the variations in study attributes impact on the results. Based on the review, important lines for future research which could contribute to a better theoretical and empirical understanding of the two competing perspectives will be highlighted.

4 Empirical Results

In terms of employee well-being, associations between HRM and happiness well-being (commitment (6), satisfaction (7), engagement (6), turnover intention (3)) were studied. Nearly 40% the studies included more than one measure of happiness: Ang et al. (2013), Boon et al. (2011), Kooij et al. (2013), LuigiStirpe et al. (2022), Ogbonnaya & Valizade (2018), Takeuchi et al (2018), Zhong et al., 2016. Further, associations between HRM and relationship well-being (indices of employee relationships: co-operation, morale and team processes; of employer relationships: trust, organizational support and social exchange, work climate, support climate) were examined in 4 studies: Abdul-NasserEl-Kassar et al. (2022), Chuang and Liao 2010, Takeuchi et al (2018), Zhong et al., 2016. 10 There is a positive relationship between HRM and performance, fully mediated by employee well-being. We found evidence that HPWP are directly and positively related to employees' job satisfaction and work engagement and reduce turnover. This evidence corroborates reports that a coherent bundle of HRM practices might encourage positive employee attitudes and behaviours (Macky & Boxall, 2007; Bal et al., 2013). When an extensive range of HRM practices are used together in combination, they generate mutually supportive effects that shape the quality of employees' functioning at work (Appelbaum et al., 2000; Van De Voorde et al., 2012). Moreover, individual components of HPWP may each have varying positive and/or negative effects on employee outcomes, but their combined use may override some of the negative effects to create an overall positive influence on employees (Macky & Boxall, 2007). Relationships between HRM and health-related well-being (indices of stressors: emotional exhaustion, Job involvement, work overload, employee stress) were considered in only 2 studies: Amanda Shantz et al.(2016), Nerina L. Jimmieson et al.(2021). HRM-cost attribution was positively related to work overload and work overload was positively related to emotional exhaustion (Amanda Shantz et al., 2016). The results showed that employees who believe that their organisation's HRM practices are designed to increase performance reported lower levels of emotional exhaustion via job involvement, whereas those who believed that HRM practices were intended to reduce organisational costs reported an increase in emotional exhaustion via work overload. Hence, to reduce emotional exhaustion, organisations should communicate that HRM practices are intended to promote employee effectiveness. In terms of performance measurement, nearly half the studies dealed with individual performance (9), 5 studies included an operational outcome, and 2 studies included both outcome types: Esther Villajos et al. (2019) and Promila Agarwal (2021). HRM literature has mainly focused on the relationship between HRP and performance (traditionally) and well-being (more recently). Several meta-analyses have found positive relationships with these two sets of outcomes. Consequently, we found that all the practices contribute to the two sets of outcomes if they are correctly implemented. Therefore, it is important to incorporate context-free measures of well-being in order to know how different HRM practices influence employees. This provide practitioners and academics with a tool to assess HRP from the employees' perspective using a two-tier approach, so that it can be used 11 as a measure of the whole HRP system or differentiating it in two important bundles of that system. Nearly 40% of studies examined the mediation on HRM, well-being and performance relationship. These mediators were Job involment, Work overload, Employee engagement, Jos satisfaction, Work engagement, Employee outcome, Support climate and Individual affective commitment. Just in employer, Age, Employee health and support cilmate played the moderator role in 5 studies. The data show that employee perceptions of high-performance HRM practices do not directly lead to higher levels of task performance. Rather, HRM practices only have an impact on task performance when trust in the employer is taken into consideration (Alfes et al., 2012). This is an important finding given that prior research which has investigated this relationship has relied primarily on self-report performance data and produced inconsistent results (Kuvaas, 2008; Kuvaas and Dysvik, 2010; Snape and Redman, 2010). The results based on supervisory-rated performance data in the present study suggest that a degree of caution is needed when arguing for a direct relationship between HRM practices and performance.

Table 3. Results of study

No.	Study	HRM	HA				HE	RE	WB	IP	OP	MO	ME
			C	S	E	T							
1	Abdul-Nasser et al. (2022)	HRP						+	+	+			
2	Alfes et al. (2012)	HRP				- -			+ +	0 +		Trust in the employer	
3	Alfes et al. (2013)	HRP			+				+	+			
4	Amanda Shantz et al.(2016)	HRM					- -						Job involvement Work overload
5	Ang, S.H. et al. (2013)	HPWS	+	+		-			+				Employee engagement Job satisfaction
6	Tensay, A. T., & Singh, M. (2020)	HRP			+				+		+		Employee engagement
7	Boon et al. (2011)	HRP	+	+					+	+			Person-Organisation Person_Job
8	Chuang and Liao (2010)	HPWS						+	+		+		
9	Villajos, E. et al. (2019)	HRP		+					+	+	+		
10	Alqudah, I. H. Et al (2022)	HPHRMP	+						+	+			
11	Kooij et al. (2013)	Develoment HRP Maintenance HRP	+ -	+ -					+ -			Age	
12	Stirpe, L. et al. (2022)	HRP		+	+				+			Employee health	Work engagement
13	Jimmieson, N.L. et al. (2021)	Work stress management					+		+				
14	Tordera, N. et al. (2020)	HRP							+			Age	
15	Ogbonnaya & Valizade (2018)	HPWP		+	+				+		+		Employee outcomes
16	Agarwal, P. (2021)	HRP							+	+	+		
17	Takeuchi et al (2018)	HPWS	+					+	+	+		Support climate	Support climate Individual affective commitment
18	Van De Voorde, Veld & Van Veldhoven, 2016	HRM			+				+				
19	Zhong et al., 2016	HPHRMP			+			+	+	+			

5 Conclusion

These reviews shows that HR practices impove some employees' well-being then promote individual and organsisational performance. Managers should be aware of this to implement effective HR practices since employees are a crucial element of organisations, the human is needed to put back into HRM. We demonstrate that the implementation of some HR practices contribute to increase employee happiness, healthy and relationship. However, there are some mediators or moderators can affect the relationship between HR practices and employee well-being.

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Evaluation the Factors Affect the Ecoturism in Ba Ria Vung Tau Province

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Abstract
In this study, the author evaluated the factors affecting ecotourism in Ba Ria-Vung Tau province, Vietnam. The Delphi method was applied to carry out the research. There are 23 experts, including postgraduate and doctoral specialists, who were interviewed and willing to participate in the study. The IBM SPSS Statistic Software version 20 was used to analyze the data, and the criteria with a mean rating over 3.5 were selected. The topic hypothesizes that there are how many groups of factors that affect the process of choosing a type ofecotourism in the locality. Finally, 18 group factors with 102 indicators were found. The research has reachedthe final results through two interviewing rounds. The project proposes some solutions to ecological location assessment that lay the groundwork for further studies.

Keywords
Eco-tourism, factor, evaluation, natural resources, Delphi method

JEL Classification
M10; D71

1 Introduction

The type of ecotourism is developing at a rapid rate, in a short time, this type has become a type of industry that attracts many workers, plays a high proportion in GDP, has a great influence. to the economy. To ensure the sustainable development of ecotourism, the identification of influencing factors is urgent thing today. Therefore, the article points out a number of factors affecting the sustainable development of tourism activities from an individual research point of view.

With the advantage of rich natural resources and beautiful landscapes, diverse traditional culture, Ba Ria VungTau has a great advantage for sustainable tourism development. However, according to an objective assessment, over the past time, the tourism industry here has not developed commensurate with the potential and advantages of the province. Within the scope of the article, on the basis of assessing the groups of factorsaffecting the type of ecotourism, the article specifies the relevant indicators and proposes some solutions to develop sustainable tourism. locally in the near future.

2 Literature Review

2.1 Overview of Ecotourism and Sustainable Tourism Development in the world

Based on the definition of UNWTO (2003), “Ecotourism refers to forms of tourism which have the following characteristics:

(1) All nature-based forms of tourism in which the main motivation of the tourists is the observation and appreciation of nature as well as the traditional cultures prevailing in natural areas.

(2) It contains educational and interpretation features.

(3) It is generally, but not exclusively organized by specialized tour operators for small groups. Service provider partners at the destinations tend to be small, locally owned businesses.

(4) It minimizes negative impacts upon the natural and socio-cultural environment.

(5) It supports the maintenance of natural areas which are used as ecotourism attractions by: Generating economic benefits for host communities, organizations and authorities managing natural areas with conservation purposes; Providing alternative employment and income opportunities for local communities; Increasing awareness towards the conservation of natural and cultural assets, both among locals and tourists."

These characteristics are sometimes referred to as principles of ecotourism.

In the research Hui, Wan, and Ho (2006) said that Travel and Tourism will continue to generate GDP and jobs across the world economy. This will benefit not only the industry itself but also generate a strong flow-throughеffect in other sectors such as retail, transportation and construction. However, with greater customer demandfor service qualities and tourists becoming more information-driven, travel destinations are also fiercely competitive with one another. Therefore, many researchers have the study of tourist behavior is of great interesting (Wong and Yeh, 2009).

Referring to EU guidebook on sustainable tourism for development (UNWTO, 2003), it is to encourage the promotion of investment in sustainable tourism, including eco-tourism and cultural tourism, which may include creating small and medium sized enterprises and facilitating access to finance, including through microcredit initiatives for the poor, indigenous peoples and local communities in areas with high eco-tourismpotential.

2.2 Ecotourism and Sustainable Tourism Development in Vietnam

According to Tourism Law (Law Library, 2017), Ecotourism is a type of tourism based on nature, associated with local cultural identity, with the participation of the local community, combined with education on environmental protection. According to The Regulation on Management of eco-tourism activities in national parks and nature reserves, issued by the Ministry of Agriculture and Rural Development in 2007, Ecotourismis a form of nature-based tourism, associated with local cultural identity with local culture. the participation oflocal communities for sustainable development, meeting current needs without affecting the ability to meet tourism needs in the future.

In the Ecotourism Book (Ba, 2009), the author mentioned that "Ecotourism is a type of tourism that takes specific and natural ecosystems as an object to serve tourists who love nature, travel, enjoy landscapes or studyecosystems. It is also a form of closely and harmoniously combining tourism economic development with theintroduction of the beautiful landscapes of the country as well as education, propaganda, and protection and development of the environment and natural resources in a way lasting".

Therefore, these articles confirmed the importance of ecotourism, as: ecotourism has great contributions in terms of socio-economic in many countries, ecotourism has brought many benefits in the field of conservationand community economic development. Thanks to ecotourism, people in buffer zones in protected areas and national parks develop handicraft industries and participate in tourism activities to ensure income and limit theimpact on forests. Ecotourism in Vietnam has also made great contributions to community development and environmental protection. Thanks to the development of ecotourism, the people of some ethnic groups and residents living in the buffer zones of national parks and protected areas can get jobs, improve their living standards, and enjoy festivals, customs and handicraft industries. The public is preserved and developed. In this study, the author used Delphi method to find the importance of factors affecting ecotourism in Ba Ria - Vung Tau province.

3 Methodology and Data

3.1 The Delphi Method

The Delphi approach is the unique method for eliciting and refining group judgment based on the rationale that a group of experts is better than one expert when exact knowledge is not available (Kaynak & Macauley,1984). It is a procedure to solicit opinion, judgment and consensus from a group of experts (Dalkey, 1969). The Delphi technique is a long-range forecasting method of aggregating the forecasts of most experts on multidisciplinary issues (Dalkey and Helmer, 1969). To develop objective indicators, this study employs the

Delphi technique, one of the best known qualitative and structured techniques for predicting future events through consensus (oudenberg, 1991). The aim of the Delphi surveys is to obtain the advice of panel members,and whenever possible to reach a consensus (Richey, Noble and Deser, 1985). Carefully selected experts answer questionnaires in two or more rounds. At the end of each round the researcher provides an anonymoussummary of the panel member's suggestions from the previous round. It is believed that during this process the range of the answers will decrease, and the group will converge towards the outcome. Finally, the processis stopped after reaching stable results by determining the mean or median scores.

3.2 Likert Scale

The Likert scale was used to consider the scores that experts assessed on groups of conditions and indicators of the type of ecotourism. According to McLeod (2008), the Likert scale is a five (or seven) point scale that isused to allow the individual to express how much they agree or disagree with a particular statement. Likert scale (typically) provides five possible answers to a statement or question that allows respondents to indicate their positive-to-negative strength of agreement or strength of feeling regarding the question or statement.

A Likert scale assumes that the strength/intensity of an attitude is linear, i.e., on a continuum from strongly agree to strongly disagree, and makes the assumption that attitudes can be measured. This article uses Likert scale with 5 points scale, as:

- Point 1: Strongly disagree
- Point 2: Disagree
- Point 3: Neutral
- Point 4: Agree
- Point 5: Strongly agree

Preliminary quantitative research was carried out by surveying 23 experts to eliminate inappropriate groups of conditions and indicators. We know from the evaluation in the lesson that it very well expresses a grade of 3.We use verbal or numerical scales for relief. In practice, various scales such as 3.52 to 4.78 are used. A lowerpoint scale such as 3,50 would be completely unusable. The project model uses a scale of 1 to 5, with the lowest number expressing un-consensus, while the highest number expresses the highest satisfaction (Hague,2021).

3.3 Selection of Respondents

The selection of respondents is the most important step in the Delphi technique (Nelson, 2002). Random selection is not acceptable. Wheels and associates (1990) cited the need for a balanced panel and accepted thatthere must be an element of judgment to achieve such a panel consisting of many experts from different fields.Delbecq, van de Ven and Gustafson (1975) note that the person invited to participate must be knowledgeableabout the subject matter in question. One of the most important requirements is the selection of qualified professionals (Okoli and Pawlowski, 2004). Linstone (1978) mentioned that the minimum appropriate questionnaire size was seven. The decision on panel size is empirical and practical considering factors such astime and cost (Hassan, 2000).

Representativeness is assessed by the quality of the panel of experts and its size (Powell, 2003). A sample of ten to fifteen experts is sufficient to yield sufficient results (Hartman, Karahn and Skulmoski, 2007). The Taiwan Ecotourism Association proposed twelve experts on ecotourism (Tsaur, Lin and Lin, 2006). Dalkey and Hemer (1969) argue that the fuzzy Delphi group possesses the greatest confidence when the number of experts is at least ten. In this research, author invited 23 specialists in tourism, management, and establish policy - who are willing take part in this survey.

3.4 Data processing

Mean

As result from Manikandan (2011), central tendency is defined as "the statistical measure that identifies asingle value as representative of an entire distribution." It aims to provide an accurate description of the entire

data. It is the single value that is most typical representative of the collected data. The term “number crunching”is used to illustrate this aspect of data description. The mean, median and mode are the three commonly used measures of central tendency.

Mean is the most used measure of central tendency. There are different types of mean, viz. arithmetic mean, weighted mean, geometric mean (GM) and harmonic mean (HM). If mentioned without an adjective (as mean),it generally refers to the arithmetic mean

$$\bar{X} = \frac{\sum x}{n} \tag{1}$$

where $\sum x$ refers to summation of individual values, and n is the number of observations in the sample (samplesize).

Arithmetic mean (or, simply, “mean”) is nothing but the average. It is computed by adding all the values inthe data set divided by the number of observations in it.

If interval data divided into classes with their frequencies are available, mean is calculated using the formula

$$\bar{X} = \frac{\sum fX}{n} \tag{2}$$

where f is the frequency, X is the midpoint of the class interval, and n is the number of observations. In this project, a mean An average greater than 3.5 detects an item with significant content.

Standard Deviation

The formula for (sample) standard deviation (*SD*) is

$$SD = \frac{\sum |x - \bar{x}|^2}{n - 1} \tag{3}$$

where $\sum$ means "sum of", x is a value in the data set, $\bar{x}$ is the mean of the data set, and n is the number of valuesin the data set.

The sample standard deviation characterizes the dispersion of observations about the sample mean and estimates the population standard deviation.

However, there is no such thing as an “acceptable” level of data. Whether the standard deviation is good orbad will depend on the expectations of the person doing the research.

For data on a five-point Likert scale, it is approximately (O’Neill, 2017):

- when the results are low standard deviation ($SD < 1$), the values tend to be close to the data file mean – data are homogeneous;
- when the standard deviation is high ($SD > 1$), the values in the data file are being spread out over a wider range –data are heterogeneous.

4 Empirical Results

4.1 Social System Results

The results from the respondents’ sociodemographic characteristics mentioned that these experts' gender distribution was dominant (male percentages exceed 60%). However, there were fewer female respondents for the following reason: field experts often travel to the site to conduct surveys, so women oftenface obstacles in these activities. The 41–50 years age range was dominant (exceeding 50%), ensuring the respondents’ ability to understand and fill in the questionnaire. Most of the experts (over 90%) who participatedin the survey had received post-graduate education or above.

4.2 Indicator Results

According to the Table 1, there are 3 group of criteria in this survey. Group A (from A1 to A5) is about available resource in this Ba Ria – Vung Tau Province, group B (from B1 to B9) is about destination management activities, and group C (from C1 to C4) that is basic travel services.

Table 1. List of Expert's Rating of Criteria in SPSS 20.0 (*N*=23)

Criteria	*N*	*Mean*	*Maximum*	*Minium*
A1. Natural Resources Indicator	5	4,06	4,78	3,48
A2. Cutural Resources	6	4,02	4,22	3,70
A3. Entertainment	5	3,70	4,17	3,13
A4. Shopping	4	3,99	4,22	3,83
A5. Festivals/Special Event	4	3,89	4,00	3,74
Total	*24*			
B1. Basic Insfrastructure	8	4,13	4,57	3,52
B2. Human Resources Development	5	4,38	4,65	4,13
B3. Hygiene and Tourist Safety	8	4,28	4,70	3,78
B4. Community, Promotion	6	4,25	4,35	4,09
B5. Participate of Stakeholders	8	4,03	4,39	3,70
B6. Sustainable management of culture	7	4,01	4,30	3,83
B7. Sustainable management of the environment	11	3,90	4,22	3,61
B8. Competition and association in the industry	9	3,98	4,48	3,70
B9. Planning and development policy	4	4,01	4,13	3,87
Total	*66*			
C1. Accommodation service	4	4,27	4,43	3,83
C2. Food service	4	4,38	4,74	4,04
C3. Transportation Services	6	4,01	4,35	3,87
C4. Travel services	4	4,28	4,52	4,09
Total	*18*			
	108			

Source: survey output by author

In group A, there have 5 criteria with 24 indicators. The factor of Natural Resources has the highest point in mean, with maxium point is 4,78 point, minimum point is Entertainment with 3,13 points . This identified thatcustomer always look forward the high qualitty of natural sightseeings, natural of geomorphology when they choosing ecological tourism kind for their holidays. And, With the lowest average score, it can be explained that at ecotourism sites, experience and discovery activities have taken up most of the time of visitors, so otherrecreational activities are less focused.

In group B, there have 9 criteria with 66 indicators. This group got the most of amount factors in this survey –that is the main keyword in this project. The results in table shows that Human Resources Development factoris the most important factor in group B. Moreover, the maximum mean point in this group is 4,65 and the minimum is basic insfrastructure with 3,52 points. It means that when establishing policy for ecological locations, administrator or State manager needs care about human resources training, to adapt the increasing needs of customers.

In group C, there have 4 criteria with 18 indicators. The results in table shows that Food Serivce factor is the most significant factor in group C. The maximum mean point in this group is 4,74 and the minimum is accommodation service with 3,83 points. With dense exploration activities at eco-tourism sites, food quality to meet the needs of safety and hyiene is an essential requirement of tourists, so tourism managers need to choose source of green, clean and nutritious food to serve tourists. Despite having the lowest score in group C, the score value of the Accommodation service is also relatively high, showing that tourists are also interested in the quality of the accommodation they will stay in during their stay. From this result, when building infrastructure at tourist sites,

investors also need to come up with a reasonable implementation plan, both to ensure that the beauty of the tourist area is not disrupted, while the resources are balanced. invest in this construction activity.

In summary, there have 108 indicators in total, includes 6 indicators was removal by lower 3,5 point. The target groups have clearly indicated the essential desires and specific criteria that tourists expect to receive when they participate in the experience at these sustainable tourist destinations.

5 Conclusion

Ecotourism is a complex system between people, the ecological environment with other stakeholders. Sustainable development requires a harmonious relationship between stakeholders and requires synchronous development between the economy, culture, society and ecological environment. Previous studies have proposed indicators to assess the sustainability of tourism in eco-forests, these studies have rarely been concerned with both systems and the relationship between the eco-forests. Internal elements of the system areoften overlooked. To overcome these shortcomings, this project makes the following solutions:

(i) it establishes an assessment framework for sustainable ecological tourism that includes stakeholders and environmental systems based on the subsystem framework. people-environment from the point of view of experts

(ii) it applies the relational framework of eco-community-tourism systems and linkage theory to reflect the relationships between stakeholders and various aspects of the environmental system;

(iii) identify a set of criteria systems suitable to the tourism characteristics of the nature resources, combining the advantages of subjective indicators to assess the perceptions of stakeholders and objective indicators reflecting changes of the environment.

Based on the result of Table 1, which get high point in natural resources (4,06), Human Resources Development (4,38) and Food service (4,38), author propoes some solution framework such as:

1. Natural resource management solutions. Tourist sites need to have plans for sustainable exploitation and use of natural resources. Create good conditions for plants and animals to grow. plans to alternately use and recreate the natural landscape. Maintain unspoiled natural landscapes. Administrator regularly plans to checkthe tourist area, and do not leave flammable objects at the places of interest, which can cause fires in the dry season. Experience shows that if Vietnam tourism wants to welcome guests with money, go long, stay long, people who love nature and experience tourism - they should limit the cable car, keep the island pristine and the sea clean. The forest is still pristine, the destination is always clean, beautiful and civilized. Brutal interference in the landscape, creating cheap and easy spaces not only destroys tourism resources but also causes mispositioning and lowers Vietnam's destination brand.

2. Human Resources management solutions. Improve the quality of tourism human resources. The quality of tourism human resources is still poor compared to other countries in the region in terms of management capacity, professional skills and foreign language skills. Therefore, improving the quality of staff in the industry is a central task in the direction of tourism development in the coming time. For state management staff, it is necessary to equip themselves with professional knowledge of tourism because most officials and civil servants at the level of Vietnam National Administration of Tourism and localities come from other sectors, or study other professions. different industries, have not yet mastered the specialized knowledge of tourism; improve the professional level of state management, especially economic management. For human resources, businesses and communities focus on fostering market knowledge, foreign languages and in-depthprofessional skills, raising awareness of protecting natural resources and the environment.

3. Sustainable management solutions. Infrastructure investment and digital application in tourism management synchronously, from central to local. The effectiveness of international visitors must be fully considered in terms of the amount of foreign currency they bring in, not just the number of visitors (many customers, but insignificant spending). The quality of life is increasingly improved, so the demands of visitorswill not be limited. Therefore supporting infrastructure to improve convenience for customers is necessary.

The development associated with ecosystem protection is a great balance that destinations always aim for. Sustainable destinations need to be well managed: green, clean and beautiful, free of garbage and dirty wastewater, closely monitoring the role of localities, another important factor is to encourage people to do tourism in a civilized way. and legitimately benefit from tourism. Every citizen can be an ambassador. From acustoms officer who greets guests with a smile as soon as they arrive at the airport, to a taxi driver who knowshow to give up petty greed so as not to "cut and slash", or a local resident who does not arbitrarily litter... All of which will contribute to the creation of a tourist nation.

The above results are the premise for the author's future research, such as conducting interviews with many local potential customers, and quantitative advanced statistical analyses, including:

- consistency analysis and exploratory factor analysis (EFA);
- regression analysis;
- confirmatory factor analysis (CFA) and structural equation modelling (SEM).

The aim of these analyses will be to develop a structural model to better understand the factors affecting ecotourism, and the ecological location assessment in Ba Ria-Vung Tau province (Fan, Chen, Shirkley et al., 2016).

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Theoretical and Methodological Foundations for the Formation of the Financial Capacity of Territorial Communities in Ukraine: Entrepreneurial Aspect

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Abstract
The paper is devoted to the investigation of the theoretical and methodological foundations for the formation of the financial capacity of territorial communities (TC) in Ukraine. The object of the study is the territorial communities in the Kharkiv region, the selection criteria of which were the TC area and population size. The research methodology is based on a combination of elements of statistical analysis and the Methodology for the Formation of Capable Territorial Communities approved by Resolution № 214 of the Cabinet of Ministers of Ukraine. The paper examines territorial communities' budgets, including revenue and expenditure. It has been proven that the capacity of the community shows the ability to attract, accumulate and effectively use financial resources from various sources to solve topical issues of local importance. The main advantages of the decentralization policy, which has been actively implemented in the TC of Ukraine since 2014, are given. The "Methodology for the Formation of Capable Territorial Communities" is substantiated, the results of the calculation obtained by the TC according to this methodology are given. The budget for 2020-2021 was analyzed on the example of territorial communities of the Kharkiv region. In most territorial communities, the most significant part of income is taken by tax revenues, which indicates the importance of the further mandatory development of entrepreneurial activity in communities.

Keywords
territorial community, financial capacity, decentralization, incomes, expenses, entrepreneurship

JEL Classification
E62, M21, R22

1 Introduction

Getting income from various sources is an important condition for the economic development of territories, since ensuring economic growth in a tactical and strategic perspective requires the investment of a significant amount of financial resources. At the beginning of 2014, the process of growth of own revenues of local authorities and funds transferred from the state budget gradually began in Ukraine. Due to the increase in the revenue part of local authorities, there is an increase in the expenditure part, which undoubtedly shows the positive trends of the decentralization process in Ukraine.

2 Literature Review

The main goal of financial decentralization in Ukraine is ensuring the financial capacity of territorial communities, which, in accordance with the Law of Ukraine «On Voluntary Unification of Territorial Communities» and the Prospective Plan for the Formation of Territorial Communities, merged to create a territorial community (TC) (Law of Ukraine). Thus, financial decentralization made local budgets independent from the state budget and created opportunities for planning the development of territories, opportunities for implementing real projects (Rudachenko O., 2019). Local budgets, including the budgets of territorial communities, are independent, they are not included in the State Budget of Ukraine and other local budgets. Full budgetary independence and financial independence of local budgets is ensured by the state at the legislative level.

Financial capacity is the ability to «attract, accumulate and effectively use financial resources from various sources to solve issues of local importance» (Sukharska, L.,2019; Bibik N.,2020).

Budget potential is a part of the financial potential of the community, which is the total amount of financial resources (money) that can be attracted from existing sources to the budget of the community during a certain time and in valid economic conditions (Financial and budgetary potential of local self-government bodies in the conditions of administrative and territorial reform,2013).

The theoretical foundations for the formation and development of territorial communities and issues related to their financial capacity were reflected in the scientific papers of the following scientists: Buryachenko, A., Filimoshkina, I., 2018.; Belyavtseva V.V., Dymchenko O.V., 2019; M. Bryl, 2018; T. Sakhno, 2020; L Sukharska, 2019; Melnyk, M. I, Leshchukh, I. V., & Yaremchuk, R. E. 2019, etc. However, they did not come to a consensus on the definition of the methodology for the formation of financial capacity, which makes the research particularly relevant.

It is worth noting that the main goal of the community is the formation of sufficient resources for financing the priority areas of social and economic development and increasing the efficiency of budget funds use.

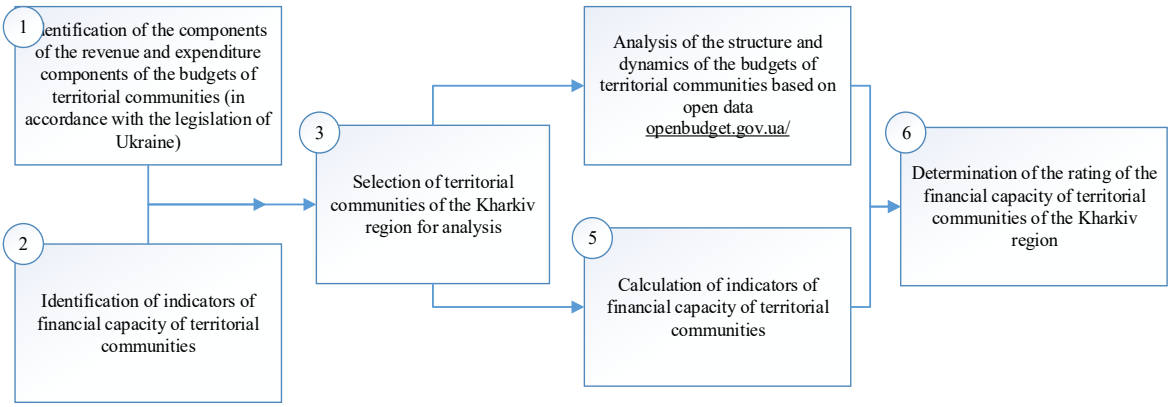
A great advantage in the creation of TC is the transfer of significant powers and budgets from state bodies to local self-government bodies. The main task of uniting communities is to give the right to independently solve the most important local issues to the residents of cities, villages and towns, namely issues related to the distribution and formation of the community budget, the solution of primary problematic issues that take place in the allocation of a significant part of expenses from the budget. The budget is the main component of the system of economy`s financial regulation, its balance, optimality is one of the main conditions of economic growth. The budget policy should be built on the basis of a scientifically based concept of the development of budget relations as part of the financial policy aimed at creating conditions for improving the quality of public services, socio-economic development of the country and territories.

3 Methodology and Data

The research methodology is based on a combination of elements of statistical analysis and the Methodology for the Formation of Capable Territorial Communities approved by Resolution № 214 of the Cabinet of Ministers of Ukraine dated April 8, 2015 (as amended by Resolution № 34 of the Cabinet of Ministers of Ukraine dated January 24, 2020) (Resolutions “On approval of the Methodology for the formation of capable territorial communities”).

Research scheme for assessing the financial capacity of territorial communities is shown in Figure 1.

Figure 6. Research scheme for assessing the financial capacity of territorial communities



At the first stage of the research, one defines the main categories: income and expenditure of the budget of the territorial community in accordance with the current legislation, and their components (Table 1, 2).

Revenues of the TC budget are tax, non-tax and other revenues on an irrevocable basis, the settlement of which is provided by the legislation of Ukraine (including transfers, fees for the provision of administrative services, own revenues of budget institutions) (Budget Code of Ukraine; Natalenko H.V,2016).

Table 1. Components of budget revenues

Tax revenues	Non-tax revenues	Income from capital transactions	Transfers
statewide taxes and fees and local taxes and fees	income from property and business activity; administrative fees and payments, income from non-commercial economic activity; other non-tax revenues	income from the sale of capital assets (fixed funds, state stocks and reserves, land)	funds received from other state authorities, local self-government bodies, other states or international organizations on a free and non-refundable basis

According to the current legislation, budget revenues include two important components: revenues of the general fund and revenues of the special budget fund.

Expenditures of the budget of the territorial community are funds directed to the implementation of budget programs provided for by the relevant budget (Budget Code of Ukraine). Budget expenditures do not include: debt repayment; provision of loans from the budget; placement of budget funds on deposits; acquisition of securities; return of excess amounts of taxes and fees paid to the budget and other budget revenues, carrying out their budget compensation (Budget Code of Ukraine).

At the second stage, indicators of the financial capacity of the territorial community are determined. In accordance with the requirements of the «Methodology for the formation of capable territorial communities» (Resolutions “On approval of the Methodology for the formation of capable territorial communities”.), the assessment of the level of capability is carried out on the basis of criteria characterizing the main socio-economic indicators that affect the development of the corresponding capable territorial community.

In general, the assessment of financial capacity is carried out on the basis of the results of monitoring the implementation of local budgets according to 8 main indicators (Table 2) (Decentralization.).

Table 2. Indicators of financial capacity of territorial communities

Indicator`s №	Name	Calculation method
1	revenues of the general fund per 1 resident (without transfers), UAH	the ratio of the volume of revenues of the general fund without transfers to the number of residents of the corresponding TC
2	expenses of the general fund per 1 resident, UAH	the ratio of the volume of expenditures of the general fund to the number of residents of the corresponding TC
3	expenses for maintenance of the management apparatus per 1 resident, UAH	the ratio of the volume of expenses for the maintenance of the management apparatus, carried out at the expense of the funds of the general fund, to the number of residents of the corresponding TC
4	capital expenditures per 1 resident, UAH	the ratio of the volume of capital expenditures of the community budget to the number of residents of the corresponding TC
5	level of subsidization of budgets (specific weight of basic/reverse subsidy in revenues), %	the ratio of the volume of the basic or reverse subsidy to the total amount of revenues of the general fund of the budget of the UTC with subsidies, but without taking into account subventions from the state budget
6	the specific weight of expenses for the maintenance of the management apparatus in the revenues of the general fund (without transfers), %	the ratio of expenses for the maintenance of the management apparatus of local self-government bodies with the amount of revenues of the general fund, excluding transfers from the state budget
7	specific weight of wages in general fund expenditures, %	the percentage share of wage expenditures made from the general fund of the budget with accruals to the volume of expenditures of the general fund of the budget without taking into account transfers transferred from the budget of the TC to other budgets
8	specific weight of capital expenditures in the total amount of expenditures (general and special funds), %.	the share of capital expenditures in the total amount of expenditures of the general and special fund of the corresponding budget of the TC

The third stage involves the selection of territorial communities. Communities of the Kharkiv region were taken as base communities for determining financial capacity, among which 5 territorial communities were selected. Selection criteria: TC area and population.

The fourth stage: based on the open data at openbudget.gov.ua, an analysis of the structure (the specific share of the components in the formation of the total amount of budget revenues and expenditures) and dynamics over the years (base growth rates) of the components of the revenues and expenditures of territorial communities budgets is carried out.

The fifth stage involves the calculation of indicators of territorial communities financial capacity of the Kharkiv region.

At the 6th stage, the assessment of the financial capacity of territorial communities, their rating, and the development of proposals are carried out.

4 Empirical Results

To compare the community's financial capacity, the budget for 2020-2021 was analyzed in the paper using the example of the following territorial communities of the Kharkiv region (Table 3) (State budget web portal for citizens), which were selected in accordance with the third stage of the proposed research methodology.

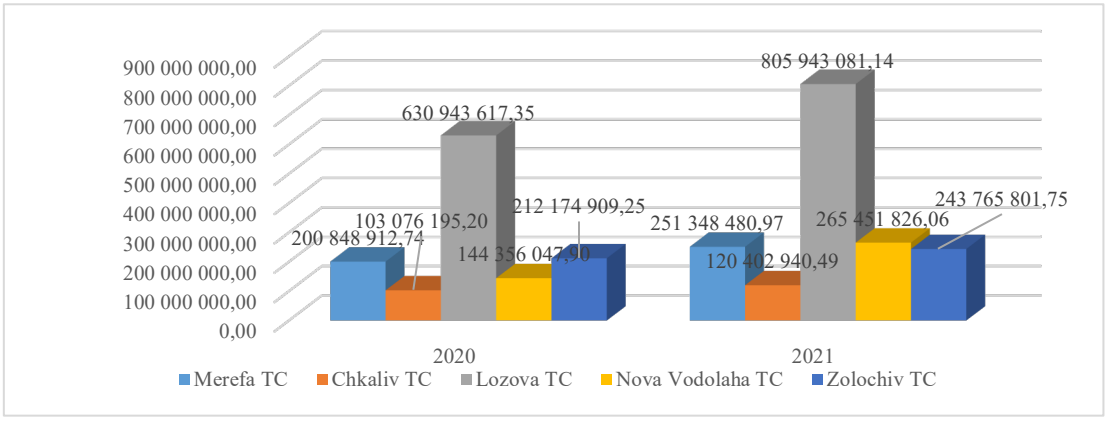
Table 3. Characteristics of territorial communities

Indicators	Area, km^2	Population, thousands of people
Merefa TC	167,8	25,1
Nova Vodolaha TC	351,6	16,4
Chkaliv TC	387	12,2
Zolochiv TC	917	24,6
Lozova TC	1102,40	79,1

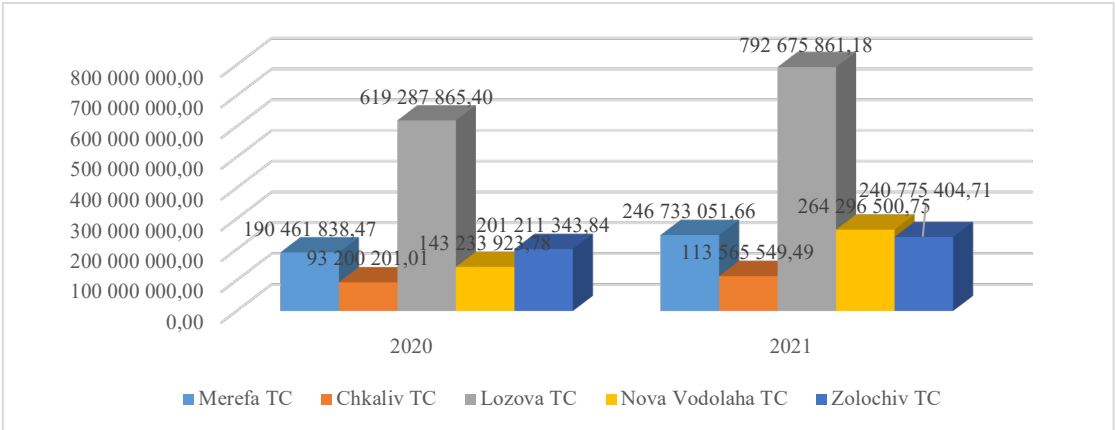
The presented characteristics of the TC of the Kharkiv region testify to the heterogeneity of settlement and the uniqueness of each of the communities. So, for example, in Merefa TC 7 m^2 of total area corresponds to 1 inhabitant, while there is 14 m^2 per inhabitant in Lozova TC, which is of great interest in the analysis of the financial capacity of the communities listed above.

Figure 2 shows comparison of budget revenues and expenditures for 2019 of the Kharkiv Oblast TC presented above(State budget web portal for citizens).

Figure 2. Revenues and expenses of the TC of the Kharkiv region for 2020-2021, UAH.



a) income



b) expenses

As for the budget, none of the territorial communities had losses during the analyzed periods.

A more detailed analysis of the expenditure part of the budget for 2020-2021 is given in Table 4.

Table 4. Expenditure analysis of the TC of the Kharkiv region for 2020-2021, UAH.

Indicators	Merefa TC	Chkaliv TC	Lozova TC	Nova Vodolaha TC	Zolochiv TC
2020					
State functions	30 540 507.23	16 987 045.45	77 962 508.13	19 973 968.77	36 255 799.28
Public order, security and judiciary	142 700.00	0	0	23 940.00	848 261.22
Economic activity	18 180 593.59	10 602 211.35	64 953 362.28	20 258 098.35	11 227 409.30
Protection of the natural environment	42 314.00	0	349 926.00	172 791.86	117 974.00
Utilities	28 678 129.13	8 421 790.47	35 070 755.80	20 773 387.02	10 613 557.65
Healthcare	0	1 547 101.60	54 027 869.79	779 473.48	2 965 475.48
Spiritual and physical development	8 428 342.81	2 411 521.19	39 433 533.00	5 818 224.90	8 175 671.60
Education	95 716 493.47	49 764 540.37	323 211 674.84	71 283 130.11	124 900 379.99
Social protection and social security	8 732 758.24	3 465 990.58	24 278 235.56	4 150 909.29	6 106 815.32
2021					
State functions	29 673 729.15	16 753 715.63	91 854 697.79	24 427 862.08	31 175 688.72
Public order, security and judiciary	1088 383.40	0	0	24 797.20	365 425.35
Economic activity	24 293 558.71	10 275 132.44	45 796 271.20	47 295 866.04	14 041 525.52
Protection of the natural environment	0	0	14 936 067.88	448 656.00	69 006.00
Utilities	29 062 373.69	10 212 709.41	44 941 981.51	34 475 851.85	14 189 083.03
Healthcare	7 308 362.88	2 248 447.32	38 761 359.08	9 530 973.57	6 909 220.42
Spiritual and physical development	10 192 392.78	3 872 388.15	55 474 401.50	15 016 522.72	14 250 464.38
Education	133 346 450.00	65 632 331.53	468 544 661.13	125 254 560.03	151 894 754.37
Social protection and social security	11 767 801.05	4 570 825.01	32 366 421.09	7 821 411.26	7 880 236.92

The analysis showed that in all investigated TCs, the largest part of expenses is spent on education. Ensuring the proper level of education and progress in this area is one of the priority areas of development of territorial entities. Education on the territory of Kharkiv Region TC is provided by the functioning of comprehensive schools, lyceums, gymnasiums, and preschool education institutions. So, for example, in Lozova TC in 2021, they amounted to 468 544 661.13 UAH.

The analysis of the expenditure part for each particular TC showed that the local government directs a large part of the expenditure to the maintenance of management bodies. So, for example, in the same Lozova TC in 2021, expenses related to state-wide functions amounted to 91 854 697.79 UAH.

However, each territorial community receives broad powers and responsibilities regarding the financing of community expenses.

In general, community funds are spent on the repair and construction of roads, administrative services centers, medical and midwifery centers and dispensaries, schools and kindergartens, water supply and sewerage, street lighting, etc. That is, they are spent for everything that allows to quickly demonstrate positive changes from the creation of the TC. Currently, a significant number of social infrastructure objects are transferred to the balance sheet of the TC, while the burden on the spending part is also significant.

It is worth noting that the most powerful communities are those that constantly increase their own incomes, using all reserves, and also attract investment resources. It is also important to implement a high-quality personnel policy, since it is professional specialists who allow communities to mobilize additional funds and ensure their effective use. In this regard, below is an analysis of the incomes of the studied territorial communities of the Kharkiv region for the year 2020-2021 (table 5).

Table 5. Income analysis of the TC of the Kharkiv region for 2020-2021, UAH.

Indicators	Merefa TC	Chkaliv TC	Lozova TC	Nova Vodolaha TC	Zolochiv TC
2020					
Tax revenues	94 562 410,51	45 199 178,02	387 382 608,47	51 567 772,73	112 535 482,95
Non-tax revenues	2 957 868,70	9 742 361,28	17 672 461,92	7 390 498,14	9 276 233,56
Income from capital transactions	29 393,02	542 816,35	5 556 121,39	44 117 924,33	25 409,60
Official transfers	46 806 375,67	101 635 776,70	220 332 425,57	0	90 337 783,14
Trust funds	0	65 751,00	0	0	0
2021					
Tax revenues	155 174 625,18	109 256 882,45	488 934 522,10	66 927 136,65	134 535 396,44
Non-tax revenues	8 112 349,16	10 969 320,46	22 692 081,67	2 044 671,73	134 535 396,44
Income from capital transactions	58 300,00	1 425 864,55	1 545 226,68	2 020 600,00	188 100,00
Official transfers	102 010 551,72	126 696 413,51	292 571 250,69	49 310 681,11	95 841 490,31
Trust funds	96 000,00	3 000 000,00	200 000,00	99 851,00	0

In the majority of territorial communities, the largest part of income is taken by tax revenues, which means that entrepreneurial activity is developing. Thus, a detailed analysis of the communities made it possible to establish that the agricultural sector and industry are developed on the territory of the communities.

Therefore, with the aim of bringing the standard of living of the population closer to European standards and creating conditions for strengthening the economic activity of territorial communities, a favorable environment for small and medium-sized enterprises is constantly being formed. At the same time, organization of entrepreneurship training, opening of centers and agencies for the support and development of small businesses, informing residents about the opportunities to participate in programs for the development of small and medium-sized enterprises, joining donor programs, which should lead to an increase in the number of entrepreneurs and become another powerful lever of community development.

The indicators of the financial capacity of territorial communities of the Kharkiv region for 2020 are below (table 6) (Decentralization).

Table 6. The indicators of the financial capacity of territorial communities of the Kharkiv region for 2020

Indicator 1	Indicator 2	Indicator 3	Indicator 4	Indicator 5	Indicator 6	Indicator 7	Indicator 8	General rating
Nova Vodolaha TC								
5758,4	6897,2	935,1	1 446,2	0	16,2	71,3	17,1	15
Lozova TC								
4895,8	6620,9	866,9	888,2	0,2	17,7	66,9	11,6	24
Zolochiv TC								
4548,5	6652,3	872,7	838,4	4,5	19,2	74,7	11,0	30
Chkaliv TC								
4173,8	6056,0	907,9	1 030,9	11,5	21,8	73,1	14,5	49
Merefa TC								
3636,4	6159,2	895,7	922,1	13,7	24,6	72,7	12,8	61

Thus, basing on indicators, the general rating of the financial capacity of the investigated Kharkiv TCs is as follows:

- Nova Vodolaha – 15th place;

- Lozova – 24th place;

- Zolochiv – 30th place;

- Chkaliv – 49th place;

- Merefa – 61st place.

Thus, the created tool for determining the community's financial capacity enables local authorities to assess and form capable territorial communities. The community must provide each resident with appropriate public services in accordance with the defined criteria. It is important in this matter to ensure the maximum available financial resources due to their effective use.

5 Conclusion

The analysis of the community's financial capacity showed that, indeed, budget decentralization measures had a rather positive effect on the financial capacity of TC budgets. However, the independence of local self-government bodies, which is one of the main ideas of budget decentralization, is determined not only by the amount of financial resources, but also by the reason for their increase. Territorial communities should take into account that transfers and other financial assistance from central authorities are temporary funds: today the state allocates them, but tomorrow it does not. Therefore, the TC should rely on its own capabilities in the accumulation of tax and non-tax revenues, thereby emphasizing the development of entrepreneurship from small to large.

The paper also substantiates that, according to the Methodology for the Formation of Capable Territorial Communities, the main conditions for their creation are:

- ensuring the ability of local self-government bodies to solve public issues that fall within their competence to meet the needs of the population of the relevant administrative and territorial units;

- historical, geographical, socio-economic, natural, ecological, ethnic, cultural features of the development of the relevant administrative-territorial units;

- infrastructure development of relevant administrative and territorial units;

- financial support of the relevant administrative and territorial units;

- labor migration of the population;

- availability of services in relevant areas.

The medium-term plan of priority actions of the Government in the context of the implementation of the decentralization reform defines the mandatory unification (by 100%) of all communities into capable territorial communities.

The main factors of achieving the financial capacity of the TC are:

– a sufficient level of own revenues to the TC budgets due to the development of entrepreneurial activity;

– the possibility of using local loans, if necessary;

– optimization of inflows of interbudgetary transfers;

– formation of budgets indicators of TC at an acceptable level of budget risk, calculated on the basis of empirical data;

– availability of institutions that ensure public control of the efficiency of spending of TC finances.

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Relation between the EU and Turkey from the Competitive Point of View

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Abstract
The extent of trade relationship between the European Union and Turkey has always been a key point in any negotiation that has happened between the representatives of these two entities. Even though it seems that the EU might be a clear winner in terms of net export regarding this relationship, according to some (see Dursun, 2023), there is robust statistical evidence that the Customs Union stablished in 1995 between the EU and Turkey has not had a significant impact. Nevertheless, Dursun (2023) points out that in the first ten years there was a positive impact on the mutual trade which, then, for unknown reasons vanished. The research aims to further open the debate about the international competitiveness of the European agricultural sector with regard of the new Green Deal Policy that has been promoted as a core guidance to what agriculture in the European Union might look like in the up-coming years, providing a more thorough compliance with new environmental challenges. Besides, looking upon the recent progress concerning the war in Ukraine, it must be considered what that means for the European agricultural outlook and possibility of Turkey becoming a new agricultural commodity trading partner. The purpose of this paper is to give a deeper insight into the matter of relationship between the EU and Turkey, providing some critical evidence from various researches and also legislature.

Keywords
EU, Turkey, Competitiveness, Customs Union, Decision 1995

JEL Classification
F01, F10, F20, K20, K33

1 Introduction[1]

The extent of trade relationship between the European Union and Turkey has always been a key point in any negotiation that has happened between the representatives of these two entities. Even though it seems that the EU might be a clear winner in terms of net export regarding this relationship, according to some (see Dursun, 2023), there is robust statistical evidence that the Customs Union stablished in 1995 between the EU and Turkey has not had a significant impact. Nevertheless, Dursun (2023) points out that in the first ten years there was a positive impact on the mutual trade which, then, for unknown reasons vanished. The Decision from 1995 establishing the customs union is crucial for searching the connections with legal, economic and security relations, especially within the conflict in Ukraine while the customs union does not include mainly agricultural unprocessed products.

The main purpose of this paper is to outline the development of the relationship between the EU and Turkey from the point of view concerning competitiveness in agriculture and possible developments not just in trade, however, also in further economic, legislative, and political cooperation. As will be discussed further on, the cooperation and communication between the EU and Turkey is at the same time necessitous, however, also complicated, one might say even intricate. There has always been an option for Turkey to join the EU, nevertheless, the historical development and mainly the cultural background of both "parties" have been the unstated reasons, among others, that Turkey's application is still pending and does not seem to have developed any further towards the plausible end for either side. Author will therefore comment on possible effects of the

[1] This paper was written based on the seminar work that had been submitted as a part of the subject - Law of the EU: „The Customs Union between the EU and Turkey".

opening of the customs union for these products as well and will also try to implement current knowledge, including the use of the jurisprudence of the Court of Justice of the European Union (hereinafter CJEU).

As Altay (2018) and Özyüksel (2022) argue, Turkish EU membership would significantly help the Turkish economy within the internal market, but historically it is highly unlikely that this idea would be on the agenda, as President Erdogan's statements suggest in 2016 that Turkey did not need EU membership, however, five years later, he said that Turkey would not withdraw its candidacy because it could be a suitable replacement for the outgoing United Kingdom. However, after the failed coup, Turkey becomes a presidential authoritarian republic, where Erdogan builds his cult of personality, e.g. by making statements about Greece, with which he (and Cyprus) has disputes over access to maritime economic zones, when he declares "...one night we can come." Such positions and statements make Turkey's path to any improvement in the conditions of the customs union or even the possibility of joining the EU very difficult. However, in a 2011 study, there are words of praise for this customs union, where Togan (2011) showed, based on data, that the Turkish economy has shifted from government control to a market-based system thanks to the customs union. Therefore, Turkey was able to catch up with Central and Eastern Europe. Mutual trade between the European Union and Turkey has been growing ever since its inception but it must be omitted that a partial merit must go for the Decision from 1995, despite the statistical evidence that suggests the impact has not been that significant. Trade in industrial products and processed agricultural products are two key sources of income for both parties, but more important from the Turkish point of view. The author wants to deal with the question of whether it is possible to improve the conditions of the customs union for Turkey, specifically for unprocessed agricultural products.

The historical core for the customs union established by the 1995 Decision between the EU and Turkey is the so-called "Ankara Agreement" of 1963 and the subsequent Additional Protocol of 1970. This agreement guarantees one of the basic freedoms, namely the freedom of free movement of goods specified in this agreement. The mentioned goods must be manufactured in EU member states or in Turkey or released into economic circulation after being imported from third countries. All this subject to meeting the conditions set by the common customs tariff and other regimes and rules. Cooperation between the EU and Turkey is crucial for both countries, but from a macroeconomic point of view it sounds more important for Turkey, which is discussed below. In the framework of this work, European sources of law connected with the customs union with an impact on the Czech legal system or social topics, both political and security, will be discussed.

2 Evaluation of the legislation of the customs union between the EU and Turkey

Gocmen (2018) argues that the prohibition of any tariffs and measures having equivalent effect, as well as discriminatory or protective taxation, will have the same effect as European internal market legislation under Article 66 of the Decision. Gocmen (2018) based his findings on the Istanbul Lojistik preliminary ruling. Ulger (2016) analysed then political, economic, social, and above all legal changes in Turkey with regard to the introduction of the customs union between the EU and Turkey. Ulger (2016) supports the view that the rapprochement of the EU and Turkey in 1996 and the following years marked the social transformation of Turkey. According to Ulger (2016), legislative convergence was evident in Turkey after the Helsinki summit when Ankara wanted to comply with the Copenhagen criteria. Here, we could state that in the beginning of Turkey's legislative transposition to a more democratic way of governing, emphasizing human rights and the growing volume of foreign trade influenced higher trust in the rule of law, which, according to Ulger (2016), significantly supported foreign direct investment in Turkey. It could therefore be argued that even the debates at the time about Turkey's possible accession to the EU caused Turkey to become a very strong economic player in the Middle East. Turkey's role changed significantly in 2016 during the refugee crisis. Indeed, according to Erdenir (2021), thanks to the conclusion of the Migration Agreement, Turkey gained a strong negotiating position. Erdenir (2021) further states that the provision in the "1 for 1" agreement was criticized from the point of view of European and International Law, when refugees were not guaranteed equal opportunities to reach the EU. In his analysis, Erdenir (2021) concludes that this agreement was a political matter rather than an international source of law.

If we look at the jurisprudence of the CJEU, the Ilumitrónica judgment was significant, as commented by Mendez (2013). According to Mendez, this meant clarifying the positions regarding the agreement with Turkey when the court asked whether the disputes could be submitted directly to it, to which the answer was yes, but at the same time it is not an obligation. Furthermore, the jurisprudence of the CJEU stipulates that the current

European legislation must be interpreted "... in the sense that it does not prevent the legislation of a Member State, such as the legislation at issue in the original proceedings,... when companies providing road transport of goods based in Turkey can carry out such transportation to that Member State." The Istanbul Lojistik judgment is also fundamental, which states that the tax surcharge for motor vehicles originating in Turkey and transiting through a country that wants to impose this tax, here the transit country was Hungary, "represents a charge with an equivalent effect duty".

3 Economic, social and political aspects of the Customs Union Decision and the current state of play

According to Eurostat (2021), Turkey was the sixth largest import and export partner when the export balance in 2021 is more sound for the EU by EUR 1.3 billion. From Turkey's point of view, the European market is in the first place for both exports and imports. It could therefore be argued that the customs union and the partnership between Turkey and the EU in general is crucial for both countries, but more significantly for Turkey, which has a strategic partner in the EU for both imports and exports. The academic sector is in favour of expanding economic cooperation between the EU and Turkey, especially from an economic point of view, e. g.by expanding trade with raw agricultural products (here, for example, Harrison et al., 1997; Dawar et al., 2018; Altay, 2018 or Özyüksel, 2022). This would open up new possibilities, especially from the Turkey's point of view which could make better use of its agricultural potential that is still considerable if we take into account the 10% share of agriculture in GDP. On the other hand, Akan and Engin Balin (2016) argued that Turkey would be better off signing a free trade agreement instead of the current customs union based on recent developments. Author took into account Turkey's static position as a country applying to join the EU, mainly because Turkey would not have to submit to a unified customs tariff but would a lawmaker for itself.

4 Discussion and Findings

In the current difficult international situation, when the EU is facing an energy and environmental crisis, the comparative advantage that European farmers have thanks to the restriction of trade in raw agricultural products could weaken. The author therefore believes that the European authorities do not plan to amend the agreement with regard to Turkey, or theyhe do not even think about it. The Czech position, both diplomatically and economically, towards the improvement of the conditions of the customs union for Turkey is no less difficult after the mutual clash when the Czech Republic stood up for Greece in the dispute with Turkey, Ankara responded very harshly in the sense that "the Czech Republic and the EU should not inquire into the position of Turkey".

From an economic point of view, the inclusion of unprocessed agricultural products in trade between the EU and Turkey would mean a weakening of the already very faltering Czech agriculture. However, as Sezgin (2022) states, the replacement of Ukrainian imports by Turkish ones to the EU seems unlikely according to the analysis. The Czech position would therefore copy the position of the whole of Europe, namely that ideological, diplomatic and economic positions would leave the EU without its negotiating levers. Seufert (2021) adds that negotiations, especially from Brussels and Berlin, will be extremely difficult due to Turkey's constant changes of opinion. This also corresponds to the change in the conditions for obtaining financing for projects from the European Investment Bank (Forýtek, 2022). Turkey's attitude towards the Russian aggressor in Ukraine is also problematic, when Turkey, as a NATO member, acts on an almost friendly level with Russia. On the other hand, drones supplied by Turkey are killing Russian soldiers on the Ukrainian front.

According to Pierini (2023), the basic democratic principles are at stake in Turkey due to some obvious legislative changes that are curiously leading to make favourites out of the current political leadership. General hardship that the opposition has to undergo through judicial actions against People's Democratic Party and effectively forcing hidden form of censorship and the very well known "Kavala case".

5 Conclusion

Considering the current legislative situation in the relationship between the EU and Turkey, the author concludes that it is not desirable for the degree of economic integration to deepen. The author draws this conclusion mainly because of Turkey's very fickle and unclear attitude towards Russian aggression in Ukraine,

constant diplomatic skirmishes between Turkey and EU member countries (Greece and Cyprus), Turkey's attitude towards NATO expansion and sometimes even Turkey's blackmail attitude in the context of the migration crisis. Regarding the economic interests of European farmers who would suffer economically from the extension of the customs union to unprocessed agricultural products, it is obvious that the desired improvement of the customs union (even due to the EU's position) is very small indeed.

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EU Legislature

[1] Smlouva o fungování Evropské unie
[2] DODATEK Rozhodnutí Rady přidružení ES-Turecko č. 1/95 je považováno za součást Zvláštního vydání Úředního věstníku Evropské unie v českém jazyce, kapitola 11, svazek 23. ROZHODNUTÍ RADY PŘIDRUŽENÍ ES-TURECKO č. 1/95 ze dne 22. prosince 1995 o provádění závěrečné etapy celní unie.
[3] NAŘÍZENÍ EVROPSKÉHO PARLAMENTU A RADY (EU) č. 1228/2011 ze dne 16. listopadu 2011, kterým se ruší nařízení Rady (EHS) č. 429/73 o zvláštních ustanoveních pro dovoz určitého zboží, které spadá do působnosti nařízení (EHS) č. 1059/69 a pochází z Turecka, do Společenství.
[4] SDĚLENÍ KOMISE "Modrá příručka" k provádění pravidel EU pro výrobky 2016 (Text s významem pro EHP) (2016/C 272/01).
[5] Sdělení Komise Příručka k článkům 34-36 Smlouvy o fungování Evropské unie (SFEU) (text s významem pro EHP) 2021/C 100/03.
[6] Sdělení Komise „Modrá příručka“ k provádění pravidel EU pro výrobky 2022 (Text s významem pro EHP) 2022/C 247/01 C/2022/3637.

Internet

[1] Erdogan: Turecko nutně nemusí do EU. Může se připojit k asijskému bloku. Odkaz
[2] Erdogan už zase chce do EU. Turecko podle něj může nahradit Británii. Odkaz
[3] Jedné noci můžeme přijít. Erdogan nepokrytě vyhrožuje Řecku. Odkaz
[4] Češi nemají co mluvit do vztahů Turecka a Řecka, míní Erdogan. Odkaz

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The Relationship between Uncertainty Indicators and Metal Prices: NARDL Approach

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Abstract
The recent exposure of commodity markets to various dangers and disruptions has interfered with their regular operation. Higher uncertainty in the market has been influenced by the global Covid-19 outbreak, Brexit, and the intensification of the hostilities between Russia and Ukraine. This paper's objective is to examine the non-linear relationships between particular uncertainty indicators and metal prices by using the NARDL model from 2 January 2020 to 29 July 2022. Our findings show that, over the long term, financial volatility has a linear impact on the prices of gold and palladium. Likewise, the cointegration between gold prices, geopolitical risk, and the unpredictability of economic policy was also verified. The uncertainty indicators, on the other hand, have a long-term asymmetrical impact on the prices of copper and silver. Shocks in financial volatility in the short, as well as long run, affect the prices of silver and copper. Besides, copper prices are also affected by changes in geopolitical risk in the long run. No asymmetry between economic policy uncertainty and prices of selected metals over the short and long term was verified. Moreover, the cointegration between uncertainty indicators and prices of aluminium, iron ore, platinum and steel was not confirmed.

Keywords
Commodity, Economic policy uncertainty, Financial volatility, Geopolitical risk, Metal price.

JEL Classification
C32, C51, Q02, Q34.

1 Introduction

Numerous disruptions and concerns have recently affected the financial and commodity markets and their developments. The growing frequency of political and military conflicts, global pandemics, changes in political systems, laws and policies and a wide range of other unforeseen and extraordinary occurrences and phenomena resulted in increased uncertainty around the world. Thus, uncertainty-producing events became more common. These events have an impact on the performance and regular operation of the commodity markets and affect investment, policy, and production decisions.

In past decades, commodity markets caught a great deal of attention from researchers, investors, and policymakers. A rapidly expanding area of research now involves incorporating financialization and a wide range of other variables in models of commodity price (Ji et al., 2019). For instance, Pástor and Veronesi (2012) claim that independent of supply and demand variables, financial concerns and uncertainty regarding government policies and disputes that generally affect stock markets have emerged as significant commodity price drivers. Thus, uncertainty may be regarded as an important factor affecting the development of the economy and markets. According to Carney (2016), the economy and markets may be significantly negatively impacted by the 'trinity of uncertainty' including geopolitical, economic, and policy uncertainty. Similarly, Caldara and Iacoviello (2018) state that geopolitical risk, financial, macroeconomic, and economic policy uncertainties have all been proven to have a detrimental impact on asset price dynamics. Fang and Shao (2022)

believe that uncertainty shock is a major factor causing volatility and instability in commodity markets. Likewise, Reboredo and Uddin (2016) argue that financial uncertainty and stress are significant contributors to commodity price fluctuations. Moreover, uncertainty shocks are critical for the macroeconomy because they reduce industrial production, employment rate, and aggregate investments while raising market volatility (Aslam et al., 2022). Hence, growing uncertainty has an impact on how commodities markets are functioning.

In this study, the main focus is given to the global metal market. We analyse prices of precious and industrial metals concerning the uncertainty factors. Although various indices may be used to indicate uncertainty, in this study we only use three: the economic policy uncertainty index, the geopolitical risk index, and the financial volatility index. We contribute to the existing literature in two ways. Firstly, we analyse metal prices during the period of higher uncertainty caused mainly by the global pandemic of Covid-19 and the war between Russia and Ukraine, which are two distinct crises of different kinds, but both caused higher uncertainty around the world. Thus, we utilise the three mentioned representative uncertainty indicators. Secondly, to enable an asymmetric time-varying influence of uncertainty on metal prices, we apply a non-linear approach except for the standard linear technique used by the majority of authors. It is important to assess how the metal market functions during the period of increased turbulence and uncertainty as well as how it responds to such unforeseen changes and occurrences in the context of the latest events. Therefore, this paper's objective is to examine the nonlinear relationship between uncertainty indicators and metal prices by using the NARDL model during the period 2 January 2020 to 29 July 2022. Our study's conclusions may be helpful to future decisions made by investors, policymakers, and producers.

The rest of the paper is organized as follows: section 2 reviews relevant literature; section 3 describes the study's data and methodology; section 4 examines the study's findings; and section 5 offers a conclusion.

2 Literature Review

The connection between uncertainty and the metal market has been the subject of several studies. According to Liu et al. (2020), metals are a critical aspect in demonstrating economic expansion and are seen as key indicators of the status of the economy. A number of variables, such as monetary circumstances, oil shocks, exchange rates, economic cycles, industrial production, political disputes, discount rates, and stock prices, have an impact on the performance of the metal markets (Aslam et al., 2022). Moreover, due to their minimal correlations with other financial markets, precious metals are often regarded as one of the finest investment instruments for portfolio diversification (Mokni et al., 2021). Thus, in times of recession or crisis, precious metals are utilized as a store of value especially, as a hedge against various risks including inflation, financial market dangers, the unpredictability of monetary policy and geopolitical threats (Huynh, 2020). On the other hand, Zhu et al. (2021) claim that industrial metals are essential and key components of manufacturing industries and emerging sectors, thus maintaining the price stability of these metals is vital for ensuring steady growth in the economy and industries.

Numerous studies have suggested that commodity prices are impacted by the unpredictability of economic policy. For instance, Aslam et al. (2022) provide evidence about the existence of nonlinear dependencies between economic policy uncertainty and metal markets. Wang et al. (2015) discover a predicted association between commodity prices and economic policy uncertainty. Similarly, using the NARDL model, Bilgin et al. (2018) claim that rising economic policy uncertainty causes rises in the price of gold. In contrast, Mokni et al. (2021) investigate how the Covid-19 pandemic's effects on economic policy uncertainty affected the interconnectedness of precious metals. Moreover, the influence of economic policy uncertainty on the gold market was demonstrated by Thongkairat et al. (2019), but no compelling evidence was discovered for the impact on the silver and platinum markets. On the other hand, Husain et al. (2019) claim that silver, gold, platinum, and palladium influence the volatility spillover of the uncertainty of the US economy.

Commodity price swings are also significantly influenced by financial uncertainty and stress. Bahloul et al. (2018) prove that financial uncertainty may be used to anticipate price changes for commodities. In contrast, Huynh (2020) finds that precious metals affect economic policy uncertainty and financial volatility, despite being immune to financial volatility shocks but not economic policy shocks. The findings of Reboredo and Uddin (2016) suggest that neither co-movement nor Granger causation exists between metal futures prices and financial uncertainty. On contrary, before and during the latest financial crisis, Cheng et al. (2015) study how

changes in the financial volatility index affect both trader positions and commodity prices, as well as how commodity futures prices and financial traders' futures positions altered as a result.

The importance of geopolitics has grown as a consequence of the increasing number of geopolitical conflicts and threats in the latest decades. Thus, rising geopolitical risks are thought to have a tremendous impact on commodity prices. Triki and Maatoug (2021) and Będowska-Sójka et al. (2022), describe gold as a hedge against geopolitical risk and a safe haven. Chiang (2021) and Baur and Smales (2018) discover a favourable response of gold returns to increased geopolitical risk. According to Gkillas et al. (2020), geopolitical concerns can accurately forecast changes in the prices of gold. On the other hand, Cheng et al. (2022) study the nonlinear and asymmetric impacts of geopolitical risks on the connection of gold-oil and describe the time-varying correlation among the gold and the oil markets. Furthermore, Yilanci and Kilci (2021) analyse how geopolitical risk affects metal prices. On contrary, quantile regression is used by Das et al. (2019) to investigate the effects of geopolitical risk on the returns of metals. Likewise, Huang et al (2021) examine the causative link between the metal market and geopolitical threats using a nonparametric causality-in-quantiles methodology. Findings show geopolitical concerns have an impact on market volatility rather than returns.

3 Methodology and Data

The impacts of uncertainty in economic policy, geopolitical risk, and anticipated financial volatility on metal prices are investigated using the standard autoregressive distributed lag method (ARDL) and the non-linear autoregressive distributed lag method (NARDL). The ARDL bounds test developed by Pesaran et al. (2001) is used in the first step to identify a long-term relationship between the time series. The ARDL model provides some desirable features such as the ability to estimate long-term and short-term parameters efficiently. An appropriate ARDL formulation can effectively manage the endogeneity issue and serial correlation (Pesaran and Shin, 1999). The ARDL technique may also encompass multiple delays for several regressors. Importantly, the ARDL method can be used for stationary time series I(0), stationary in first differences I(1), or cointegrated with one another. However, if I(2) variables are incorporated into the model, the estimated F statistics are regarded as being invalid (Pesaran et al., 2001). Hence, to ensure that none of the variables is integrated of order I(2) or greater, we verify the stationarity of the time series and their first differences using the Augmented Dickey-Fuller test (ADF) and the Phillips-Perron test (PP). Subsequently, a long-run relationship's existence is examined using the ARDL bounds testing procedure. The ARDL (p, q) model has the following basic principle:

$$y_t = c_0 + \sum_{i=1}^{p} \phi y_{t-1} + \sum_{i=0}^{q} \beta_i x_{t-1} + u_t \quad (1)$$

where y is the dependent variable (the price of the metal commodity), x is the independent variable (economic policy uncertainty, geopolitical risk, financial volatility), p is the number of optimal lags of the dependent variable, and q is the number of optimal lags of each explanatory variable. Using conditional error correction, we get the following reparameterization:

$$\Delta y_t = c_0 + \sum_{i=1}^{p} \psi_i \Delta y_{t-i} + \sum_{i=0}^{q} \psi_i \Delta x_{t-i} + \ ae_{t-1} + u_t \quad (2)$$

where α stands for the short-term coefficients and the rate at which the dependent variable adjusts to a short-run deviation from equilibrium and ψ short-term coefficients. Following Pesaran et al. (2001) the e_{t-1} in equation (2) can be substituted by the linear combination of lagged level variables of the model and we can rewrite equation (2) into the form:

$$\Delta y_t = c_0 + \sum_{i=1}^{p} \psi_i \Delta y_{t-i} + \sum_{i=0}^{q} \psi_i \Delta x_{t-i} + \ \gamma_i y_{t-1} + \gamma_i x_{t-1} + u_t \quad (3)$$

where ψ represents short-term effects, and γ denotes the long-run effects. Two distinct types of critical values are used to study if there is a long-term relationship between the two time series (Pesaran et al., 2001). In the first variant, all model variables are assumed to be I(1), but in the second form, all included variables are assumed to be I(0). The null hypothesis that no cointegration occurs should be discarded if the estimated F-statistic and t-statistic are both higher than the upper bound. If the resultant F-statistic and t-statistic both dip under the lower bound, the null hypothesis of no longstanding relationship cannot be rejected; as a result, the ARDL model should be evaluated in first differences without the error correction component. If either the F-

statistic or the t-statistic stays within the critical ranges for the upper and lower bounds, the test in the final case is indecisive.

With respect to metal prices, we also investigate any potential asymmetries between the uncertainty of economic policy, geopolitical risk, and the financial volatility index. We particularly utilise the NARDL model from Shin et al. (2014). This process allows the asymmetry to be examined by applying both positive and negative shocks of independent factors. The positive and negative shifts of the independent variables are partially summed in the "+" and "-" notations:

$$x_t^+ = \sum_{i=1}^{t} \Delta x_i^+ = \sum_{i=1}^{t} max(\Delta x_i, 0) \quad (4)$$

$$x_t^- = \sum_{i=1}^{t} \Delta x_i^- = \sum_{i=1}^{t} max(\Delta x_i, 0) \quad (5)$$

It is conceivable to rewrite the symmetric long-run specification of Eq. (3) as the corresponding asymmetric formulation:

$$\Delta y_t = c_0 + \sum_{i=1}^{p} \psi_i \Delta y_{t-i} + \sum_{i=0}^{q} \psi_i \Delta x_{t-i}^+ + \sum_{i=0}^{q} \psi_i \Delta x_{t-i}^- + \gamma_i \Delta y_{t-1} + \gamma_i \Delta x_{t-1}^+ + \gamma_i \Delta x_{t-1}^- + u_t \quad (6)$$

Using this procedure, it is feasible to distinguish between the size of a change caused by an increase in the independent variable and the size of a change resulting from a decrease in the independent variable. After estimation, diagnostic tests are conducted to evaluate the functional form, serial correlation, heteroscedasticity, and normality (Jarque-Bera test, Portmanteau test, Breusch/Pagan test, Ramsey RESET test).

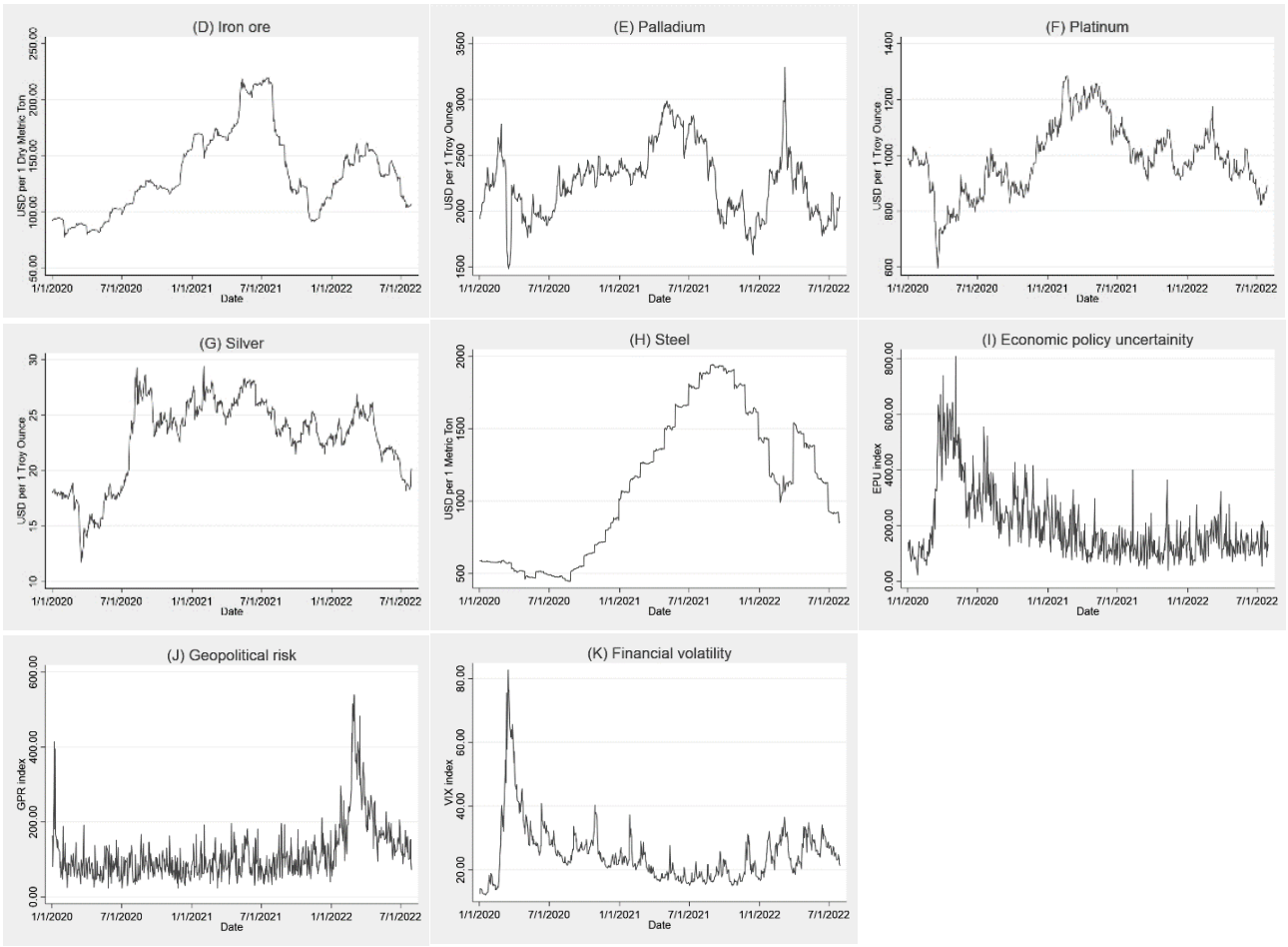
The selected uncertainty indicators include the economic policy uncertainty index (EPU), the geopolitical risk index (GPR) and the financial volatility index (VIX). First, the EPU index measures the proportion of articles in own-country newspapers that mention three phrases related to the economy, policy, and uncertainty. Second, the GPR index counts the keywords used in the news to track the occurrence of significant geopolitical threats, conflicts, and events. Third, the VIX index is a real-time market index that depicts how much volatility the market anticipates over the next 30 days. The data about EPU, GPR, and VIX were obtained from fred.stlouisfed.org[2], matteoiacoviello.com[3], and finance.yahoo.com[4]. Moreover, the prices of selected metals, including aluminium, copper, gold, iron ore, palladium, platinum, silver, and steel were retrieved from investing.com[5] and markets.businessinsider.com[6]. Besides, all commodity prices were expressed in natural logarithm form and stated in US dollars.

4 Empirical Results

Prices for metal commodities have increased throughout time and have shown substantial volatility at times of greater uncertainty around the world (Figure 1). The EPU and VIX both grew dramatically as a result of the shock brought on by the worldwide pandemic at the beginning of the year 2020. On the other hand, the GPR shot up dramatically as Russian and Ukrainian tensions intensified in February 2022. To measure the effects of these events on the development of metal prices and to verify the stationary characteristics of the time series under consideration, we execute the ADF test and PP test as the first steps in our research. The results of the unit root tests show that neither of our variables is integrated of a second order I(2) or higher[7], thus we can continue with the ARDL bounds test to examine the cointegration between time series.

[2] https://fred.stlouisfed.org/tags/series?t=daily%3Bepu
[3] https://www.matteoiacoviello.com/gpr.htm
[4] https://finance.yahoo.com/quote/%5EVIX/history/
[5] https://www.investing.com/commodities/
[6] https://markets.businessinsider.com/commodities
[7] The results of the stationarity test are available upon request from the authors

Figure 1. Development of selected commodity prices and uncertainty indicators



Source: Own processing

The results of the cointegration testing are shown in Table 1. With the exception of gold and palladium, all other commodity prices in the basic linear ARDL model have F statistics and t statistics that, are closer to zero than the critical values for I(0) at the 10% level of significance. It means that for these variables, we cannot exclude the null hypothesis of no cointegration between commodity prices and uncertainty indicators. Only in the scenario of gold and palladium prices, where F and t statistics are both higher than the specified significance level's critical values for I(1) variables, can the null hypothesis be denied. Besides, because of the nonlinear properties of the long-term connection between the time series, likely, the null hypothesis could not be completely excluded. Consequently, to account for any potential asymmetry in the response variable's reaction to an expansion or reduction in the explanatory variables, we estimated the NARDL model. Our findings demonstrate a long-term link between the prices of copper and silver with the selected uncertainty indicators. Afterwards, the F test was used to determine whether there was a long-run and short-run asymmetry (Table 2). The outcomes only support long-run asymmetry for prices of copper and silver. Therefore, the NARDL model is appropriate for these commodity prices. No asymmetry is confirmed in the reaction of gold and palladium prices to the changes in explanatory factors, thus the best approach to model these prices is the standard ARDL model with error correction term. Since there was no evidence of cointegration for aluminium, iron ore, platinum, or steel, ARDL without error correction should be utilised.

Table 1. The results of the bounds test for cointegration

	ARDL				*NARDL*			
	F		***t***		***F***		***t***	
lnAluminium	1.865	-	-1.024	-	2.559	-	-3.429	-
lnCopper	2.653	-	-1.629	-	4.365	**	-4.164	**
lnGold	4.792	**	-3.615	*	3.153	-	-4.149	**
lnIronore	0.939	-	-1.064	-	1.417	-	-1.714	-
lnPalladium	4.987	**	-3.892	**	3.026	-	-4.354	**
lnPlatinum	4.342	**	-3.229	-	2.568	-	-4.045	**
lnSilver	9.548	***	-2.721	-	3.980	*	-4.620	***
lnSteel	2.515	-	-1.133	-	3.732	-	-1.585	-

Note: ***, ** and * denote respectively the 1%, 5% and 10% significance level.

Source: Own calculation

Table 2. The results of asymmetry testing

		Long-run asymmetry		*Short-run asymmetry*	
		F-stat		***F-stat***	
lnCopper	lnVIX	1.911	-	0.589	-
	lnEPU	5.588	**	0.415	-
	lnGPR	33.950	***	0.144	-
lnSilver	lnVIX	3.667	*	1.417	-
	lnEPU	27.620	***	0.000	-
	lnGPR	10.720	***	2.374	-

Note: ***, ** and * denote respectively the 1%, 5% and 10% significance level.

Source: Own calculation

Cointegration between economic policy uncertainty, geopolitical risk and financial volatility and prices of aluminium, iron ore, platinum, and steel was not confirmed. Table 3 displays the results for the ARDL models for these commodity prices. Highly statistically significant is only the VIX coefficient in the aluminium and platinum model. If the expected financial volatility increases by 1% in the short run, the prices of aluminium and platinum decrease by 0.027% and 0.096% respectively. Besides, all coefficients of EPU and GPR are statistically insignificant. That means that economic policy uncertainty and geopolitical risk do not have an impact on aluminium, iron ore, platinum, and steel prices.

Table 3. ARDL estimations for short run

	lnAluminium		***lnIronore***		***lnPlatinum***		***lnSteel***	
L1.	0.044	-	0.084	**	0.068	*	0.004	-
DlnEPU	0.001	-	-0.001	-	-0.001	-	0.001	-
DlnVIX	-0.027	***	0.005	-	-0.096	***	0.001	-
L1.	-0.023	***	-	-	-	-	-	-
DlnGPR	0.000	-	-0.001	-	0.002	-	-0.003	-
_cons	0.000	-	0.001	-	-0.000	-	0.000	-

Note: ***, ** and * denote respectively the 1%, 5% and 10% significance level.

Source: Own calculation

The findings of ARDL models with error correction terms for gold and palladium are shown in Table 4. The error correction terms are negative and highly statistically significant at a 1% significance level, which is desirable because it indicates the presence of cointegration. In the case of gold, the coefficients of EPU, VIX and GPR are statistically significant. When economic policy uncertainty and geopolitical risk increase by 1%

in long term, then the gold prices rise by 0.101% and 0.057% respectively. On the other hand, the growing financial volatility of the stock market by 1% decreases gold prices by 0.141% in the long period. Besides, in the short run, none of the explanatory variables has an impact on the prices of gold. For the palladium model only the coefficient of VIX is statistically significant. When the anticipated financial volatility grows by 1%, then the palladium prices fall by 0.435% in the long term. The coefficients of EPU and GPR in the palladium model are not statistically significant, which means that they do not affect the prices in long run. Furthermore, palladium prices are affected by changes in financial volatility also in short-term periods. If the financial volatility increases by 1%, the price of palladium is reduced by 0.067%.

Table 4. ARDL estimations for the long run

	lnGold		***lnPalladium***	
long-run coefficients				
ECT	-0.029	***	-0.035	***
lnEPU	0.101	**	0.115	-
lnVIX	-0.141	**	-0.435	**
lnGPR	0.057	*	0.105	-
short-run coefficients				
D.lnPalladium	-	-	0.158	***
D.lnVIX	-	-	-0.067	***
cons	0.210	***	0.282	***

Note: ***, ** and * denote respectively the 1%, 5% and 10% significance level.

Source: Own calculation

We found an asymmetric link between selected uncertainty indicators and prices of copper and silver. Table 5 shows the results for the NARDL models of copper and silver. The error correction terms are negative and statistically significant at a 1% significance level, which is preferable since it indicates the presence of cointegration and the speed at which the long-run equilibrium is being adjusted. The speed of adjustment is 4.2% for the copper model and 6.1% for the silver model, which displays a daily adjustment process. This means that the long-term equilibrium is fully recovered in 24 and 17 days respectively. The outcomes of the NARDL approach display statistically significant asymmetric impacts of anticipated financial volatility on copper and silver prices. The negative cumulative sum of changes in financial volatility (VIX-) increases the prices of copper and silver by 0.217% and 0.399% respectively in the long run. On the other hand, the positive analogue of changes in financial volatility (VIX+) lowers the prices of copper and silver by 0.279% and 0.294%. Neither of the changes in economic policy uncertainty, whether it is negative (EPU-) or positive (EPU+) does have a statistically significant asymmetric impact on the prices of copper and silver. Moreover, coefficients of geopolitical risk are statistically significant, meaning that changes in geopolitical risk have asymmetric effects on copper prices. The negative sum of changes in the geopolitical risk index (GPR-) decreases the copper prices by 0.092%, while the positive analogue (GPR+) increases the prices by 0.117% in the long run. The geopolitical risk index does not have an asymmetric impact on silver prices in long term. On the other hand, in the short term only changes in expected financial volatility influence asymmetrically prices of copper and silver. Decreased financial volatility of 1% lowers the price of copper by 0.070%, while a 1% increase in financial volatility lowers the prices of copper and silver by 0.044% and 0.048% respectively.

Table 5. NARDL estimations for the long run and short run

	lnCopper		***lnSilver***	
long-run coefficients				
VIX-	0.217	**	0.399	***
VIX+	-0.279	***	-0.294	***
EPU-	-0.068	-	-0.099	-
EPU+	0.054	-	0.062	-
GPR-	-0.092	**	-0.075	-
GPR+	0.117	***	0.090	-
ECT	-0.042	***	-0.061	***
C	0.046	***	0.186	***
short-run coefficients				
dVIX-	-0.070	***	-0.023	-
L1	-0.020	-	0.006	-
L2	-	-	-0.019	-
L3	-	-	0.056	**
dVIX+	-0.044	***	-0.048	***
L1	-0.022	*	-0.039	**
L2	-	-	0.001	-
L3	-	-	0.027	-
dEPU-	0.003	-	0.004	-
L1	-0.001	-	0.006	-
L2	-	-	-0.000	-
L3	-	-	-0.003	-
dEPU+	-0.002	-	-0.000	-
L1	0.000	-	-0.002	-
L2	-	-	0.005	-
L3	-	-	0.005	-
dGPR-	0.001	-	0.006	-
L1	-0.000	-	0.006	-
L2	-	-	0.005	-
L3	-	-	-0.007	-
dGPR+	0.002	-	0.006	-
L1	-0.004	-	0.002	-
L2	-	-	0.001	-
L3	-	-	-0.007	*

Note: ***, ** and * denote respectively the 1%, 5% and 10% significance level.

Source: Own calculation

5 Conclusion

The main objective of this paper was to study the non-linear nexus between uncertainty indicators and prices of precious and industrial metals. We investigate relationships between time series during the period of higher uncertainty caused by the Covid-19 pandemic and war in Ukraine by the application of the (N)ARDL model. The results lead to a number of interesting and important implications.

First, by the application of the linear ARDL model, we did not find a cointegration between the prices of aluminium, iron ore, platinum, and steel with uncertainty indicators. Thus, economic policy uncertainty, geopolitical risk and financial volatility do not have a long-term influence on these commodity prices. However, the long-term linear link was confirmed between uncertainty indicators and prices of gold and palladium. Second, we employed a non-linear approach, and the findings showed the asymmetric relationship between the uncertainty indicators and metal prices. Asymmetry was confirmed in the case of copper and silver. While economic policy uncertainty does not affect the price of metals, financial volatility and geopolitical risk do.

To sum it up, based on our findings, we suggest that uncertainty indicators have an impact on metal prices. These findings are in line with many authors such as Cheng et al. (2015), Baur and Smales (2018), Das et al. (2019), Thongkairat et al. (2019), Huynh (2020), Chiang (2021), Mokni et al. (2021), Triki and Maatoug (2021), Yilanci and Kilci (2021). Moreover, in terms of practical applications, our findings provide a variety of potential outcomes and relevant information for policymakers, investors, and producers regarding the metal market. Firstly, we found evidence that economic policy uncertainty, geopolitical risk and financial volatility of the stock market influence metal prices and their returns, therefore they should be taken into account when making policy, investment and production decisions. These decisions consequently affect the entire functioning of the economy and market. Although, a unique approach must be taken to each metal because various metals react in distinct ways to different shocks and serve various purposes. Secondly, our findings show strong support for a positive association between gold returns and uncertainty, including increased economic policy uncertainty and geopolitical turmoil. Thus, we suggest risk-averse investors purchase and maintain gold as a hedge towards possible wealth loss when uncertainty levels grow. Although the hedging function of platinum, palladium and silver against higher uncertainty was not confirmed, thus they should not be used for safe-haven purposes. Thirdly, we found that geopolitical risk has a long-term effect on copper prices. During times of increasing geopolitical risk, the price of copper grows which consequently increases the overall production costs. Thus, to reduce costs, producers should look for alternative materials that could substitute copper, for example, aluminium where we did not find any long-term link with an indicator of geopolitical risk.

Our research looked at the metal market concerning uncertainty from the global perspective during the period covering the Covid-19 pandemic and Russo-Ukrainian tensions. Thus, there is a space for further research. Our study can be extended by the application of data covering a longer period, consideration of different types of uncertainty indicators, or focusing on specific markets because prices may react differently in diverse regions and under various conditions. In addition, further studies may replicate and extend this one using alternative methodologies to fill in the research gaps.

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Is Nutri-Score Labelling Affecting the Food Decisions? Analysis of the Perception and Knowledge of Generation Z

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Abstract
In the last few years, consumers have had considerable interest in healthy and nutritious food. Consumers are conscious and believe that food has a favourable or unfavourable impact on health, therefore monitoring food composition is becoming more essential. Several studies have shown that Front-of-Pack labels and Back-of-pack influence consumers' choices. Nutritional labels are considered an effective tool for helping consumers to make healthy food decisions. The aim of this paper is to investigate the perception, knowledge and influence of Nutri-Score labelling on Generation Z. The research is based on primary data obtained from an online questionnaire survey. According to the results, the majority of respondents consider the Nutri-Score label as understandable. It can be concluded that women incline to purchase more products with the Nutri-Score label compared to men. Moreover, respondents who live in urban areas prefer to purchase food with the Nutri-score label compared to respondents living in rural areas. When identifying the factors that influence the consumer when purchasing food, results indicate that advertising and the design of packaging do not influence purchases. On the other hand, previous experience is considered the most influencing component of the purchase. Moreover, the Nutri-Score label is marked as a significant element while purchasing.

Keywords
Consumer Behaviour, Front of Pack, Nutri-Score, Nutritional Labelling, Generation Z.

JEL Classification
M30, M31, Q13.

1 Introduction

Consumers are facing a wide variety of food choices. Over the years, consumption patterns have evolved significantly. Current trends indicate that the food sector has transformed in the last few years to the point where food plays a crucial role in maintaining health, promoting psycho-physical well-being, and preventing several diseases in addition to their nutritional and sensory qualities (Annunziata and Pascale, 2009). Furthermore, the recent COVID-19 pandemic has caused changes in consumer behaviour (Hesham et al., 2021). The number of health-conscious consumers is increasing and as a result, consumer behaviour is influenced by multiple motivational elements (Szakály et al., 2012).

Nutrition labelling has recently drawn more attention in scientific and political discussions (van der Bend et al., 2022). Especially, front-of-pack labelling was widely discussed in the European Union (EU). It is part of the farm-to-fork strategy of the European Commission. Providing unambiguous information and comprehensible nutrition information can contribute to affect purchases (Hagmann and Siegrist, 2020). According to EU Regulation 1169/2011, back-of-pack nutritional labelling is now required in the EU (Grunert et al., 2010), but studies show that only a small percentage of consumers use it when it comes to food decisions. In the context of food decisions, Maubach et al. (2014) report the main reasons why consumers pay less attention to back-of-front labels including inconspicuous placement on the back of packaging and problems interpreting the numerical information.

In contrast, most front-of-pack labelling is still voluntary (Jones et al., 2019). There are currently many types of front-of-pack labels used in the EU, which can be classified into four main groups: numerical labels, colour-

coded labels, graded indicators, and endorsement logos. Each label differs in visual presentation, message type, and focus (Storcksdieck et al., 2020). The Multiple Traffic Light, the Choices, the Keyhole, and the newest one, the Nutri-Score logo, are the most used in the system of labelling (Julia et al., 2018). In addition, front-of-pack nutrition labels are thought to be useful for healthier food selections at the point of purchase. They provide quick access to nutritional information which is easily used for consumers' food choices (Grunert et al., 2010).

One of the goals of the Farm-to-Fork strategy is to ensure food security, nutrition, and public health, and ensure that everyone has access to sufficient, safe, nutritious, and sustainable food. Providing clear nutritional information ensures simpler decisions for consumers to select food. European Commission suggested uniformly front-of-pack nutrition labelling to enable consumers to make healthy and sustainable food decisions. The EU is actively supporting the Nutri-Score label as part of its Farm to Fork strategy to improve the eating habits of the general public (European Commission, 2022). According to Stiletto and Trestini (2022), Nutri-Score represents colour distinguishable traffic light of the identification of the nutritional values of a product conjointly using a chromatic and an alphabetical scale (from green A, "higher nutritional quality", to dark orange E, "lower nutritional quality"). In the context of the EU, the Nutri-Score label is voluntary but it is widely used in several nations, including Belgium, Germany, France, Luxembourg, the Netherlands, Spain, Switzerland, and Portugal. In addition, The Pro Nutri-Score Alliance was established only in 2021 in Slovakia and it is used by several manufacturers (Pro Nutri-Score Aliancia, 2023).

The study provides insight into the perception and level of knowledge of Nutri-Score labelling on Generation Z. The main objective of this presented paper is to identify if the Nutri-Score label affects food purchases of Generation Z. Furthermore, this study investigates the perception of the Nutri-Score label. The research is conducted on consumers of Generation Z born between 1995 and 2009, which is described by many authors as the largest and most influential generation (Spitznagel, 2020). We focus on detecting associations concerning selected socio-demographic characteristics. The present paper demonstrates the perception and understanding of Nutri-Score labelling in the context of a nutritional information system that can potentially improve the dietary choices of Generation Z. In addition, it highlights the importance of consumer education related to food and nutritional literacy. This study is structured into five parts. The literature review is focused on Nutri-Score labelling, method of calculation, and advantages of implementation. The next section is dealing with the hypothesis and research framework. The following part deals with the results and discussion and finally, the last part of the paper is the conclusion.

2 Literature Review

As reported by Wartella et al. (2010) nutritional labelling was first used in the 1960s and the main aim of nutritional labels was to help consumers in following dietary advice. Since then, health organizations, governments and manufacturers have seen an opportunity to proactively push consumers to change consumption patterns. Temple (2020) in his study confirms the statement that nutritional labels help to make significantly healthier decisions when purchasing. The main purpose of nutritional labels is to convey information about a product's nutritional value supported by science (Wąsowicz et al., 2015). According to consumer research done by Küster and Vila (2017) and Song et al. (2021), labelling is a useful tool as it reduces the cost of health information, prompts perceptions of product quality, affects product choice, and promotes a healthier lifestyle. Studies show that food labels provide useful nutrition information and help consumers to make healthier decisions (Wyrwa and Barska, 2017) and encourage producers to enhance the nutrition profile of their manufactured products (Hercberg et al., 2021). This was recently proven in a comprehensive analysis of numerous food label types, including front-of-package, back-of-package, menu, and labelling in grocery stores (Shangguan et al., 2019). Thus, Arno and Thomas (2016) claim that nutrition labelling is primarily understood from the psychological perspective of the consumer. Moreover, many consumer studies focus on consumer variables associated with nutritional labels. Findings by Chen (2011) highlight that variables such as gender, age, attitudes towards health and motivation/interest are correlated with using food labels. Additionally, a higher level of nutritional and health awareness and interest was associated positively with wider use and a better understanding of labels in the research by de Magistris et al. (2010). Other individual consumer determinants affecting label effectiveness involve lifestyle choices and shopping habits (Chen, 2011). Research done by Christoph et al. (2018) indicates that women of middle age with a higher level of education were most interested in nutrition labels.

Various labelling forms, including nutrient-specific and summary formats, are used globally. For instance, according to Temple and Fraser (2014), two types of nutritional labels are recognized. Firstly, back-of-package labels contain a nutrition facts table that provides information about the composition. Secondly, front-of-pack labels inform consumers of the brand and the type of food. The front-of-pack label involves a description of the food's ingredients or a health claim. Temple (2020) further divides the front-of-pack labels into nutrient-specific and summary labels. A significant difference between the two types is that nutrient-specific labels concentrate on substances that are harmful when consumed in excess. In contrast, summary labels refer to a spectrum from the most healthy foods to the most unhealthy foods. It has been proven that summary formats provide a comprehensive assessment of the product's nutritional quality and consumers found it easier to understand and use (Hersey et al. 2013). This category includes the Nutri-Score label, which assigns a grade to food products' nutritional value using a five-colour coded scale consisting of 5 letters associated with a specific colour for each one. A represents products with a high nutritional value that we can consume practically unlimitedly. On the other hand, E involves products that we should eat less often (Hercberg et al., 2021). Several studies have been investigating Nutri-Score logo awareness. According to Talati et al. (2019a), and Egnell et al. (2018) it has been revealed that the Nutri-Score label is well understood and perceived by consumers for comparison of food quality. Additionally, Talati et al. (2019b) declare that Nutri-Score leads to healthier food selections and improves the nutritional quality of their purchases. Finally, a simulation study done by Egnell et al. (2019) suggests that Nutri-Score labels may reduce mortality from nutrition-related chronic diseases by encouraging healthier dietary intakes. In general, the labelling regulation is applied for food sold in packages, cans, or cardboard boxes and foods that allow this to be stated on their packaging. On contrary, food for infants and clinical nutrition, fresh fruits and vegetables is not marked by Nutri-Score. An algorithm is used to calculate the total score, which is then divided into five groups (A to E) to indicate the range of food with higher nutritional quality to those with lower nutritional quality (Ter Borg et al. 2021). Firstly, nutrients that may have a less positive effect on health are assigned points from 0 to 10. The higher the amount of energy, saturated fatty acids, sugar and salt in 100 g (ml) of the product, the more points each nutrient receives. Secondly, nutrients with a positive impact on diet, such as the amount of fibre, protein, fruit and vegetables, nuts and legumes in 100 g (ml), are assigned from 0 to 5 points. The final result is calculated by subtracting the sum of points from step 2 from the sum of points from step 1. The lower the resulting score, the better the nutritional quality of the food. The letter Nutri-Score is then assigned to the corresponding result. Based on different product characteristics, the Nutri-Score is calculated differently for solid foods and differently for drinks, cheeses and fat (Pro-Nutri-Score Aliancia, 2023). However, due to the harmonization of the front-of-pack nutritional declaration, the Nutri-Score label is at the heart of food and nutrition policy discussions in the EU. Therefore, in connection with the Nutri-Score label, two groups were formed: those who support the label and those who are against it. The implementation of mandatory Nutri-Score labelling is mostly in Mediterranean countries. The major concern for them is an argument that the front-of-pack scheme discriminates against traditional and single-ingredient foods or those protected by quality schemes (Delhomme, 2021; Fialon et al., 2022). According to Wax and Leali (2022), Italian producers' associations consider the Nutri-Score system discriminatory. It allegedly provides distorted and incomplete information on nutritional values and arbitrarily classifies several Mediterranean foods (for instance virgin olive oil or Parmigiano Reggiano) as risky, while for the economy they are an irreplaceable article. On the other hand, several benefits of using Nutri-Score labels have been proven (Pro Nutri-Score Aliancia, 2023):

- Nutri-Score offers an understandable explanation of nutritional value based on current scientific knowledge.
- Nutri-Score evaluates each food as a whole, not just its individual components. It is an objective nutritional evaluation of the product.
- The main aim is to teach consumers to evaluate foods according to their nutritional value.
- Nutri-Score already works in many European countries, e.g. in France, Germany, Belgium, and Spain, and is recommended by the European Office of the World Health Organization.

3 Methodology and Data

Since the Pro-NutriScore Alliance was introduced in Slovakia in 2021 and some manufacturers voluntarily started using the Nutri-score label, we are interested in overall awareness of Generation Z. The main objective

of this presented paper is to identify if the Nutri-Score label affects food purchases of Generation Z. In addition, this study investigates the perception of the Nutri-Score label. Primary data analyzing consumer attitudes were obtained through an online questionnaire survey. Data were collected from September to November 2022. The questionnaire survey consisted of 17 questions and was divided into 3 sections. Moreover, the questionnaire survey contained closed and open questions, we used a 5-point Likert scale to find out which determinants have the biggest impact on food purchases. The first section included socio-demographic questions. In the case of age, the respondent indicated a specific number based on which was subsequently assigned to the relevant generation. Based on the definition of Goh and Lee (2017), Generation Z includes consumers born between 1995 and 2009. Only participants over the age of 18 were selected to fill out the questionnaire. The second section contained questions related to Nutri-Score. Respondents could choose from two options. This part was focused on the perception of the Nutri-Score logo. Consequently, a selective question was used regarding whether participants had already encountered the Nutri-Score label, if not, the questionnaire was completed for them. The last part of the questionnaire survey contained questions to find out the level of knowledge of Generation Z. We used a 5-point Likert scale to find out the agreement or disagreement of respondents with various statements.

The final research sample contains 244 respondents from Generation Z. The socio-demographic characteristics of the research sample are summarized in the following table (Table 1). Based on the questionnaire survey it can be concluded that women represented more than 57% of participants. The majority of the research sample represented were employed participants living in the urban area who had monthly incomes between 801€ and 1,000 €.

Table 1: Socio-demographic characteristics of respondents

Variable	*Category*	*Frequency*	*Frequency %*
Gender	Female	141	57.78%
	Male	103	42.21%
Monthly income	Up to 400 €	42	17.21%
	401 - 600 €	47	19.26%
	601 - 800 €	31	12.70%
	801 – 1000 €	83	34.01%
	1001 – 1200 €	22	9.01%
	More than 1200 €	19	7.78%
Economic activity	Student	85	34.83%
	Employed	129	52.86%
	Unemployed	2	0.81%
	Entrepreneur (freelancer)	20	8.19%
	Maternity leave	4	1.63%
Place of residence	Urban	146	63.93%
	Rural	98	40.16%

Source: own processing based on questionnaire survey (2023)

In order to meet the main object of the research paper, two hypotheses were determined:

H1: There exists a dependency between selected demographic characteristics (gender and place of residence) and the purchase of foods with the Nutri-Score label.

H2: There are statistically significant differences in the evaluation of the importance of factors that affect consumers when purchasing food.

Additionally, to fulfill the main aim, multivariate, descriptive, and non-parametric statistics were implemented. Statistical software XLSTAT (version 2022.5.1) was used to analyze and evaluate the primary data. Specifically, Friedman's test, Fischer's exact test, and multiple pairwise comparisons using Nemenyi's method were used.

4 Empirical Results and Discussion

At the beginning of the questionnaire, respondents were asked to answer the selective question if they know the Nutri-Score label. Approximately 75% of participants declared that they know the Nutri-Score label. The remaining 25% of respondents did not know the Nutri-Score label. In correlation with Ducrot et al. (2022), approximately 97% of French adolescents reported that have already seen or heard of Nutri-Score. On contrary, Stiletto and Trestini (2022) were investigating the knowledge among different front-of-pack labels. The results show that Multiple Traffic Light (23%) and Daily Reference Intake (31%) were the best known by Italian consumers. On the contrary, only 12% of respondents declare to be familiar with the Nutri-Score. In comparison to other labels, research by Fialon et al. (2020) has demonstrated that the Nutri-Score is an intuitively understandable label.

The next question was focused on the sources from which participants know about the Nutri-Score logo. More than 50% of respondents stated that they knew the logo from the packaging and 33% from the Internet. Table 2 represents selected questions from the questionnaire survey. Respondents could choose from two options: yes/no. Based on the results, it could be concluded that more than 89% of respondents consider the Nutri-Score logo as understandable and easy to remember. On the other hand, only 10% of respondents stated that the Nutri-Score logo is not understandable and hard to remember. Our results are in line with Ducrot et al. (2022), who conducted research aimed at finding out the awareness, perception, and self-reported impact of Nutri-Score on food choices among French adolescents. Based on the results, it can be mentioned that more than 91% of French adolescents consider the Nutri-Score label as understandable and 92% declare that is easy to identify. In several studies, it has been shown that the Nutri-Score logo is considered a highly intuitive and attention-grabbing label that could motivate better food choices (Dubois et al., 2021, Egnell et al., 2019, Hagmann and Siegrist, 2020, Temmerman et al., 2021). The study done by Public Health France in 2020 shows that 93% of French participants considered the Nutri-Score labelling useful for knowing the nutritional quality of products. Additionally, more than 57% of participants knew the Nutri-Score logo and had changed one or more purchasing habits (Southey, 2021). Finally, the Nutri-Score has shown to be a useful tool for assisting and directing customers toward making more knowledgeable and healthful food purchase selections (De Temmerman et al., 2021).

Taking into account the health aspect, approximately 86% of respondents consider food with the Nutri-Score logo as healthier. The following question was focused on Nutri-Score purchases. Our findings show that more than half of the participants buy products with the Nutri-Score. Data obtained by Sarda et al. (2020) show that more the 42% of respondents modified more than one behaviour thanks to Nutri-Score. In France, the majority of teenagers (70%) reported that they had already bought a product with the Nutri-Score logo. The Nutri-Score had an impact on the purchasing decision for 54% of those who bought a product with the logo (Ducrot et al. 2022). In research by Folkvord et al. (2021), no effects of the Nutri-Score were observed on purchase intention.

In addition, hypothesis testing showed that there exist statistically significant differences between gender and purchases with Nutri-Score labels ($p < 0.0001$). As the computed p-value is lower than the significance level alpha=0.05, one should reject the null hypothesis, and accept the alternative hypothesis. Women belonging to Generation Z tend to purchase products with the Nutri-Score logo more frequently compared to men. Our results are in line with Campos et al. (2011) who declared that women are more interested in nutrition and they are more likely to use nutrition labels when purchasing. A study made by Egnell et al. (2018) indicates that individual attributes of participants, including age and educational level of education, were correlated with the ability of products' to rank according to their nutritional quality. Moreover, results showed that women were also more able to rank the product according to the nutritional quality. When testing the place of residence, the results confirmed the alternative hypothesis. In more depth, there exist statistically significant differences between the place of residence and purchases containing the Nutri-Score label. Based on the results, it could be concluded that respondents living in urban areas tend to buy more food with the label compared to respondents living in rural areas.

Finally, when discovering the attitudes towards discrimination of some products, only 32% of participants claimed that Nutri-Score is discriminatory. Different results were obtained in France in a study by Sarda et al. (2020). A total of 1001 individuals were enlisted in 2019 and provided feedback via an online survey on the Nutri-Score awareness, support, and behavioural changes after it was introduced. The results show that more

than 90% of participants supported the Nutri-Score system. More than 87% of respondents expressed that they would be in favour of adopting the Nutri-Score system as mandatory in 2019.

Table 2: Selected questions from the questionnaire survey

Question	*Answer*	*Frequency %*
Do you find the Nutri-Score logo comprehensible/easy to understand?	Yes	89.61%
	No	10.38%
Do you think that foods with the Nutri-Score label are healthier?	Yes	86.33%
	No	13.66%
Do you buy products with the Nutri-Score label?	Yes	55.19%
	No	44.80%
Would you prefer food with a Nutri-Score label over food that does not have this label?	Yes	57.37%
	No	42.62%
The Nutri-Score label is discriminatory for some types of food.	Yes	32.24%
	No	67.75%

Source: own processing based on questionnaire survey (2023)

The following part of the questionnaire survey was focused on investigating the level of knowledge about the Nutri-Score label among Generation Z (Table 3). To express the attitudes towards several statements, the 5-point Likert scale was used, where 1 represented strongly disagree and 5 represented strong agreement with the statement. Based on the results, it could be concluded that participants strongly agreed with the statement "*Foods with Nutri-Score A and Nutri-Score B have a high nutritional value*". Moreover, respondents are inclined to the statement which claims that Nutri-Score labels split food into healthy and unhealthy. As it was mentioned earlier, the main aim of the Nutri-Score system is to help consumers towards healthier choices and points to products with higher nutritional value and products with lower nutritional value. When verifying the statement about the products with E labels, the respondents showed considerable disagreement. Foods with lower nutritional value should be consumed more sparingly. Finally, when finding out whether the respondents understand the method of calculation, we found out that most of the respondents cannot determine it.

Table 3: Selected questions from the questionnaire survey

Question	*Mean*
Nutri-Score divides foods into healthy and unhealthy.	4.13
Nutri-Score divides foods into foods with better nutritional value and foods with lower nutritional value.	4.08
Foods with Nutri-Score A and Nutri-Score B have a high nutritional value.	4.39
We cannot consume foods labelled E.	2.41
Nutri-Score is calculated based on the ratio of the content of unfavourable components (e.g. sugar) to the content of beneficial components (e.g. fibre)	3.21

Source: own processing based on questionnaire survey (2023)

This study was oriented on the evaluation of selected determinants considered during food purchases using a 5-point Likert scale ranging from 1 to 5, where 1 represented the least important factor and 5 represented the

most important factor. The second hypothesis H_2 assumed statistically significant differences in evaluation among selected factors. We calculated the Friedman's test (Table 4) and consequently used Nemenyi's method. Our findings show that statistically significant differences occurred between selected factors (p-value = <0.001).

Table 4: Results of Friedman's test

Q (Observed value)	977.370
Q (Critical value)	24.996
DF	15
p-value (one-tailed)	<0,0001
alpha	0.05

Source: author's calculations (2023)

In addition, Nemeyi's method formulated on multiple pairwise comparisons explains the main significant differences in groups (Table 5). Group E represents the most important elements which are quality and previous experience. On the other hand, group A includes the least important attributes which belong to the design of packaging, promotion followed by the place of purchase, number of kcal, size/weight and lastly material of packaging. From the overall evaluation of the results, we found that there are significant differences when comparing the group of E factors with the other groups. There are no significant differences between the group of factors C and D. The results of Friedman's test revealed that the Nutri-Score label was evaluated as a significant factor influencing food purchases. A study by Stiletto and Trestini (2022) revealed that Italian consumers rely mostly on nutritional information, price and list of ingredients. On the other hand, factors such as ethical concerns, cooking instructions and serving per pack were evaluated as the least important when shopping. According to Jürkenbeck et al. (2022), the most influential element when purchasing among consumers in Germany was mostly the ingredients list, sugar content, followed by fat content.

Table 5: Results of Nemenyi's method: Differences among examined factors

Sample	*Frequency*	*Sum of ranks*	*Mean of ranks*	*Groups*					
Design of packaging	183	945.500	5.167	A					
Promotion	183	986.000	5.388	A					
Place of purchase	183	995.000	5.437	A					
Number of kcal	183	1031.000	5.634	A					
Size/weight	183	1056.000	5.770	A	B				
Material of packaging	183	1156.500	6.320	A	B				
Flavour	183	1370.500	7.489		B	C			
Appearance	183	1628.500	8.899			C	D		
Country of origin	183	1665.000	9.098			C	D	E	
Composition	183	1815.000	9.918				D	E	
Nutri-Score label	183	1885.500	10.303				D	E	
Brand	183	1893.500	10.347				D	E	
Discount	183	1915.500	10.467				D	E	
Price	183	1956.500	10.691					E	
Quality	183	2286.500	12.495						F
Previous experience	183	2301.500	12.577						F

Source: author's calculations (2023)

5 Conclusion

In most countries, consumers can take into account labels of the nutritional quality of several indications on the packaging when shopping. Firstly, the nutritional information on the back of the product, secondly, nutritional labels on the front of the package, and thirdly, dietary and health claims on the packaging. While the back-of-front label is mandatory on food packaging, front-of-pack labels are used voluntarily in several

countries. Based on the studies, it has been proven that only a small percentage of consumers use the nutrition fact table to learn about the nutritional value of different food. On the other hand, front-of-pack labels are interpreted as a reliable tool to engage the consumer about the nutritional information of food products. Currently, the main focus is concentrated on the interpretive summary indicator label Nutri-Score. The EU is actively supporting Nutri-Score labelling as part of its Farm to Fork strategy for improving the eating habits of the general public.

This study provides new data on the awareness, perception, and impact of the Nutri-Score in Slovakia by Generation Z. Based on the findings, we can conclude that more than 75% of respondents of Generation Z know the Nutri-Score label and the majority of participants understand and remember it easily. More than 50% of participants learned about the Nutri-Score logo directly from the packaging and 33% from the Internet. Our results showed that the most important determinants of food purchases of Generation Z are mostly previous experience with the product and overall quality. Nutri-Score is considered as a significant element of purchase. In contrast, design of the packaging, promotion and place of the purchase were evaluated as the least important elements when purchasing. Additionally, in this paper we focus on the level of knowledge of Generation Z. Overall, our results indicate a good level of understanding and knowledge on the Nutri-Score system, but most of the respondents do not understand the method of calculation.

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Convolutional Neural Networks in the Prediction of Economic Time Series

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Abstract
This article provides insights into the theoretical foundations of Artificial Neural Networks (ANNs) for time series forecasting and highlights the advantages of using Convolutional Neural Networks (CNNs). It presents a mathematical model of a neuron, along with algorithms for building ANNs, their training, and loss functions. The architectures of both CNNs and Long Short-Term Memory networks (LSTMs) are considered.
The article also reviews the existing experiences of using CNNs for forecasting economic time series. Additionally, it mathematically describes the limitations of CNNs, such as the possible spatial dependence of incoming data, the processing of long-term dependencies, the limited ability of fixed reconciliation kernels to recognize patterns in different data time scales, and the possibility of overfitting models.
The article proposes methods for addressing these limitations, some of which are realized in an experiment. The experiment demonstrates that the use of appropriate hyperparameters and hybrid models can reduce indexes of loss metrics by half. Based on these results, the article concludes that further research into the use of CNNs for time series forecasting is warranted.
Overall, the proposed methods for addressing the limitations of CNNs provide a starting point for future research in this area.

Keywords
Neural networks, LSTM, CNN, WaveNet.

JEL Classification
C13, C32, C45, C63, **D81**

1 Introduction

ANNs are inspired by the biological neural system and are regarded as universal approximators capable of performing different tasks, including forecasting time series. When referring to neural networks, we mean a connection model formed from units arranged in multiple layers composed of perceptrons, known as a multiplayer perceptron network. Neural networks are black box models that learn from data and teaching patterns, making their employment simplified. Common algorithms used for feedforward neural networks are based on gradient minimization of the output error. As designated by Marcek (2017), they also have the biggest potential in predicting time series, which is frequently applied in financial risk management.

The problem of time series forecasting is solved in LSTM with the help of a memory cell referred to as the LSTM cell. This type of network possesses the capability to learn long-term dependencies in data, which shows its applicability to a time series problem (Livieris et al., 2021). The architecture of LSTM is based on Recurent Neural Network (RNN).

CNN is another deep learning algorithm applied in stock market prediction after LSTM. In Di Persio and Honchar's study (2016), CNN and RNN were applied to the forecasting of stock market price movements of the S&P 500 index. Experiments demonstrated advantages of CNN over other methods. Other experiments show that CNN plays an important role in the quality of the extracted feature set and the final prediction. For example, CNN was used in Gunduz et al.'s study (2017), in which data of 100 companies in Borsa Istanbul were utilized to produce technical indicators and temporal features. It was found out that CNN achieved better relative F-Measure values than other classifiers. CNN was the leading algorithm with the best F-Measure scores in most cases.

Di Persio and Honchar (2016) would like to underline that they achieved much better results using ensembles of neural networks. Livieris et al. (2021) uphold a similar position. During the last time, deep learning methods

used for time-series predictions exploit advanced deep learning techniques, special architectural designs, and are based on convolutional and Long short-term memory (LSTM) layers.

In the context of time series forecasting, "spatial features" usually refer to features that have a spatial structure or can be represented as an image, such as a matrix of pixel values. CNNs are able to forecast economic time series that can be represented as spatial features.

Thus, observing the theoretical base of using CNNs for forecasting time series allows us to make conclusions about their big hidden powerful potential for solving these issues. Also, our own experiments showed that CNN has the possibility of improving its results. CNNs have the advantage of reducing the computational expenditures of model training process and risks of overfitting. In the future, different models and multiple indicators should be used, which can help capture different aspects of the behavior of the investigated object and provide a more comprehensive view of its trends.

The main goal of the research is the search for the best models, patterns, settings, and applied methods of CNNs for forecasting economic time series.

In the section "Theoretical background of forecasting time series using ANNs," the total theoretical background of ANNs, such as the mathematical model of a neuron, model of a multi-layered neural network, learning orders, different types of ANNs, and error metrics are described.

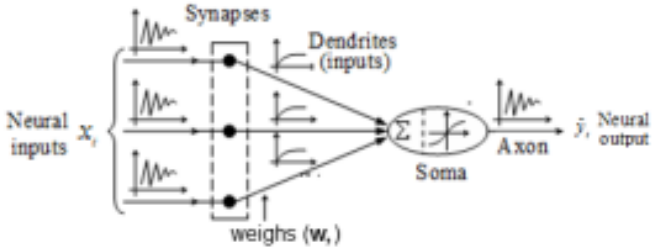
In the section "Data and tools," we describe the input data and tools used in our research.

The theoretical foundations of the limitations of CNNs in forecasting time series and ways to solve them, including their mathematical formulation, are discussed in the section titled "Problems and Solutions." Some of these solutions, such as the use of hybrid models and experimentally-determined hyperparameters settings, are realized as experiment. Additionally, this section highlights areas of research that require further investigation.

2 Theoretical background of forecasting time series using ANNs

Each network consists of neurons, which are elementary processors that receive and transmit signals. The mathematical model of a neuron is mapped in Figure 1. All processors are joined in set of connections (synapses), which has defined value. The neural output threshold value is used to compute the activation signal, which is the ratio of the weighted sum and threshold value. In the case where the threshold is zero, the activation signal is equal to the sum of input value. The activation function, or transmission function, defines whether to activate the neuron or not.

Figure 1 Mathematical model of a neuron



Source: Marcek, D., n.d.

The somatic nonlinear activation function $\varphi(.)$ maps scalar product value $u(t) \in (-\infty, +\infty)$ to a bounded neural output. In general, the neural output is in the range [0, 1] for unipolar signals and [-1, 1] for bipolar signals. The nonlinear activation function transforms the signal $u(t)$ into a bounded neural output $y(t)$, which is expressed as:

$$y(t) = \varphi[u(t)] = \varphi[w_t x_t] \, \epsilon \, R^1 \tag{1}$$

Many different forms of mathematical functions can be used to model an activation function, such as linear, unipolar and sigmoidal bipolar, multimodal sigmoidal and radial basis operators.

2.1 Algorithm for building a neural network

According to Fedorin I. (2022), the number of stages above can be reduced to five.

The first stage, the construction of a neural network model, involves carefully selecting input data that affect the expected result. From the source information, it is necessary to exclude all information that does not relate to the investigated problem. For the factors that are included in the training sample, it is advisable to pre-estimate their significance by conducting correlation and regression analyses and analyzing the ranges of their possible changes.

At the second stage, the transformation of the source data is carried out, taking into account the nature and type of the problem displayed by the model, and methods of presenting information are selected. The effectiveness of the neural network model increases if the ranges of changes in input and output values are reduced to some standard, for example, [0,1] or [-1,1].

The third stage consists of the construction of the ANN, which is the design of its architecture (the number of layers and the number of neurons in each layer). The structure of the ANN is formed before the start of training.

The fourth stage is related to the training of the network, which can be carried out by taking into account the constructive or destructive approach. The learning process of a neural network is a refinement of the values of the weighting coefficients for individual nodes based on a gradual increase in the amount of input and output information. The start of training should be preceded by a procedure for selecting the neuron activation function, which takes into account the nature of the problem to be solved.

The fifth stage involves testing the resulting ANN model on an independent sample of examples.

2.2 Learning neural networks

A multilayer network is not programmable in the usual sense, and solving a specific problem is carried out through the process of learning, which involves selecting a set of its coefficients.

The training of the neural network consists of changing the internal parameters of the model in such a way that a vector of values is generated at the output of the ANN, which coincides with the results of the training sample. The learning paradigm is determined by the availability of the necessary information. In general, tasks solved using machine learning methods belong to different types of learning: learning with a teacher (supervised learning) or without one (unsupervised learning).

According to Fedorin (2022), the learning process of the ANN consists of correcting the initial values of the weight coefficients of interneuron connections, which are usually set randomly. When entering the input data of a memorized example (stimulus), a reaction appears, which is transmitted from one layer of neurons to another, reaching the last layer, where the result is calculated. The difference between the known value of the result and the response of the network corresponds to the magnitude of the error, which can be used to adjust the weights of the interneuron connections. At the same time, at each k-th step for the j-th neuron, the weight of the i-th connection is calculated as

$$w_{jik} = w_{ji(k-1)} + \Delta w_{jik} \tag{2}$$

where $\Delta w_{jik} = \eta \delta_{jk} x_{jik}$, $\delta_{jk} = T_{jk} - R_{jk}$, where $T_{jk}$is the known (correct) output value of the j-th neuron; R_{jk}– the calculated output value of the j-th neuron; x_{jik} is the magnitude of the signal at the i-th input, η is the learning rate coefficient.

The optimal values of the weights of interneuron connections can be determined by minimizing the root mean square error using deterministic or pseudo-random algorithms for finding the extremum in the space of weight coefficients. At the same time, a traditional optimization problem arises, which is connected with getting stuck in a local minimum.

2.2.1 Loss functions

According to Fedorin (2022), all machine learning algorithms are based on the minimization or maximization of a function, which we call the “objective function”. The group of functions to be minimized is called "loss

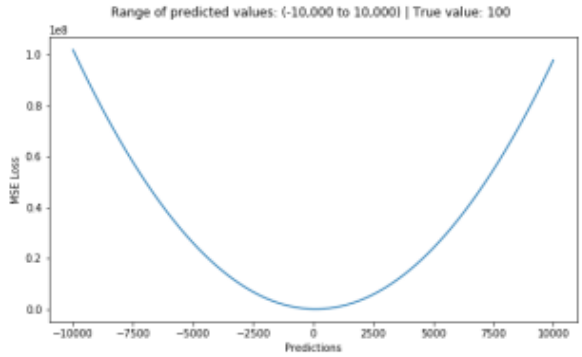
functions". The loss function measure how well the forecasting model predicts the expected outcome. The most commonly used method of finding the minimum point of a function is gradient descent. There is no single loss function that works with all types of data.

Loss functions for regression problems calculate the quantity of the Mean Squared Error, Quadratic Loss, or L2 loss (MSE). MSE is the most commonly used loss function for regression problems, and it is calculated as the sum of squared distances between our target variable and the predicted values:

$$\text{MSE} = \frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{n} \tag{3}$$

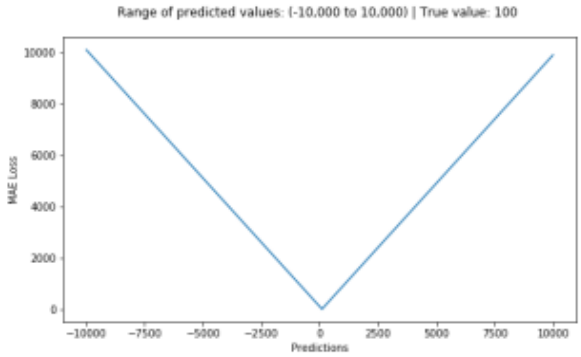
where y_i – actual value, $\hat{y}_i$- predicted value, n – total number of samples.

Figure 2a. The examples MSE loss function



Source: Fedorin (2022)

Figure 2b. The examples MAE loss function



Source: Fedorin (2022)

Figure 2a shows a plot of the MSE function where the true target value is 100, and the predicted values range from -10,000 to 10,000.

Root Mean Square Error (RMSE) is also one of the most commonly used metrics for the accuracy and forecasting of neural networks. It represents the difference between the actual and predicted values and provides an aggregate measure of the magnitude of the error.

The RMSE is calculated as the square root of the squared differences between the actual and the predicted values. The lower value of the RMSE indicates a better forecast result.

$$RMSE = \sqrt{\frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{n}} \tag{4}$$

where y_i – actual value, $\hat{y}_i$- predicted value, n – total number of samples.

The RMSE is an effective metrics because it considers not only direction but also the magnitude of the error.

Mean Absolute Error, L1 loss (MAE) is another loss function used for regression models. MAE is the sum of the absolute differences between our target and predictor variables. Therefore, it measures the average magnitude of errors in a set of predictions, regardless of their direction. The range of change is also from 0 to ∞.

$$\text{MAE} = \frac{\sum_{t=1}^{n}|y_i - \hat{y}_i|}{n} \tag{5}$$

where y_i – actual value, $\hat{y}_i$- predicted value, n – total number of samples. Figure 2b shows a plot of the MSE function.

Using MAE loss is beneficial when the training data is affected by outliers. One major issue with using MAE losses, especially for neural networks, is that its gradient is uniform, which means that the gradient will be large even for small values of loss. This can be detrimental to the learning process. In contrast, MSE performs well in this scenario and converges even with a fixed learning rate. The gradient of MSE is high for large loss values and decreases as the loss approaches 0, making it more accurate towards the end of training. Additionally, MAE is faster to calculate than MSE.

2.3 Deep Learning

Deep learning is a class of machine learning algorithms that learn to understand data in a deeper (more abstract) way.

2.3.1 LSTM

According to Preeti et al. (2019), LSTM network architecture is a sequential model based on two critical components: states and three gates. The states include hidden state, which depicts the value of the previous hidden layer, and input state, which is a linear combination of the current input data and hidden state. The LSTM cell consists of three gates: the input gate, forget gate, and output gate, which are named (i, f, o). The hidden state is the output vector and is named s. Each unit of the LSTM cell network consists of these three gates and uses an optimizer function to update the weights associated with units of the network. The forget gate, f_t is computed using Equation 6 to find which information from the previous state should be kept for further computation.

$$F_t = \sigma(W_{fx}x_t + W_{fs}\mathrm{f}\, s_{t-1} + b_f) \tag{6}$$

where, σ denotes the sigmoid activation function. After that, the input gate is used to find an intermediate parameter it using Equation 7, and C_t is found using Equation 8 to decide whether the internal state value should serve as memory cell.

$$i_t = \sigma(W_{ix}x_t + W_{is}s_{t-1} + b_i) \tag{7}$$

$$c_t = \tan h(W_{cx}x_t + W_{cs}s_{t-1} + b_c) \tag{8}$$

Finally, the information to be kept is decided by merging the output of the input and forget gates using Equation 9.

$$C_t = f_t \times C_{t-1} + i_t \times c_t \tag{9}$$

Sigmoid and tanh layers are used to compute new information being stored in cell state. Then, output layer captures the output in Equation 10, which is used to give the final output prediction s_t in Equation 11.

$$o_t = \sigma(W_{ox}x_t + W_{os}s_{t-1} + b_0) \tag{10}$$

$$\tilde{s}_t = o_t \times \tan(C_t) \tag{11}$$

where, $W_{fx}, W_{fs}, W_{ix}, W_{is}, W_{cx}, W_{cs}, W_{ox}, W_{os}, b_f, b_i, b_c$ and b_o are corresponding weights and biases used at different layers, respectively, and $\tilde{s}_t$ denotes the output of the LSTM network at time signal *t*.

2.3.2 CNN

Convolutional Neural Networks (CNNs) have recently been applied to time series forecasting. CNNs are good for this task as they are able to automatically extract features from raw data.

The historical values of the time series are transformed into a matrix, known as a tensor, and fed into the input layer of the network. A convolutional neural network is based on a powerful and universal mathematical operation called convolution (Equation 12).

The network then applies filters to the tensor, which serve as feature extractors. The filters are responsible for identifying patterns in the data, such as trends, seasonality, and anomalies. These patterns are then passed through multiple hidden layers, where the features are combined and processed to produce a prediction.

According to authors Madera and Marcek (2023), all configurations of CNNs are based on the classical feedforward artificial neural network and therefore adopt most of its basic principles of structure, training and inference. The configurations are built on the basis of the following three principles: weight sharing, local receptive field, and subsampling. The result of weight sharing is a substantial reduction in the number of free parameters, thereby enhancing the network's ability.

The CNN configuration has several types of layers:

- Input Layer: The input layer of the CNN accepts the raw data, such as images or time series data.

- Convolutional Layer: This layer extracts various features from the input feature map. It creates a convolved kernel with the input layer for creating a tensor of outputs.

$$Y_{i,j}^{y} = b^{l} + \sum_{h=1}^{H} \sum_{m=1}^{K} \sum_{n=1}^{K} X_{i+m,j+n}^{h} \times W_{m,n}^{h} \quad (12)$$

where $x_{i+m,j+n}^{h}$is a point in the position in h input map, similarly, $Y_{i,j}^{l}$ is a point at a position (i,j) in the l output map, $W_{m,n}^{h}$ is the coefficient at the position (m,n) in the $(K \times K \times H)$ dimensional kernel used for the h input map and b^{l} is the bias for the l output map.

- Pooling Layer: This layer performs the merge operation, which is essentially the same as in the case of convolutional weaving. The difference lies in the function that is used over a group of points in the local neighborhood. Merging leads to size reduction. In the case of the merging layer, the most used functions are average and maximum. Merging leads to a reduction in the dimensions of maps on other layers, a reduction in the number of synapsis, and free parameters.

$$Y_{i,l}^{l} = f(X_{i,j}^{l}, X_{i+1}^{l}, X_{i,j+1}^{l}, X_{i+1,j+1}^{l}) \quad (13)$$

- Fully-Connected Layer: This layer performs the inner product of the input vector X and the transpose weight vector W' plus bias b_i, i.e.,

$$Y = X_{\,i} W' + b_i \quad (14)$$

This layer serves as a classifier, where the input vector represents the vector of features extracted in previous layers.

- Rectified Linear Unit Layer: This layer is vital in CNN architectures and is based on the nonsaturation 'activation function'. Without activating the fields of the convolutional layers, it increases the decision function's nonlinear properties by removing the negative values from the activation map and converting them to zero. For example, rectified linear unit $ReLU$ (34) speeds up network training and calculations.

$$ReLU(x) = \max(0,x) \quad (15)$$

- Dropout Layer: It helps prevent overfitting. It randomly drops out a certain percentage of neurons in the network during training.

- Batch Normalization Layer. It normalizes the activations of the previous layer, which helps to speed up training and improve the generalization performance of the network.

- Output Layer: This layer produces the final predictions.

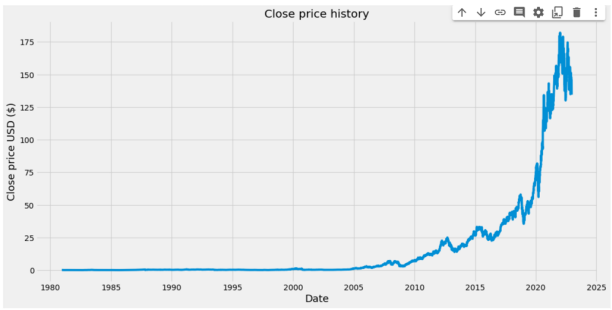
3 Data and tools.

We are solving the problem of forecasting stock prices based on historical data. The input data for this problem consist of historical stock price data for Apple Inc. (AAPL), which was obtained from Yahoo Finance (Yahoo Finance, n.d.). As an example, Figure 3a displays the historical daily prices for Apple Inc. stocks on NASDAQ from December 12, 1980, to December 17, 2022, in a comma-separated values format.

Initially, we use two metrics, RMSE and MAE, to measure the performance of our models.

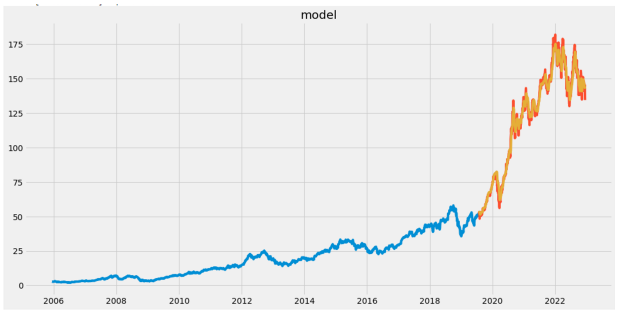
The basic models were built using the Keras and TensorFlow toolkit. According to Keras (n.d.), Keras is a deep learning API written in Python and runs on TensorFlow. Keras was developed with a focus on enabling fast experimentation. TensorFlow is an end-to-end platform that makes it easy for users to build and deploy Machine Learning models (TensorFlow, n.d.). Additionally, we used the following Python libraries: NumPy, pandas, Scikit-Learn, Malplotlib, and Seaborn.

Figure 3a. The time plot of daily prices for Apple Inc. stocks by "Close" from December 12, 1980 till December 17, 2022



Source: own processing

Figure 3b. The data distribution for training and testing. Prediction values for the LSTM



Source: own processing

4 Problems and solutions

4.1 The theoretical foundations of the CNN limitations in forecasting time series and ways to solve them

In general, CNNs for forecasting economic time series have four problems that we will try to describe in this research.

Problem 1 is that time series data can often have a temporal dependency and order between data points. The convolution operation include multiplying a fixed-sized kernel with a part of the input data at a time. This operation assumes that the input data are spatially independent of one another.

To solve this problem, we can try using networks that can recognize temporal dependencies between data points like Recurrent Neural Networks (LSTM), hybrid format like ConvLSTM, or a 1D CNN model with convolutional kernels of size *k* that slide across the time dimension by step *s*, as per Equation 16, which allows the model to capture temporal dependencies and patterns in the data (Brownlee, 2018). We can also combine both methods.

$$y_i = \sigma(\sum_{j=0}^{k-1} w_j \, x_{i+s*j} + b) \tag{16}$$

where, *x* is the input time series sequence, *w* is the learnable filter/kernel weights.

Problem 2 is that CNNs may have problems with processing long-term dependencies, especially when with large time lag between dependent variables. This problem can be solved by using RNNs (LSTM) and hybrid format with CNNs.

Problem 3 is that the fixed-size convolutional kernel may not be able to recognized patterns which present in different time scales of data, therefor some of information can be loss.

One way to solve this problem is to use extended convolutions, which allow the kernel to have a larger receptive field without increasing its size. Extended convolutions work by inserting gaps between kernel weights, effectively increasing the convolution step.

Special attention should be given to WaveNet for solving problems 1-3. WaveNet uses a special type of convolutional layer called extended causal convolution. Using an exponentially increasing expansion rate, WaveNet can capture patterns over very long time scales. This allows it to model long-term dependencies in data without sacrificing computational efficiency. According to Lim and Zohren (2020), modern architectures frequently use dilated covolutional layers, which extend casual convolutional filter as below:

$$(W * h)(l, t, d_l) = \sum_{\tau=0}^{k/d_l} W(l, \tau) h_{t-d_l\tau}^{l} \tag{17}$$

where h_t^k is an intermediate state at layer *l* at time *t*, $*$ is the convolution operator, *W(l, τ)* is a fixed filter weight at layer *l*, d_l is a layer-specific dilation rate.

Dilated convolutions can be interpreted as convolutions of a down-sampled version of the lower layer features, reducing resolution to incorporate information from the distant past. By increasing the dilation rate with each layer, dilated convolutions can gradually aggregate information at different time blocks, allowing for more history to be used in an efficient manner. With the WaveNet architecture, dilation rates are increase with adjacent time blocks aggregated in each layer, allowing time steps.

Another approach is to use multi-scale convolutions with multiple convolution kernels of different sizes. It can be useful to find patterns at different scales. This can be done with parallel branches on the network, where each branch has a different core size.

Problem 4 is that overfitting can be possible if the model learns the noise in the training data rather than the true patterns. Mathematically, it can be represented by the large difference between training error (the loss function evaluated on the training data) and validation error (the loss function evaluated on the validation data):

$$E_{train}(w) \ll E_{validation}(w) \tag{18}$$

According to Goodfellow et al. (2016), we can try the following approaches to solve this problem.

Dropout: This means randomly dropping out (setting to zero) some of the output layer during training, which helps prevent the ANN from becoming overly dependent on any single feature.

Data Augmentation: This means generating new training data through transformation to the existing data (in the case of time series: time shifting, scaling, and rotation to the existing data). It can helps to increase the size and diversity of the training set. Time shifting includes shifting the time series forward or backward in time by a certain amount, which creates new instances of the time series with different starting points. Scaling involves multiplying the time series by a scaling factor, which changes the amplitude of the signal. Rotation involves applying a linear transformation to the time series data, which can change the direction or shape of the data. These transformations can help to increase the size and diversity of the training set, which can be able to improve the generalization performance of the CNN.

Early Stopping: This technique involves monitoring the performance of the network on a validation set during training and stopping the training process early if the performance on the validation set stops improving. Validation loss is evaluated after each training epoch. The stopping criterion can be based on the threshold or tracking the loss of validation on a fixed number of epochs.

Regularization: This means adding a penalty term to the loss function during training, which helps to prevent the network from learning over complicated models that are more likely to overfitting. The modified loss function is given by:

$$L(w) = \frac{1}{N}\sum_{i=1}^{N} \mathcal{L}\big(y_i, f(x_i; w)\big) + \Lambda \|w\|_2^2 \tag{19}$$

where N is the number of samples in the training set, L is the loss function, y_i is the ground truth label for the i-th sample, $x_i; w$ is the predicted label for the i-th sample, $x_i; w$ is the vector of weights in the network, $\|w\|_2^2$ is the L2-norm of the weight vector, and $\mathcal{L}$ is the regularization strength.

4.2 The experiments with hybrid networks and hyperparameters

During the experiment, forecasting was evaluated based on the RMSE and MAE metrics of the LSTM and CNN models with 2D convolution. The best results were shown by the LSTM model with RMSE = 7.948132684550487 and MAE = 4.603387983932711. The image prediction results for Figure 3b are presented.

The baseline CNN prediction results are displayed in Table 1 as indicators of the base models. High metrics reflect unsatisfactory forecast results.

The use of the hybrid ConvLSTM model demonstrated a decrease in the indicators of the base models with RMSE decreased by 12% and MAE by 16%, respectively, according to Table 2.

Following the conclusions in section 4.1, during the experiment, the number of filters in the convolution layers was added as hyperparameters to the basic CNN model with values of 20, 5, and 3, respectively. The dropout was removed, and the Softmax activator was applied to the Convolutional layers. This led to an improvement

in forecasting performance compared to the base model. The appropriate number of filters and disabling dropout proved to be the most efficient, as shown in Table 1. A certain number of CNN filters allowed the models to learn optimal complex features to improve accuracy and prevent overfitting. The absence of a dropout layer in the model could be due to the loss of important functions necessary for more accurate forecasts.

Different numbers of epochs, number of filters and kernel size, added layers, Learning rate of 0.001, and Early stopping were applied as hyperparameters to ConvLSTM. Certain configurations of the number of filters, kernel size, and early stopping turned out to be the most effective hyperparameters for these models, as shown in Table 2.

A certain number of ConvLSTM filters allowed the models to learn the optimal complex features in the data to improve accuracy. An appropriate kernel size allowed the ConvLSTM models to determine the receptive field of the convolutional layer and detect patterns in the input data. Early stopping detected when the model stopped improving and stopped the training process to prevent accuracy degradation.

By using a hybrid approach and appropriate hyperparameter settings, it was possible to almost halve the values of loss metrics.

4.3 Direction for further research

Further improvements of these approaches, as well as solutions such as the use of a 1D model with sliding convolutional kernels and the testing of WaveNet, will be considered and presented in subsequent papers.

In the future, experiments need to apply the integration of other important information, such as economic indicators or sentiment analysis data. We will also explore multi-step forecasting techniques and transfer learning approaches, in which a pre-trained CNN is fine-tuned for a specific economic time series forecasting problem. Additionally, we aim to develop more interpretable CNNs for time series forecasting to further enhance their accuracy.

5 Conclusion

From the perspective of a researcher in ANNs, forecasting economic time series using CNNs presents both an opportunities and challenges.

One advantage of CNNs is their ability to extract useful features from the raw economic data by applying convolutional filters, which can help to capture important patterns and relationships that may not be apparent with statistical methods and other ANNs. Additionally, CNNs are able to process high-dimensional economic input data and data with irregular time intervals.

However, there are also some limitations to using CNNs for forecasting economic time series. CNNs assume that data points are independent of each other, but points in a time series often have a temporal dependency and order. This can be problematic for processing long-term dependencies, especially with large time lags between dependent variables. Additionally, some information may be lost because the fixed-size convolution kernel cannot properly handle the recognized patterns that are presented in different data time scales. CNNs may also suffer from overfitting if the model is too complicated or the training data is small.

These limitations can be addressed by using RNNs, hybrid formats like ConvLSTM, or 1D CNNs with convolutional kernels of different sizes to capture temporal dependencies between data points. Techniques such as extended convolutions, such as WaveNet, multi-scale convolutions, and regularization can be used to address overfitting and information loss. Additionally, integrating other relevant information, such as economic indicators or sentiment analysis data, multi-step forecasting, and transfer learning to time series forecasting, where a pre-trained CNN is fine-tuned for a specific time series forecasting problem, can also help to overcome these limitations. Developing interpretable CNNs can also improve the forecasting accuracy of CNNs.

Overall, while there are some limitations to using CNNs for forecasting economic time series, the advantages outweigh the challenges. In fact, recent research has demonstrated the powerful potential of CNNs in increasing the accuracy of forecasting economic time series.

Table 1. The results of Conv2D models prediction

Indicators / Metrics	*RMSE*	*MAE*
Indicators basic model	86.46146286170344	71.4449541211425
Descriptions of changes (DCh)	Added 1 convolution layer	
Indicators with changes(ImCh)	83.94134726706228	62.05541110604879
DCh	Added 2 convolution layers	
ImCh	67.23601443341896	56.0166828907943
DCh	Added 3 convolution layers	
ImCh	79.1030990020852	55.014714181372526
DCh	Number filters 20,5,3	
ImCh	46.967285502298914	42.418816558526395
DCh	Without Dropout	
ImCh	43.84165095674403	37.26498005911165
DCh	Convolutional layers activator Softmax	
ImCh	86.49818960386088	71.41118329734464

Table 2. ConvLSTM2D models prediction

Indicators / Metrics	*RMSE*	*MAE*
Indicators basic model	74.08214241184652	55.68227454619636
Descriptions of changes (DCh)	Number epochs 4, kernel size 8x8	
Indicators with changes(ImCh)	51.14067368829464	40.55694866678691
DCh	Added 1 ConvLSTM layers, number filters 45,30,15	
ImCh	62.073340399337816	41.33865243583884
DCh	Number filters 15 for all	
ImCh	70.24679703851665	50.721268030000495
DCh	Number filters 20, 5, 3, kernel size 5x5	
ImCh	54.76692921416348	39.57454775376341
DCh	Kernel size 3x3	
ImCh	53.60355684400685	39.32991130122005
DCh	Learning Rate 0.001	
ImCh	72.3220489784212	53.745122953405286
	Early Stopping	
	53.870111918655255	41.062400551702844

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COVID-19 Crisis and the Labour Market in the Czech Republic – The Recovery

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Abstract
I focus on the assessment of the COVID-19 pandemic effects on the labour market in the Czech Republic. The structural indicators of the labour market over the years 2020-2021 are observed and the persistence of these effects with the data already available for 2022 is evaluated. An important part of the study is a review of studies concerned with labour markets abroad, especially in the European context.
Throughout the pandemic in the Czech Republic, the unemployment rate has risen over the long-term average but still reached its highest point at only modest 3.4% at the height of the epidemic, which is predominantly thanks to the extensive government spending policies to compensate for both drop in demand and the restrictions, it recovered by the start of 2022. The employment rate dropped below the long-term average but recovered to the pre-crisis levels in 2022. In absolute numbers the number of people actually working has dropped by more than 100,000 between the end 2019 and the end 2020 but recovered by the end of 2021. After that another drop which can be already attributed to other factors can be seen. I document that the employment effects have been highly heterogenous in terms of area of work and some of the changes will be permanent. There was a delayed drop in the self-employment rate.
In terms of long-term effects both the unemployment and employment rate as well as some structural indicators returned to the long-term average in 2022 but the self-employment in some segments particularly did not recover since. The analysis of the permanency of some of the more subtle effects with longer recovery periods is difficult due to the coincidence of the newly emerging energy crisis onset and the COVID-19 recovery period in 2022.

Keywords
Crisis recovery, COVID-19, Employment, Unemployment

JEL Classification
J2, J4, J6

1 Introduction

During the COVID-19 pandemic crisis, which struck the world in the years 2020 and 2021, the economies of the world were subject to a complex set of changes including the direct effect on labour force availability through illness, the limits on production due to hygiene related restrictions and change in demand structure due to the behavioural changes in the society. These direct effects were also multiplied through the change of supply chains. All these changes induced an adaptation in labour market structure which I try to elaborate on below focusing on the case of the Czech Republic with the benefit of a short hindsight already. As the main focus is structural change, the text deals with employment and omits the question of income development here for brevity reasons.

The goal of this paper is to provide a general overview which will serve as a basis for further elaboration of more specialized aspects of the analysis. Therefore, the approach is descriptive. The paper summarizes the labour market developments in the Czech Republic during the COVID-19 pandemic in the European context, particularly with respect to employment structure and unemployment. A summary review of broader publications is presented first, then I present the employment changes in the basic NACE structure in the Czech Republic, then the unemployment statistics and lastly the interesting and persisting drop in self-employment rate. Upon concluding areas for evaluation and deeper analysis are identified.

2 Literature Review

Firstly, I mention some literature concerning the situation internationally. There has been some extensive statistical coverage of the epidemic, mostly descriptive in the earliest studies with some more complex analysis with the benefit of a hindsight.

At least in terms of short-term impact, there is likely a significant difference of impact between highly formalized labour markets of Europe or OECD and more informal economies of the developing countries. (ILO 2022) covers the development of informality in selected highly informal markets and shows that the impact was much higher in the informal sector. There is a general publication by the World Bank (World Bank 2022) focusing on long term effects of the crisis on Latin-American countries. An interesting finding is a shift from standard employment towards self-employment, from large firms to micro-firms. Interestingly this is the opposite to what can be seen in highly formalized market of the Czech Republic (as shown below). The study also points out the missed education of young people who had to enter the labour force prematurely, before finishing the education which is also an effect unique to the emerging markets and developing world. An example of a highly informal market of a developing country is documented in (Morales et al. 2022) describing the case of Columbia. They calculate the direct influence of the pandemic itself constituting about ¼ of the effect on employment drop in their D-D model, the influence of the restrictions constituting about ¼ attributing the rest to the general economic decline. (Ohnsorge, Yu, and Kose 2022) point out that the informal sector tends to recover at a slower pace and without special measures might slow down the recovery.

The informal dimension is an important one, however, the Czech Republic and the EU in general are characterized by relatively small informal sectors which also allows governments an easier intervention. The more formalized markets of OECD countries are covered by the OECD employment outlook (OECD 2021b). The most significant characteristic is the disproportionate impact on segments of the labour market and also the risk of a long-term unemployment growth, which is what I also address below on Czech data. They also point out the drop in job quality and rise in domestic outsourcing. The descriptive statistics for EU markets, which is regularly covered by Eurostat, (Eurostat 2022b), notes a general increase in unemployment. They also construct a new measure called the work slack. Both these indicators show an increase starting on average in 1Q-2020 and recovering by 4Q-2022. The international data thus show a strong pattern of mostly temporary effect of the COVID-19 related adjustments of major aggregates. The self-employed are being hit the hardest in the drop in working hours (Eurostat 2022a). In terms of the US Economy (Forsythe et al. 2022) documents the drop in employment rate and the "shift from customer facing jobs" which persist.

The very disproportionate impact is also repeatedly shown in different smaller scale studies. (Borjas and Cassidy 2020) document the disproportionately high impact of COVID related restrictions on immigrant workers in the US in 2020. The possible reason is the concentration of these immigrant workers in less "remotable" occupations. They use the rate of job loss as the measurement. (Cortes and Forsythe 2020) conclude a large analysis confirming the heterogenous impact of the pandemic on different subgroups in the US. Particularly hit were the groups generally disadvantaged even before the pandemic - the young workers and minorities. (Han and Hart 2021) use early data from spring 2020 and point out that the largest impact is on the already precariously employed groups who are much more likely to lose employment and income during the crisis.

The meta-study of (Vyas 2022) divides the effects of the pandemic on the world of labour into 3 categories – The acceleration of trends existing before the pandemic, normalization of some rare practices and lastly new practices remodelling the work arrangements. The difference between white-collar workers and blue-collar workers is also identified, with white collar workers having the better adaptation opportunities. The study identifies some major trends, some of which are the continuation or acceleration of processes happening even before the pandemic:

- Accelerated digital transformation.
- Emergence of hybrid work
- Changes in organizational infrastructure and labour mobility
- The challenges related to remote working management and consequently the tendency towards more individualistic rather than team-based approach to work

- Potential exacerbation of existing inequalities because of the different ability to adapt and the already vulnerable worker groups and jobs being hit very hard by the pandemic
- Managing work–life balance which shows new challenges and opportunities with the spread of hybrid work

These findings are reiterated in the literature in other places.

The policy measures per se are not our primary concern here but it's worth mentioning that a comprehensive work has been done during 2020 with (Eichhorst et al. 2020) and (Eichhorst et al. 2021). The topic is also covered in (OECD 2021a) and there is also a comprehensive catalogue of the COVID-19 compensation measures compiled by the IMF(IMF 2021). (Thomas Hale et al. 2021) provide a comprehensive quantitative measurement of the related policy response in a form which is usable in quantitative models. A division between the formal developed world and the more informal developing world is seen in a comprehensive catalogue of measures in (Gentilini et al. 2022) which contains general survey of the social protection and labour measures and some aggregate statistics on global scale. The countries started implementing measures in 2020, particularly before the end of May, the biggest surge of new social protection and labour measures were implemented in the period of January – May 2021. While the activity is already much less dramatic later in 2021. In my interpretation this empirical observation of course reflects the seriousness of the epidemic but also reflects the ability of states to react massively only with some delay. For the "Second season" i.e. winter 2020/2021 the governments were already prepared and therefore much more active while of course the "first season" of winter and spring 2020 caught everyone by surprise and only some governments reacted immediately. Most of the measures recorded were in the category of social assistance. They stratify the countries by informality level showing also that the countries with more formalized labour markets also implemented more measures like cash transfers, unemployment benefits and wage subsidies while the less formalized countries more often used tools like public works. The comprehensive survey also contains a chapter on the Czech Republic (page 279), covering 2020 and 2021.

An interesting analysis of measures is in (Lafuente and Ruland 2022) which analyses the impact of Short-time work schemes with the focus on the five largest economies in the EU in the first phase of the pandemic in 2020. The short-term compensation schemes worked well to protect the jobs of permanent workers, but the temporary jobs were protected to a much smaller extent. They also observe large temporary drops from labour market participation due to people postponing their job search during the pandemic.

Apart from this general analysis there are of course numerous studies catching the situation in particular countries at different points of time. An interesting example of micro approach is offered in a case study (Gibbs, Mengel, and Siemroth 2021), focusing on the productivity development in an Asian IT company. They conclude that in their case the productivity during the pandemic dropped significantly by 20% which they attribute to increased coordination and communication costs. This was however offset by longer hours worked. It is important to note that longer hours worked is not what is observed in the standard LFS statistics, but I hypothesize that such effects as unpaid overtime while on home-office is one of the things which would be easily missed by the standard surveys.

The Czech Republic is partially covered in some of the comprehensive studies mentioned above. Below I mention some of the sources dealing specifically with different aspects of the Czech Republic case.

(Jurajda and Dolezelova 2021) elaborate on the short-term work subsidy during the "first pandemic wave" in the Czech Republic in 2020 based on the structure of earnings survey. They conclude that the subsidy scheme was utilized more by firms from the manufacturing segment and that given the trends possibly some of the compensation was used for the wage bills declining already before the COVID-19 crisis. They hypothesise the larger proportion of manufacturing might be due to larger employee training costs in the industry or better skill at using the subsidies by the management. I would add to that hypothesis that also the manufacturing industry is a significant pillar of the economy and thus very likely the conditions of the support were tailor made for the industry in the first place.

A larger summary of descriptive measures from different institutions has been presented in 10/2022 at Prague University of Business and Economics (CZSO, Trexima, RILSA, PUEB). It included an employment analysis but only for the first wave of the pandemic in the Czech Republic that is in 2020. They conclude that labour productivity hit was higher than the drop in employment measured in persons, that is likely to the drop in hours

worked for people who retained their employment status. They also talk about the disproportionate impact on particular market segments (like of course the hospitality industry being hit very hard while the health and nursing segment actually growing).(Mazouch 2022)

Apart from the traditional sources of information like the statistics of registered unemployment and the Labour force survey(LFS), another interesting source of data covering the period of 3/2020-2/2021 monthly is the survey "Život během pandemie" (PAQ research 2021)publishing data on the level of labour adjustment by area of work and pre-pandemic work status. The survey sample is representative and the high frequency of questioning during the height of the pandemic period makes it a unique source. The data structure and categories used are not corresponding to the more traditional structures like NACE or OSCE though. From the employment perspective the major finding is the confirmation of the very heterogenous impact the pandemic and related policy measures had on the population especially in relation to the status in employment. The self-employed contractors (not completely in line with the standard self-employment definition) were much more at risk of having their workload reduced without compensation compared to the standard formal full-time employees during the pandemic. The part-time employed and informally employed were also compensated for loss of work in much smaller proportion. These observations are fully in line with the situation observed within the informal sector in other countries.

Apart from the ones mentioned above there have been studies published already during the first phase of the pandemic in 2020 but I omit those here with the focus being the recovery and long-term effects.

The pandemic effects on labour markets were registered throughout the world and the literature documents and analyses cases from different environments which present idiosyncrasies. However, there are some things which can be concluded generally:

- There was a mostly temporary outflow from the labour force during the pandemic. Although the impact was severe, the whole episode was indeed short enough to prevent major long-lasting effects on employment numbers. There seems to be recovery (more on the timing of that in the analytical part). Large part of the effect in countries with developed formal labour markets happened due to lower hours worked with the workers retaining the jobs.
- One of the divisions in COVID-19 impact is formality. The informal markets seem to be hit harder than formal ones. The formal market allows for faster state intervention and mitigation of the shock.
- The larger proportion of white-collar workers with "remotable" jobs also meant smaller impact.
- Some of the important and possibly permanent changes are qualitative rather than quantitative. Some of these effects will be permanent, including the acceleration of pre-existing trends such as digital transformation, some are new but may persist in limited scale as the massive adoption of remote work.

3 The labour market data

To present the speed of the recovery and show some of the notable employment effects persistence, I use the Labour force Survey data as presented by Eurostat (downloaded 1/2023) which are published quarterly. This dataset allows to assess the employment recovery speeds of different segments of the labour market both in the Czech Republic and on the EU level. For the purpose of this exercise, I generally take just a short snapshot of 1Q/2020 – 1Q/2022, taking the 1Q/2020 as a basis. This is sufficient for an overview and apart from a noted exception doesn't create a major bias. A more sophisticated time-series analysis including seasonality and long-term trends for the different segments would need to be used in the following model based on panel data. That is not part of this publication though.

For the statistics of total employment and unemployment I also use some more detailed data from the same survey concerning Czech Republic from the Czech statistical office. The NACE division is used in aggregated form because of ease of comparison, brevity and recent quarterly data availability – the expectedly hardest hit segments are then contained in the G-I "Wholesale and retail trade, transport, accommodation and food services".

It would be very interesting to go into more detail within those broad categories and also compare the EU countries in bigger detail beyond the total average, but such an analysis would certainly not be feasible within

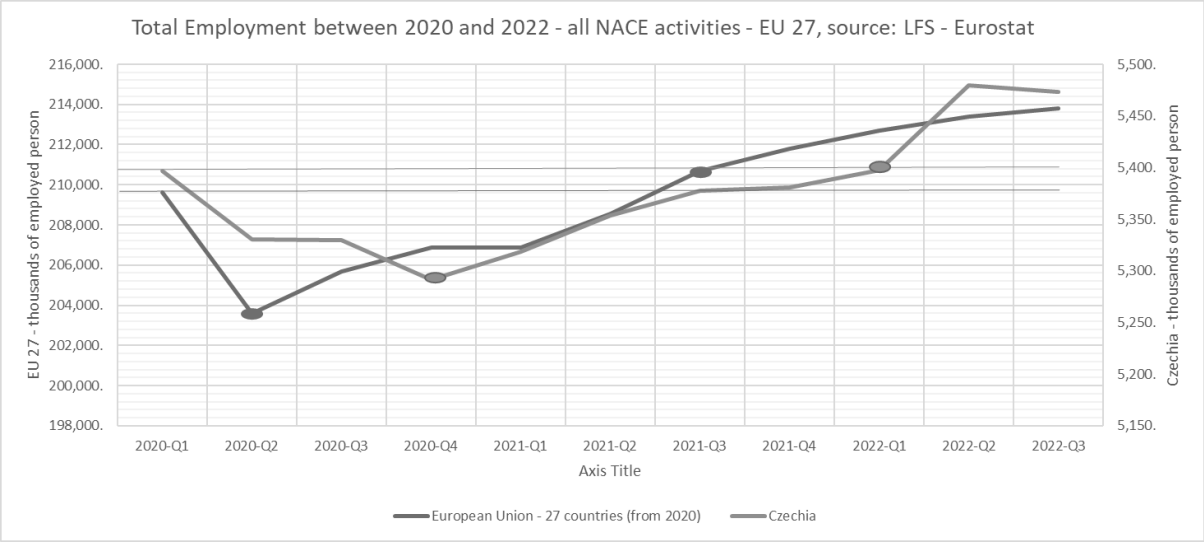
the short format of this contribution. Thus, with the focus on providing solid overview of the Czech Republic, I work only with the total EU data to provide the necessary basic context and the general NACE categories here.

4 Empirical Results

4.1 The employment recovery in the Czech Republic in the context of EU countries

As seen in Figure 7, the total employment within the 27 European countries recorded a significant slump in the first quarter of 2020 but has seen a full recovery since, overcoming the starting value of 2020 in the Q3 of 2021 already - i.e., 5 quarters later. On top of that the number of employed persons grew steadily even in 2022 likely being helped by the influx of work ready refugees from war-stricken Ukraine. Therefore, I can say there was no long-term effect of the pandemic on the number of employed personnel in the EU.

Figure 7 - Total employment during the COVID-19 crisis in the EU and in the Czech Republic



Source: Eurostat – LFS downloaded 1/2023, own processing

The situation in the Czech Republic was more dynamic. This is however the case for many countries as the average in the EU generally allows for compensation of effects between its constituting parts which experienced the height of the pandemic with different time delays. The Czech Republic is specific in being hit by the most significant drop in employment only in the Q4 of 2020, which is later than average and overcoming the pre-pandemic employment only in Q1-2022, i.e. 5 quarters after the biggest slump as well. Czech Republic was then particularly strongly influenced by the influx of refugees from Ukraine who spiked the employment numbers in Q2-2022 and the current employment numbers are thus higher than before the pandemic. So, in total numbers the Czech Republic has fully recovered to pre-pandemic levels, only with a delay corresponding to the local delay of the epidemic.

Below I show the situation divided by NACE categories. The basic structure is used but from the pandemic point of view it is important to watch in particular the category G-I :Wholesale and retail trade, transport, accommodation and food services, which contains the segments hit hardest by both the behavioural changes and by the pandemic fighting restrictions.

Table 4 - the biggest drop in employment by NACE category, EU27 and the Czech Republic between q1-2020 and q1-2022

	Biggest drop over the Q1/2020-Q1/2022 period		Difference	Biggest drop quarter		Difference in Q
	EU27	Czechia		EU27	Czechia	
Total - all NACE activities	2.88%	1.95%	-0.93%	2020-Q2	2020-Q4	2
Agriculture, forestry and fishing	1.96%	0.00%	-1.96%	2021-Q4	2020-Q1	NA
Industry (except construction)	2.49%	2.33%	-0.16%	2020-Q3	2020-Q4	1
Manufacturing	2.79%	2.39%	-0.40%	2020-Q3	2020-Q4	1
Construction	1.83%	2.21%	0.39%	2020-Q2	2020-Q2	0
Wholesale and retail trade, transport, accommodation and	5.24%	4.99%	-0.25%	2020-Q2	2020-Q4	2
Information and communication	0.32%	1.64%	1.32%	2020-Q2	2020-Q2	0
Financial and insurance activities	1.98%	9.84%	7.85%	2020-Q2	2021-Q3	5
Real estate activities	1.57%	2.77%	1.20%	2020-Q2	2020-Q3	1
Professional, scientific and technical activities; administrativ	4.55%	3.10%	-1.45%	2020-Q2	2020-Q3	1
Public administration, defence, education, human health ar	0.72%	0.20%	-0.52%	2020-Q2	2020-Q2	0
Arts, entertainment and recreation; other service activities;	4.88%	3.51%	-1.37%	2020-Q2	2020-Q2	0

Source: LFS-Eurostat 1/2023, own calculation

Table 4 shows the heterogeneity of impact in different categories, using the NACE classification. The overall highest drop was slightly lower in Czechia than the EU27 average but there are significant differences across segments.

On the EU27 level we´ve seen the biggest drop in employment expectedly in 'Wholesale and retail trade, transport, accommodation and food service activities'- 5.24%, 'Professional, scientific and technical activities; administrative and support service activities' -4.55%, and 'Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies' – 4.88%, all three reaching the lowest value in q2-2020.

Then notably the same three segments were also the hardest hit with the 'wholesale and retail trade…' being the worse at 4.99%. However, the timing is different with 'Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies' reaching the low in q2-2020, same as the EU27 average, but the other two major segments following only in q3 and q4. The very important and significant 'Industry' and 'Manufacturing' segments were also hit with the biggest drop in q4 which is one quarter later than the eu27 average. For the Czech Republic I have to exclude the significant drop of 'financial and insurance activities' segment, as the development is not linked to the COVID-19 crisis, it seems to be a trend starting before the pandemic.

Table 5 - the employment decline and recovery by NACE segments, EU 27 and the Czech Republic

		2020-Q1	2020-Q2	2020-Q3	2020-Q4	2021-Q1	2021-Q2	2021-Q3	2021-Q4	2022-Q1
European Union - 27 countries (from 2020)	Total - all NACE activities	100.00%	97.12%	98.12%	98.68%	98.69%	99.47%	100.49%	101.03%	101.45%
	Agriculture, forestry and fishing	100.00%	98.32%	98.59%	99.26%	99.69%	99.06%	98.40%	98.04%	98.26%
	Industry (except construction)	100.00%	98.17%	97.51%	97.63%	97.58%	97.94%	98.22%	98.52%	98.86%
	Manufacturing	100.00%	97.99%	97.21%	97.44%	97.33%	97.78%	97.94%	98.33%	98.63%
	Construction	100.00%	98.17%	100.01%	100.54%	101.35%	102.70%	103.13%	103.62%	105.17%
	Wholesale and retail trade, transport, accommodation and food service activities	100.00%	94.76%	96.34%	96.53%	95.66%	96.71%	99.04%	99.81%	100.04%
	Information and communication	100.00%	99.68%	101.22%	102.21%	103.45%	105.10%	106.94%	108.69%	108.91%
	Financial and insurance activities	100.00%	98.02%	99.13%	99.51%	99.10%	99.07%	99.95%	99.74%	99.43%
	Real estate activities	100.00%	98.43%	100.56%	101.31%	100.34%	101.54%	102.10%	103.32%	105.20%
	Professional, scientific and technical activities; administrative and support service activities	100.00%	95.45%	96.73%	98.21%	98.64%	99.69%	101.05%	102.02%	102.72%
	Public administration, defence, education, human health and social work activities	100.00%	99.28%	100.12%	100.97%	101.57%	102.17%	102.48%	102.84%	103.20%
	Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies	100.00%	95.12%	97.34%	97.21%	96.42%	97.71%	99.00%	99.34%	99.50%
		2020-Q1	2020-Q2	2020-Q3	2020-Q4	2021-Q1	2021-Q2	2021-Q3	2021-Q4	2022-Q1
Czechia	Total - all NACE activities	100.00%	98.78%	98.75%	98.05%	98.56%	99.20%	99.64%	99.70%	100.01%
	Agriculture, forestry and fishing	100.00%	101.36%	102.36%	101.49%	101.40%	100.28%	100.23%	100.85%	100.64%
	Industry (except construction)	100.00%	99.30%	98.61%	97.67%	98.42%	99.21%	99.23%	98.74%	98.54%
	Manufacturing	100.00%	99.00%	98.48%	97.61%	98.14%	98.74%	99.16%	98.77%	98.41%
	Construction	100.00%	97.79%	99.86%	99.97%	99.22%	99.60%	99.46%	100.83%	102.63%
	Wholesale and retail trade, transport, accommodation and food service activities	100.00%	97.95%	97.54%	95.01%	96.35%	97.27%	98.56%	98.09%	98.21%
	Information and communication	100.00%	98.36%	100.68%	102.78%	102.33%	102.36%	103.78%	103.80%	105.93%
	Financial and insurance activities	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Real estate activities	100.00%	98.26%	97.23%	97.30%	100.67%	102.11%	103.93%	106.99%	105.07%
	Professional, scientific and technical activities; administrative and support service activities	100.00%	98.18%	96.90%	98.02%	97.88%	99.13%	99.03%	98.96%	98.76%
	Public administration, defence, education, human health and social work activities	100.00%	99.80%	100.39%	100.61%	101.00%	101.39%	101.98%	102.47%	103.24%
	Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies	100.00%	96.49%	97.46%	97.29%	98.34%	98.26%	97.98%	98.96%	100.35%

Source: LFS-Eurostat 1/2023, own calculation

Table 5 shows the number of employed persons as a percentage of the last pre-pandemic Q1/2020. Looking at a more detailed picture split by the NACE categories, a couple of similarities but also differences between the average EU development and the Czech Republic can be seen. In the 3 most significantly hit categories there actually are two peaks on the European level – at the beginning in Q2/2020 and then again in Q1/2021 while in the Czech Republic the peak in Q4/2020 is clearly dominant. That corresponds with the development of the epidemic itself. On the other hand, we can see in both cases there is a strong and fast recovery in 'Information and communication', and 'Public administration, defence, education, human health and social work activities' while the 'Wholesale and retail…' segment recovers much more slowly and in the Czech Republic and recovered only in Q2/2022. Interestingly the 'Arts, entertainment and recreation…'segment follows the general European early peak pattern with a recovery happening actually earlier than on the EU average (although the difference in Q1/2022 is negligibly smaller than 1p.p.). These different patterns may actually be utilized in a distinction between the effects caused by the pandemic itself (the cases surged only in Q4/2020) and the preventative measures (happening already in Q1-Q2/2020) combined with international effects in a more detailed analysis.

4.2 The unemployment

An interesting observation is that unlike the financial crisis of 2009, the COVID-19 crisis did not mean a massive influx of new unemployed.

Table 6 - Unemployed share by length of unemployment

Unemployed share by length of unemployment	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
upto 3 months	25.05%	25.13%	28.56%	30.93%	35.24%	41.55%	43.62%	31.72%	31.50%	35.01%
3-6 months	16.95%	15.31%	15.53%	16.18%	16.48%	18.17%	20.48%	22.26%	18.08%	21.83%
6-9 months	9.49%	8.70%	8.36%	8.99%	8.65%	8.70%	9.26%	12.77%	9.37%	9.32%
9-12 months	8.81%	7.09%	6.16%	6.10%	5.94%	5.44%	5.83%	9.69%	7.68%	6.49%
12-24 months	17.79%	16.73%	12.85%	11.87%	10.37%	8.47%	8.41%	13.30%	17.42%	10.78%
more than 24 months	21.92%	27.03%	28.54%	25.94%	23.31%	17.67%	12.39%	10.25%	15.94%	16.56%

Source: CZSO 1/2023, own processing

The rate of unemployment has risen but only marginally and that is mostly due the fact that less people are reabsorbed back to the market. The proportion of newly unemployed out of all unemployed has actually gone down in 2020(Table 6). The proportion of the frictional short-term unemployed went down by approximately 12 p.p. in 2020. The market did not crash but rather stalled as a result of uncertainty. In 2022, the people losing the job in past 12-24 months, i.e. during the pandemic, didn't constitute an extraordinary proportion of the unemployed people. The consequence of this is that on one hand the unemployment problem did not manifest itself and didn't even catch the public attention. However, the structure of the unemployed has still changed significantly in favour of the long-term unemployed – as shown in Table 6, which goes against the long-term trend and can be attributed to COVID-19 crisis. Because the long term unemployed generally have worse chances of reintegration into the labour market, this could pose a significant challenge in the future and constitute a true more long-term consequence of the pandemic.

Compared with a standard economic shock, COVID-19 crises didn't become a firing market but pretty much non-hiring market which is both due to job subsidies and the general expectations that the situation is indeed temporary.

4.3 The self-employment

In the own account workers segment an interesting pattern can be observed in the Czech Republic. It differs from the general employment trend. The long-term proportion of the self-employed on total employment is shown in Figure 8.

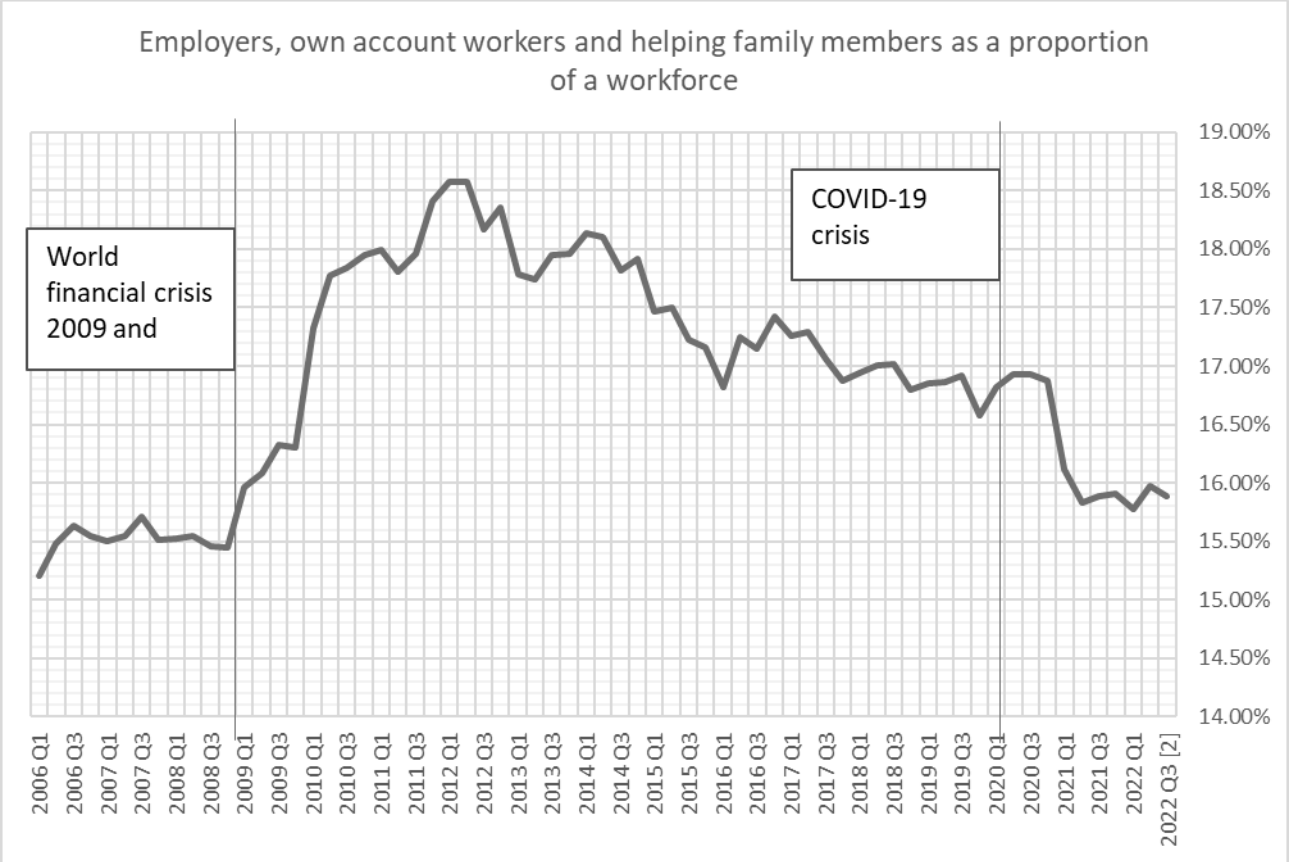
First, at the beginning of the pandemic in 2020 there is a stable period in the number of self-employed people registered in the LFS. I hypothesise that this development is a result of two effects in different directions working with a delay. The drop in self-employment in 2021 is caused by a proportion of the self-employed closing their businesses due to financial exhaustion or generally not deeming them as perspective. However, this would happen only with a delay after the pandemic has already been affecting the businesses for a long time to deplete the reserves in both capital and entrepreneurial enthusiasm. This is corroborated by the EU level statistics of the hours worked being reduced the most for the self-employed(Eurostat 2022a). On the other hand, there might have been some influx of people being laid off and especially hired only on contract by the firms uncertain about the future. This would be an effect consistent with what we have seen in the 2009 financial crisis aftermath.

Theoretically there may also be some people speculating the government compensations might be accessible in that status throughout the pandemic but that's less likely due to the unpredictability of the situation at the time. Also, the deference of compulsory insurance contributions otherwise paid on monthly basis probably postponed some of the business closures. A deference of the revenue registration legislation scheduled to start in May 2020 was another potentially stimulating factor. All of these self-employment stimulating effects would happen without a long delay after the start of the pandemic potentially offsetting the push in the opposite direction by the immediate business closures. Since Q1/2021 we see a consistent drop in the number of employers among the self-employed and that trend continues through 2022 – this group has never recovered.

The number of helping family members is rising steeply at the beginning of the pandemic then falling even more in 2021. That would be a result of some of the people losing their jobs finding refuge in the family business in the meantime and in 2021 either returning to regular activities or even the business being abandoned altogether.

The development within the self-employment segment is more indicative of what is associated with the informal sector, as commented on by the literature above. A general interpretation of the development could also be that while in a general demand crisis, the unemployment threat, the new opportunities and demand for flexibility will drive the self-employment levels up, in the presence of massive formal employment subsidies and restrictions on business, the rate will drop in favour of standard employment.

Figure 8 - The employers, own account workers and helping family members as a proportion of the work force



Source: LFS - Czech statistical office 1/2023, own processing

Table 7 shows the hardest hit sectors by NACE classification available for self-employed. Compared to standard employment we see not only more significant drops but also the fact that none of these sectors fully recovered by start of q1/2022. In fact, none of the segments recovered by q3/2022, which is the latest data available at date of publication.

Table 7 – The hardest hit sectors by employment in self-employment category in the Czech republic

NACE	biggest drop	lowest when	percentage of recovery in q1/2022
Accommodation and food service activities	26.20%	2021-Q2	77.32%
Arts, entertainment and recreation	7.83%	2021-Q2	98.16%
Education	14.04%	2022-Q1	85.96%
Transportation and storage	7.45%	2022-Q1	92.55%
Wholesale and retail trade; repair of motor vehicles and motorcycles	22.09%	2021-Q2	86.09%

Source: LFS - Czech statistical office 1/2023, own processing

The comparison of the development in this category within the EU is more difficult as there is a bigger heterogeneity than between the standard employment job markets so the usage of total average would be too misleading. What applies generally is the delay in the drop in self-employment behind the more swiftly reacting standard employment. For the sake of brevity of this contribution, I leave this specialized topic along with more detailed statistics on the recovery within the segment for a dedicated text.

5 Conclusion

Even though the COVID-19 pandemic hit almost all the countries in the world in a historically short time span of 2 years the impact it had on the labour markets were very different. The major distinction is between the developed countries with highly formalized labour markets and the developing world where informal forms of employment play a more substantial role making it harder for the governments to compensate the impacts efficiently with their already smaller budgets for the compensations in the first place. The informal sector generally was hit the hardest.

The review has shown some significant impacts of the COVID-19 pandemic in the European countries in 2020 and 2021. Due to large scale labour market policies, both passive like in self-employed income compensation and more active such as the short-term work scheme a.k.a. “kurzarbeit”, the impact didn’t present itself in unemployment. A deterioration in labour market mobility is suspected due to lower flow between temporary and permanent jobs. These main effects seem to be mostly temporary.

Looking at the case of the Czech Republic in more detail we can see that the general effects were very similar to what can be observed on the European level. The industrial structure of employment has changed and some of the changes corresponding with pre-pandemic trends will be permanent. The unemployment data confirm the low dynamics of movement out of unemployment which meant a significant rise in the average length of unemployment during the crisis period as well as to the modest growth in the unemployment rate itself. Such an effect might have some lasting and permanent effects due to the nature of long-term unemployment. However, given the generally low absolute numbers of unemployed people in the Czech Republic, this will not cause a significant macroeconomic effect and will probably not justify a specific state policy on top of the standards already in place.

In terms of employment recovery, the question is not whether but rather when and in which structure. The approximate recovery of employment to pre-pandemic numbers happened 5 quarters since the lowest period. But the structure of employment post-pandemic is not the same as pre-pandemic. In terms of industry structure, the numbers show a much faster recovery and growth over the pre-pandemic numbers in employment in information services, in construction and also in real estate activities as well as in public administration. This has happened at the expense of wholesale and retail, professional activities, industry, and manufacturing. In the EU average, but not in the Czech Republic, there is also a small drop in agricultural employment.

Some notable non-recovered or permanent structural effects of the pandemic on the labour market of the Czech Republic:

- Change in industrial structure towards information services, realities, public administration, and construction.

- Growth of the proportion of long-term unemployed among the unemployed.
- Persisting drop in self-employment rate, particularly among the employers in the Czech Republic.
- The height of the crisis happened later than in most European countries, so the recovery also happens with a delay.
- The self-employed numbers were hit harder than the employed in the most vulnerable sectors and they did not recover.

This is a descriptive summary paper, and I see three areas of questions and opportunities for research:

Firstly, the structural changes can be addressed in more detail using detailed trend analysis and LFS microdata, particularly with the attention to informality and its role during this crisis. The self-employment segment and part-time work segments should be examined in detail. There is also the question of labour market demography which was skipped here.

Secondly, there is also room for estimation of the efficiency of the government spending on compensation programs in an international comparison. That could be done through estimations of worse case scenarios without any government compensation and using panel data analysis. This is also more linked to the income distribution changes during the pandemic, which was omitted here.

Thirdly the EU countries and the developments on their markets could be subjected to a cluster analysis trying to find some patterns in how certain types or groups of countries were hit, responded and recovered.

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I'd also like to thank the two reviewers for their comments, which I tried to reflect as much as the scope of this short format allows.

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Digital Marketing Activities Affecting Green Consumer Decisions of Generation Z: The Case of fashion Brand in the World

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Abstract
Green consumerism is a new trend that is gaining traction all around the world. Consumers of generation Z in all the world demanding more sustainability from luxury brands, especially if they sniff about the act of "Greenwashing", they will stop supporting immediately. Thus, demand of gen Z about sustainability fashion is very high and be coming trend of life.
However, due to inefficient execution of marketing, more specifically, digital marketing activities in most businesses, real sales of this product line are still fairly low. The goal of this study was to find out how digital marketing activities affecting green consumer decisions of generation Z: the case of fashion brand in the world. This research will use statistical analysis method to building a research model, building a linear function for the research model, using primary data collection techniques by distributing survey forms, then analyzing survey data with Cronbach's alpha, Exploratory Factor Analysis - EFA, correlation and regression by SPSS software. Then this research can analyze the relationship between digital marketing activities and green consumer decisions of generation Z when they choose sustainability fashion products of brands fashion in the world. Then suggest solutions to help fashion brands motivate green consumer decisions of generation Z.

Keywords
digital marketing, sustainability fashion, green consumer intention, green consumer decisions, gen Z.

JEL Classification: M310

1 Introduction

In recent decades of the twentieth century, people around the world have become more and more concerned about the environment, because of the continuous and accelerating depletion of natural resources (Niklas & Tommy, 1999). Consumers' recognition of the importance of caring for the environment in the context of civilization threats is reflected in the change of values, attitudes, the structure of needs, and the conditions and methods of satisfying them, as well as in transforming purchasing behavior (Lucyna & Wiesława, 2021). It means that the purchasing of any product or service at a comparable price can be a lower environmental effect while providing a similar function and displaying social responsibility and ethics. Green consumerism is a new trend that is gaining traction all around the world. Consumers of generation Z in all over the world demand more sustainability from luxury brands, especially if they sniff about the act of "Greenwashing", they will stop supporting immediately (Alice, 2020). Thus, the demand of gen Z for sustainable fashion is very high and becoming a trend of life. However, due to inefficient execution of marketing, more specifically, digital marketing activities in most businesses, real sales of this product line are still fairly low. The goal of this study was to find out how digital marketing activities affect green consumer decisions of generation Z: the case of a fashion brand in the world. This paper use mixed-methods includes qualitative research and quantitative research with the aim of constructing, testing models and hypotheses of the effect of the digital marketing activities affecting green consumer decisions of generation Z: The case of fashion brand in the world.

2 Literature Review

2.1 EWOM

A study by Jassim et al. (2020) showed that E-WOM was a a factor that controlled the relationship between content marketing and green purchasing intentions. As a result, this paper offers practical findings that companies in Jordan could boost customer intention to purchase green products, by achieving word of mouth.

Besides that, a study by Barween et al. (2020) showed that EWOM mediated the relationship between Email Marketing, Social Media and Consumer Buying Consumer. Pejman et al. (2021) showed that EWOM altered consumers' sustainable purchase behavior. The results indicated that an increase in Eco-friendly attitude positively increases the effect of word of mouth on consumers' sustainable purchase behavior. Yan and Shah (2018) also showed that EWOM altered Consumer Purchase Intentions in the Fast-Causal Restaurant. Rahim et al. (2016) showed that EWOM is critical when it comes to persuading consumer purchasing decisions related to green products. As a result, the current study puts forward the following hypothesis:

H1: EWOM has impact on Green Consumer Intention.

2.2 Email Marketing

E-mail marketing has a lot of advantages like; that you can adjust messages for diverse clients and offer promotions which are steady with their profile (Jenkins, 2009). E-mail marketing is a kind of direct marketing that utilizes e-mail as a means of communication or fund-promoting messages to link the viewers. In its broadest logic, e-mail marketing can be taken into account for every single e-mail sent to a probable or existing customer. (Barween el at. 2020). E-mail has a profoundly positive influence on consumer buying decisions in two phases (post-purchase and information research) and has a negative impact on consumer decisions in the purchase decision stage (Amira el at. 2020). The marketing research trends bring out the facilities used by the companies email for promoting and marketing their products and services could increase an incredible number of customers as it motivates their buying decisions and intentions towards these products and services (Tran and Strutton, 2020). As a result, the current study puts forward the following hypothesis:

H2: Email Marketing has impact on Green Consumer Intention.

2.3 Social Media

Bhandari el at. (2018) showed that social media marketing has a positive and significant impact on brand awareness proven by there is a positive correlation and significant relationship. APJII, 2020 showed that social media marketing can reach many customers at a low cost. Influencers in social media can have a significant impact on the brand. Dwiana (2021) showed that consumers have a purchase intention and make a purchase decision based on information on social media, and consumers, these social media to share the information with others. Barween el at. (2020) showed that the social media users are mainly prone to depend on the comments they receive from friends or family members. Becoming more informed by others who the consumers know them with lower doubt of reliability. This provides a better effective communication to gain a lot of information on a certain product or service over the social media channels. Kurniawati el at. (2021) showed that social media is a group of Internet-based applications that build on the ideal and technical foundation of Web 2.0 and enable the creation and exchange of user-generated content. It is considered one of the most important communication platforms for brand information. Its interactive skills enable participatory, collaborative, and knowledge-sharing activities to reach more information about the products. As a result, the current study puts forward the following hypothesis:

H3: Social Media has impact on Green Consumer Intention

2.4 Mass Media

Agenda-setting theory (McCombs and Shaw, 1972) proposes that media play a very critical role in influencing people's perception and in directing their thoughts towards a specific agenda or person. Fernado et al. (2014) used agenda-setting theory to understand the use of online media to set the agenda for consumers' ecological

concern in green-washed advertisement claims. Rohit et al. (2018) provides a general description of the process that leads to the formation of green behavior by including the role played by media and attitude towards environmentfriendly packaging, along with ecological concern and perceived consumer effectiveness. Mass Media (Media influence) was a factor that affect to purchase intention and green purchase behaviors after that. As a result, the current study puts forward the following hypothesis:

H4: Mass Media has impact on Green Consumer Intention

2.5 Green Consumer Intention

Ramayah et al. (2010) showed that intention is a determination to act in a certain way. In general, empirical studies have implied a substantial positive relationship between ecological intention and behavior (Chan, 2001). The bigger the positive attitudes, the more likely the intention to buy will be and therefore, the greater the likelihood that consumer will purchase green products over conventional alternatives.

The investigated relationship between green purchase intention and green purchase behavior have been showed in some studies (Chan and Yam, 1995; Chan and Lau, 2000; Chan, 2001; Bamberg, 2003; Bamberg and Moser, 2007; Liu et al., 2010; Rezai et al., 2013; Rohit et al., 2017; Hosein et al., 2013). Considering this, it has been hypothesized that:

H5: *Green Consumer Intention* has impact on Green Consumer Decisions

3 Methodology and Data

3.1 Qualitative research

The qualitative research method was conducted by collecting the paper and researching similar topics about green consumer decisions. Besides that, test interviews need to be done to adjust the scale. The research process began with the elaboration of research objectives and the proposition of the theoretical framework. The draft scale was then finalized by an in-depth interview with consumers (n=20) who belong to gen Z and have a green intention to fashion items. The formal scale was finally arrived at and the quantitative research method was employed to quantify the factors affecting the Green Consumer Intention and Green Consumer Decisions of Gen Z.

Based on researched documents from experts and survey studies on green consumer decisions of Gen Z, the basic factors affecting green consumer intention and green consumer decisions of Gen Z then finalized. This study adjusts and adds observation variables used to measure concepts in the research model. The result of qualitative research is that the scales have been corrected accordingly and the official survey form is used for quantitative research 303 consumers were surveyed for primary data.

The questionnaire was designed with a 5-point Likert scale to assess green consumer intention and green consumer decisions of Gen Z. The official questionnaire consisted of 29 observation variables corresponding 6 scales of the research model: (1) Email Marketing, (2) Mass Media, (3) Social Media, (4) EWOM, (5) green consumer intention, (6) green consumer decisions of Gen Z.

The concept of Email Marketing is denoted by EM and measured by five observed variables; the concept of Mass Media is denoted by MI and measured by five observed variables; the concept of Social Media is denoted by SM and measured by five observed variables; the concept of EWOM is denoted by EW and measured by five observed variables; the concept of GREEN CONSUMER INTENTION is denoted by GCI and measured by five observed variables; and the concept of GREEN CONSUMER DECISIONS of Gen Z is denoted by GCD and measured by four observed variables (see Table 1).

Table 1: Mesurements

EW1	I like to share information about sustainable products or services from social networks with my friends.	Pejman *et al.,* 2021
EW2	EWOM affects the purchase decisions of consumers on social media platforms.	
EW3	I like sharing thoughts on items or services acquired from social networks with my friends	
EW4	I find E-WOM content reliable.	
EW5	Due to digital marketing channel, green product has received positive feedback faster.	
MI1	I agree TV channels like NDTV with Greenathon have enhanced knowledge about green products.	Rohit et al., 2018 Kaman, 2011
MI2	Newspapers and Magazines are a good source of propagating environment issues.	
MI3	The environment consciousness has been created by the role of media lately.	
MI4	I often come across environmental messages on advertisements	
MI5	I often come across environmental topics/ issues on radio	
SM1	The contents on social networks are believed to be thought-provoking in using sustainable products	Pejman *et al.,* 2021
SM2	Looking for tailored data related to sustainable products and services on social networks is possible.	
SM3	Using Social networks makes it easy to find sustainable products	
SM4	Using social networks saves time in identifying sustainable products easily	
SM5	Exchange of opinions or conversations related to sustainable products and services with buyers/sellers through social networks	
EM1	E-Mail marketing has played an important role in changing your attitude toward products and services.	Vaughan, 2015
EM2	E-Mail marketing plays an active role in building a relationship between the consumers and the organization	
EM3	the e-mails I receive contain information that is relevant to what I care	
EM4	the e-mails I receive contain information about the latest fashions that would be of interest to me	
EM5	the e-mails I receive contain information about special offers that are of interest to me	
GCI1	I will change my loyalty for ecological reasons to green products.	Wasim *et al.,* 2020 Vijay, 2020
GCI2	I will consider purchasing only less polluting products in the coming time.	
GCI3	I intend to purchase this product because of its environmental performance.	
GCI4	I will collect and comprehend information about eco-friendly products.	
GCI5	I will purchase eco-friendly products when I need to buy a green product.	
GCD1	I buy environmentally friendly products whenever possible.	Rohit *et al.,* 2020 Kaman, 2011
GCD2	When shopping, I deliberately check products for environmentally harmful ingredients.	
GCD3	I use products made from recycled materials whenever possible.	
GCD4	I'll choose to buy environmentally friendly products even if they are more expensive than other products.	

3.2. Quantitative Research

This paper will use the Statistical method to build a research model, building a linear function for the research model, using primary data collection techniques by distributing survey forms, then analyzing survey data, test the reliability of the scale based on two statistical indicators, Cronbach's Alpha coefficient, Exploratory Factor Analysis - EFA, correlation, and regression by SPSS software.

- Audience: Generation Z have green intention or green decisions to fashion items.

- Scope of space: Vietnam and another nations

- Sample size: 363

Sampling Method

Research sample information was collected by convenience sample selection and online survey technique. The form survey is a questionnaire distributed to gen Z about different fashion brands in the world. The survey period is from November to December 2022. A total of 363 tables were collected, there were 303 valid tables.

Research Process

The research process began with the elaboration of research objectives and the proposition of the theoretical framework. The draft scale was then finalized by an in-depth interview (n=20). The formal scale was finally arrived at and the quantitative research method was employed to quantify the factors affecting the green consumer intention and green consumer decisions of Gen Z. Primary data was processed by software SPSS 20.0 to measure the impact of factors affecting the green consumer intention and green consumer decisions of Gen Z as follows: Cronbach's Alpha, Exploratory factor analysis, correlation, and regression.

Determining Sample Size

For the topic using exploratory factor analysis (EFA), collect data at least 5 samples on 1 observed variable and preferably 10 or more (Hair et al., 1998). Hair et al. (2009) suggested that the sample size should be at least 50, preferably 100, and the observation/measurement ratio should be 5/1. In determining the sample size for EFA, the number of observations (sample size) must be at least 4 or 5 times the number of variables in the factor analysis (Hoang & Chu, 2008). For the topic using Multiple regression analysis method, then the formula will be n ≥ _8m + 50, where "n" is the minimum sample size and "m" is the number of independent variables present in the model (Tabachnick & Fidell, 1996). Hoelter (1983) said that the minimum sample size should be 200. According to Bollen (1998), 5 samples are needed for a parameter to be estimated (quoted in Le, Q., H., 2022).

Cronbach's Alpha

Cronbach's Alpha coefficient is used to evaluate whether it is appropriate to include certain observed variables in a latent variable. To check this, it is necessary to test the reliability of the scale based on two statistical indicators, Cronbach's Alpha coefficient and the corrected item-total correlation coefficient and Cronbach's Alpha if item deleted. The value of Cronbach's Alpha coefficient is: < 0.6: Factor scale is not suitable; 0.6-0.7: Acceptable with new studies; 0.7-0.8: Acceptable; 0.8-0.95: Good; 0.95: Acceptable but not good, researchers should consider observed variables that may have the phenomenon of coincidence. Test the reliability of the scale through Cronbach's Alpha coefficient to exclude variables with the total variable correlation coefficient less than 0.3. Criteria for choosing a scale when it has Cronbach's Alpha reliability ≥ 0.7 (Hoang & Chu, 2008). The scale with reliability Cronbach's Alpha ≥ 0.6 was also chosen when it was first used (Nunnally & Burnstein, 1994). In theory, Cronbach's Alpha coefficient has a variable value in the range {0,1}, the higher the Cronbach's Alpha, the better (meaning the more reliable the scale) (quoted in Le, Q., H., 2022).

Exploratory Factor Analysis (EFA)

EFA is the generic name of a group of procedures used primarily to shrink and summarize data. EFA is based on the correlation between variables and used to reduce a set of "k" observations into a set of "F" observations (F < k) of more significant factors. This means that a fairly large number of variables are collected and most of these variables are related and their number must be reduced to a usable quantity (Nguyen & Nguyen, 2011). The study used the method of Principal component coefficients with Varimax rotation at the breakpoint when extracting factors with Eigenvalue > 1. Scales with a total variance extracted from 50% or more are accepted (Gerbing & Anderson, 1988). At each concept has the difference of Factor loading and any must reach ≥ 0.3 (Jabnoun & AL-Tamini, 2003) (quoted in Le, Q., H., 2022). In EFA, the necessary requirement is that the KMO coefficient (Kaiser - Meyer - Olkin) must have a large value (0.5 ≤ KMO ≤ 1). This indicates EFA is appropriate. If the KMO coefficient is < 0.5 then factor analysis is likely to be inappropriate for the data. According to Kaiser (1974), it is suggested that: KMO ≥ 0.9 is very good; 0.9 > KMO ≥ 0.8 is good; 0.8 > KMO ≥ 0.7 is fine; 0.7 > KMO ≥ 0.6 is temporary; 0.6 > KMO ≥ 0.5 is bad; KMO < 0.5 is unacceptable (quoted in Le, Q., H., 2022).

Correlation (Pearson correlation coefficient)

The Pearson correlation coefficient measures the direction and strength of the linear relationship between two quantitative variables. Correlation is usually denoted by r. Suppose that we have data on variables X and Y for n individuals. The means and standard deviations of the two variables are x and sx for the x-values, and y and sy for the y-values. The correlation coefficient r between X and Y (r) need to get the value: $r<0.05$. (quoted by Dana, H., 2022).

Multiple linear regression

A scatterplot matrix shows the relationships between the dependent variable and the other independent variables. Researcher need to make sure that the independet variables are linearly related to the dependent variable. In Multiple linear regression, the necessary requirement is that the Durbin Watson coefficient must have a large value ($1 \leq$ Durbin Watson ≤ 3). This indicates no autocorrelation in the residuals from a statistical model. Besides that, the VIF must have the value lower than 2, this indicates no multicollinearity in regression analysis and R should be larger 0.5, this indicates the data appropriate for statistical model and Adjusted R2 is a corrected goodness-of-fit (model accuracy) measure for linear models. It identifies the percentage of variance in the target field that is explained by the input or inputs. Another index is sig.F of ANOVA, Sig. $F \leq \alpha$, this indicates the linear regression model suitable to the data and the independent variable only when meaningful when sig of each independent factor must have to lower 0.05. (quoted by Dana, H., 2022).

Tinear regression equation: $Y = b_0 + b_1x_1 + b_2x_2 + ...+ b_2x_2$.

4 Empirical Results

In the content of the objective, the proposed model includes the following factors: Email Marketing, Media Influence, Social Media, EWOM affecting to green purchasing intention before affecting to green purchasing behavior of generation Z: The case of fashion brand in the world.

In this model there are 5 hypotheses and they have been proven, such as:

Hypothesis 1: Email Marketing effect on the Green Consumer Intention of Gen Z.

Hypothesis 2: Mass Media effect on the Green Consumer Intention of Gen Z.

Hypothesis 3: Social Media effect on the Green Consumer Intention of Gen Z.

Hypothesis 4: EWOM effect on the Green Consumer Intention of Gen Z.

Hypothesis 5: Green Consumer Intention effect on the Green Consumer Decision of Gen Z.

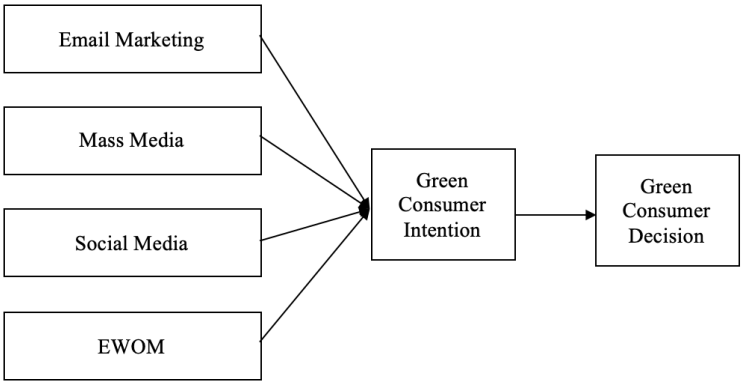

Figure 1: Proposed Conceptual Framework

3.3 Research result

3.3.1. Scale Reliability

In Table 2, six Cronbach's alpha coefficients, which range (0,711 to 0,808). They demonstrate high reliability measurement scales. No variables were eliminated after analyzes to increase the Cronbach's Alpha coefficient.

Table 2: Cronbach's alpha Factor Scale

Cronbach's alpha Factor Scale Factor	Observed Variables	Cronbach's Alpha
EWOM	EW1, EW2, EW3, EW4, EW5	α = 0,777
Mass Media	MI1, MI2, MI3, MI4, MI5	α = 0,784
Social Media	SM1, SM2, SM3, SM4, SM5	α = 0,808
Email Marketing	EM1, EM2, EM3, EM4, EM5	α = 0,758
Green Consumer Intention	GCI1, GCI2, GCI3, GCI4, GCI5	α = 0,786
Green Consumer Decision	GCD1, GCD2, GCD3, GCD4	α = 0,711

3.3.2. Exploratory Factor Analysis (EFA)

❖ **Independence factors**

20 observed variables of 4 factors – (1) Email Marketing, (2) Mass Media, (3) Social Media, (4) EWOM – are analyzed by the Principal Axis Factoring and Promax rotation. After 2 times for analyzing, the data are:

- KMO = 0.820
- Sig (Bartlett's Test of Sphericity) < 0.05
- Rotation Sums of Squared Loadings = 56.640%
- All Factor have Convergent validity > 0.5 and 1 factors are extracted from the 19 observed variables (EM5 was eliminated in the first analyzing because of Discriminant validity < 0,3).

Table 3: Rotated Component Matrix

	Component				Factors
	1	2	3	4	
SM3	.820		.145	.119	Social Media
SM2	.766			.146	
SM4	.755			.163	
SM5	.647	.115		.207	
SM1	.609	.266	.249		
EW1		.739		.146	EWOM
EW2		.733	.236		
EW4	.171	.691		.151	
EW5		.681		.182	
EW3	.204	.646	.188		
MI4			.820	.131	Mass Media
MI2	.162	.182	.736		
MI3	.137		.695		
MI5	.115	.152	.668	.240	
MI1		.260	.590		
EM1		.230		.768	Email Marketing
EM3	.157		.147	.734	
EM4	.172		.170	.694	
EM2	.201	.240		.672	

❖ **Mediator – mediating variable**

5 observed variables of factors Green Consumer Intention is analyzed by the Principal Axis Factoring and Promax rotation. After 1 times for analyzing, the data was as table below:

- KMO = 0.776
- Sig (Bartlett's Test of Sphericity) < 0.05
- Rotation Sums of Squared Loadings = 54.028%

Table 4: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.776
Bartlett's Test of Sphericity	Approx. Chi-Square	428.910
	df	10

	Sig.	.000

❖ **Dependence variable**

4 observed variables of factors Green Consumer Decision is analyzed by the Principal Axis Factoring and Promax rotation. After 1 times for analyzing, the data was showed as table below:

- KMO = 0.754
- Sig (Bartlett's Test of Sphericity) < 0.05
- Rotation Sums of Squared Loadings = 54.508%

Table 5: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.754
Bartlett's Test of Sphericity	Approx. Chi-Square	221.845
	df	6
	Sig.	.000

3.3.3 Correlation

❖ **Stage 1: Independence factors and Mediator – mediating variable**

Table 6: Correlations of Independence factors and Mediator – mediating variable

Correlations						
		GCI	SM	EW	IM	EM
GCI	Pearson Correlation	1	.900**	.389**	.426**	.453**
	Sig. (2-tailed)		.000	.000	.000	.000
	N	303	303	303	303	303
**. Correlation is significant at the 0.01 level (2-tailed).						

❖ **Stage 2: Mediator – mediating variable and Dependence factors Table 7:** Correlations of Mediator – mediating variable and Dependence factors

Correlations			
		GCD	GCI
GCD	Pearson Correlation	1	.874**
	Sig. (2-tailed)		.000
	N	303	303
**. Correlation is significant at the 0.01 level (2-tailed).			

3.3.4 Regression.

❖ **Stage 1: Independence factors and Mediator – mediating variable**

- Durbin Watson = 1.836
- Sig.F = 0.000b

Table 8: Cofficients

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.257	.093		2.757	.006		
	SM	.744	.025	.816	30.277	.000	.765	1.308
	EW	.069	.020	.093	3.537	.000	.809	1.237
	MI	.065	.022	.080	3.001	.003	.783	1.278
	EM	.049	.020	.067	2.497	.013	.773	1.293
a. Dependent Variable: GCI								

Green Consumer Intention = 0.816SM + 0.093EW + 0.080MI + 0.067EM

❖ **Stage 2: Mediator – mediating variable and Dependence factors and Mediator – mediating variable**

- Durbin Watson = 1.804

– Sig.F = 0.000b

Table 9: Cofficients

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.597	.092		6.502	.000		
	TG	.813	.026	.874	31.168	.000	1.000	1.000
a. Dependent Variable: GCD								

Green Consumer Decision = 0.874 Green Consumer Intention

5 Conclusion

EM factor is composed of five observation variables (EM1, EM2, EM3, EM4, EM5) with no variable was eliminated after two analyzes to increase the Cronbach's Alpha coefficient up to 0,758 (Table 2) and EM5 was eliminated in the first analyzing because of Discriminant validity < 0,3 in EFA (Table 3). The result shows that it has the fourth large influence on GCI (standardized β = 0.067 and Sig. value less than 0,05), the hypothesis H1 is accepted. This shows that Gen Z are very interested in green consumer decisions when they choose sustainability fashion products of brands fashion in the world. Moreover, it shows that one of the great advantages of Email Marketing is the widespread use of email. As a result, email becomes a completely effective tool to help businesses build sustainable relationships with customers and convey messages about green consumption more effectively. However, in order to increase the email open rate, businesses should carefully build a suitable mailing list of recipients and can use a third organization because of their benefits: Set up and automate email marketing campaigns with beautiful templates; Complete workflow; Target audience segmentation and in-depth analysis of email marketing campaign performance. Businesses can use automation features like Mailchimp, WordPress, OptinMonster to schedule transactional emails and update blog posts, respond quickly to customers, and create and send effective and timely promotional emails time.

MI factor is composed of five observation variables (MI1, MI2, MI3, MI4, MI5) with no variable was eliminated after two analyzes to increase the Cronbach's Alpha coefficient up to 0,784 (Table 2) and remained unchanged through EFA (Table 3). The result shows that it has the third large influence on GCI (standardized β = 0,080 and Sig.value less than 0,05), the hypothesis H2 is accepted. Mass media is an activity capable of conveying information to the public. Some popular means of mass communication are television, newspapers, leaflets, signs, sms, and radio... Mass media helps businesses combine means of media technology, production, and dissemination of news; Develop the ability to reach the public on a large scale; Have influence on society and being affected by events happening in that society; Consumers have many choices in terms of content reception, media platforms, and consumers can use different mass media at the same time. Therefore, businesses need to define clearly the message of green consumption that needs to be conveyed through different channels. Which channel will be suitable for the campaign, set up a time calendar, locate the target consumer, and cost are actions to do exactly. Define the purpose of communication to promote the brand or build a community for the brand, .. are a few criteria businesses need to determine to ensure that the messages transmitted are positive, impact the consumer effectively, and are distinct enough.

SM factor is composed of five observation variables (SM1, SM2, SM3, SM4, SM5) with no variable was eliminated after one analyzes to increase the Cronbach's Alpha coefficient up to 0,808 (Table 2) and remained unchanged through EFA (Table 3). The result shows that it has the first large influence on GCI (standardized β = 0,816 and Sig. value less than 0,05), the hypothesis H3 is accepted. Social media is part of Digital Marketing, which includes digital communication activities on the Internet. It allows consumers to interact directly with each other (feedback, online review), increasing the trust level of potential audiences and indirectly stimulating their demand for product experiences. Interactive features such as: like, share, comment... on social networks make it easy for businesses to measure their communication performance, observe market movements, catch up with trends, and make recommendations for the most suitable strategy. Gen Z's tendency to access information and be active is extremely active on social networks, but the source of information on social networking sites is extremely large and difficult to control. Therefore, businesses need

to plan a specific strategy from how to post content and images to a large campaign through accurately identifying the target audience, the message of green consumption behavior needs to be conveyed through different channels. Which social networking site will be suitable for the campaign, define the purpose of communication to promote the brand or build a community for the brand, .. are a few criteria businesses need to determine to ensure that the messages transmitted are positive, impact the audience, true and distinct enough.

EW factor is composed of five observation variables (EW1, EW2, EW3, EW4, EW5) with no variable was eliminated after two analyzes to increase the Cronbach's Alpha coefficient up to 0,777 (Table 2) and remained unchanged through EFA (Table 3). The result shows that it has the second large influence on GCI (standardized $\beta = 0{,}093$ and Sig. value less than 0,05), the hypothesis H4 is accepted. Viral messages play a particularly important role in promoting green consummė intention of gen Z when they choose sustainability fashion products from brands fashion in the world. Gen Z customers often rely on content, feelings, and experiences from previous customers to choose and spread their information. Thanks to the internet, electronic word-of-mouth is extremely effective in conveying product messages. Therefore, businesses need to invest in creating content that can communicate with consumers. To be able to develop electronic word-of-mouth activities, businesses can take the following measures: create a review and feedback space with friendly features for customers to leave content about the experience of using their products. Stimulating the spread of information through the policy of accumulating points, ranking the customer's reputation according to the quality of the review posts, and product reviews, or putting green ticking articles on green product reviews. Thereby, helping Gen Z users easily identify and spread information about green products and green consumption behavior.

GCI is an intermediate factor in the research model to GCD. The results show that the GCI factor composed of five observed variables (GCI1, GCI2, GCI3, GCI4, GCI5) with no variable was eliminated after two analyzes to increase the Cronbach's Alpha coefficient up to 0,786 (Table 2) and remained unchanged through EFA (Table 3). The result shows that it has a large influence on GCD (standardized $\beta = 0.874$ and Sig. value less than 0,05), the hypothesis H5 is accepted. This shows that the stage exchange from Green Consumer Intention to Green Consumer Decision is very important, gen Z are completely excited and they totally have the intention to use green consumption to do purchasing green fashion, that is the way to show their thinking, give their hands to solving an environmental problem, and send the message about sustainability life.

The GCD factor is the dependent variable in the research model. It is composed of four observed variables (GCD1, GCD2, GCD3, GCD4) and remained unchanged through Cronbach's Alpha analysis and EFA (Table 2, 3). This shows that the green consumption decision is now the first thing that Gen Z think of when they have a demand to buy fashion items. They will choose fashion items that have eco-friendly materials or these products produced with process sustainability with the environment and gen Z are willing to introduce these brands to family and friends when they have a need to shop.

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The Relationship Between Alcoholic, Beverage and Tea Manufacturing Industry Profits and Impact Variables

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Abstract
This paper studies the status of supply chain management in the Chinese alcohol, beverage, and tea manufacturing industry in the past ten years. The beverage consumption industry is an important part of daily consumption, so we focus on the corporate aspect. For this industry, company profits directly affect the entire supply situation, so working capital, liabilities, costs, and inventories are all direct factors influencing this situation. The aim of this article is to evaluate the relationship between the total profits of the Chinese alcoholic beverage industry profits and impact variables in recent ten years with econometrics method. More than 200 pieces of data, including those from macroeconomics and industry, are included in the test data. The relationship between variables with the maximum degree of fitting is ultimately discovered through autocorrelation, heteroskedasticity, multicollinearity, and normal distribution, and the formula form is displayed. Ultimately, we can confirm that there is a linear relationship between the total profit and the impact variables, and find that the debt to asset ratio and consumer confidence index have the most impact on the total profit. After this, feasible improvement suggestions are provided through data and algorithms.

Keywords
Total profit, linear relationship, econometrics methodology, time series analysis, quantitative methods

JEL Classification
C1;G3; E0

1 Introduction

The global economy still faces significant downside risks, according to the International Monetary Fund, the entire world economy is contracting. The COVID-19 did not have a significant impact on the Asia-Pacific area, but growth has since slowed and China's economy has essentially stagnated, which is considerably different from forecasts, and in addition, the pace of the economic recovery is considerably slower than anticipated. The Chinese government has recently changed its strategy and loosened control, which is a crucial direction for economic growth and is causing people's passion for consumption to gradually return.

The manufacturing of alcohol, beverages and tea industry is important for research because it is a key link in the intermediate and lower ranges of the supply chain and can reflect the status of status of economic development as a component of the basic retail sector. China is one of the largest consumer markets in the world and has a certain data base to better observe the influence and changes of the supply side.

“Along with the structural adjustment and the slow-down of the economy in China, retail industry has also started its times of evolution. Wages, logistics and all sorts of costs in the retailing industry remain high, resulting significant pressure on profitability.” (Deloitte, 2022) This article chooses a part of the retail, wholesale, and distribution connection based on this research and analyses data from the alcohol, beverage, and tea manufacturing industries in China over the last 10 years.

The aim of this article is to evaluate the relationship between the total profits of the Chinese alcohol, beverage, and tea manufacturing industry profits and impact variables in recent ten years.

In this paper, the law of change is observed along with data from Chinese alcohol, beverage, and tea manufacturing industries over the past 10 years. We also look for potential correlations between variables. The

best regression model within the range is provided after a quantitative analysis of the data using statistics. We focus on the profitability of companies since they can have a direct impact on supply-side production.

The article concluded that, based on the research data, there is a linear relationship between the total profit and the impact variables of this industries, with the debt to asset ratio and consumer confidence index having the most effects on the overall profit.

The structure of this paper as follows: The first chapter provides a brief overview of this context, reasons, and research theme; the second chapter gives the theoretical knowledge necessary for the paper; and the third chapter makes a claim about the economic background of the study topic and the economic model; in the fourth chapter, the data is organized and analysed to create a reasonable regression model; in the fifth chapter, the calculations are combined to draw conclusions, point the potential problem and give suggestions.

2 Literature Review

COVID-19 presented great challenges to the subsequent economic recovery of China. As a result, Chinese gross domestic product (GDP) growth rate fell from 6.0% in 2019 to 2.2% in 2020. And the results suggest that the COVID-19 has had severe economic consequences for traditional growth drivers, including accommodation and catering, petroleum products, and finance. (Han, 2022)

According to the report Chinese economic and industry outlook for 2023, Deloitte points that from 2022 to the next year, the Chinese macroeconomic structure will be reinforced under the rubric of "stability", and more emphasis will be placed on the quality of economic development rather than its pace. Basic industries are also crucial to the growth of the economy. The Regional Economic Outlook for Asia and the Pacific 2022 points out that the economics of Asia-Pacific region recovery is not ideal by IMF. The basic industry is chosen as the observation item in this research through an analysis of the macroeconomic direction.

For methodology, econometrics can be used. Econometrics is an application of statistical methods to economic data in order to give empirical content to economic relationships. (M. Pesaran, 1987) Through the method of measurement, it is expected that an estimator of ideality, which includes unbiasedness, effectiveness, and consistency, can be discovered.

3 Methodology and Data

This section mostly introduces theoretical information, economic background, data sources, and tool which will be used.

3.1 Methodology

This research utilizes time series analysis for basic data analysis. Time series analysis is the process of collecting and evaluating data from actual events to represent phenomena or evolving trends. The general rules cover seasonal cycle changes, periodic changes that fluctuate with seasonal fluctuations, cyclical changes, changes with business cycle changes, etc. Long-term trend changes, or long-term fall or rise, are also included. Drawing allows us to discover the change law and the point of change, which is useful for further analysis and forecasting.

For data reintegration, consisting mainly of two parts – dealing with the extreme values and correlation between variables. The extreme value is the data that do not fit the other data. The data must be reorganised when we perform time-series analysis on the input data. If the data contain extreme values, we must make the necessary corrections. If there exists an extreme value, the standard processing procedure is to find the extreme value and replace it with the average of the higher and lower data. If there are extreme values in the initial data, replacing them with their average equivalents is allowed. Use Pearson's correlation to find relationships between variables. The predicted absolute value is closer to 1 the higher the correlation between the two variables. The higher the predicted absolute value, the greater the correlation between the variables, where the predicted absolute value is zero indicates that there is no correlation. Additionally, we also need to examine the cross-correlation, measures the similarity between 2 discrete time series, and through shifting copies of variables as a function of lag or future.

Create a fitting model to assist in a more precise analysis of the linear relationship between its variables. A stationary process is a stochastic process in statistics means joint distribution of the subsequence does not change when it is shifted by an arbitrary amount, including the mean and variance are constant across time. In this article we apply a stochastic regression model, which formulated by an equation on the following form

$$y_t = \beta_0 + \beta_1 x_{1,t} + \beta_2 x_{2,t} + \cdots + \beta_i x_{i,t} + u_t \quad (3.1)$$

where y_t is the dependent variable over time, $x_{i,t}$ is the independent variable over time and u_t is a random variable (residuals) over time. The economic main hypothesis is in a mathematical way $y_t = f(x_{1,t}, x_{2,t}, \dots, x_{i,t})$. Moreover, the partial economic hypotheses are in a mathematical way $y_t = f(x_{1,t})^{+/-}, y_t = f(x_{2,t})^{+/-}, \dots, y_t = f(x_{i,t})^{+/-}$.

The article will use econometric techniques to test whether there is a problem with the residual value in the model through autocorrelation, heteroscedasticity, multicollinearity, and normal distribution, and make appropriate corrections. This will allow us to confirm the applicability of the model, which means the relationship between variables.

Autocorrelation refers to the correlation between the expected values of random error terms. The serial correlation of random error terms in linear regression models is relatively common, especially when applying time series data, the serial correlation of random error terms often occurs. In general, Durbin-Watson test will be used to exam the 1st order of autocorrelation, if the result is invalid, we will consider Cochrane-Orcutt estimation, which is a way to correct a linear model for serial correlation in the error term.

Then, heteroscedasticity is a statistical property of a data set that occurs when the variance of the residuals (errors) is not constant across all levels of the independent variable. We generally expect that the model has no heteroscedasticity. We use White test for heteroscedasticity. The White test is used to determine whether the variance of the errors in the regression model is constant. In general, where the explanatory variable is the square of the residuals, the explanatory variable is the original two explanatory variables, then their quadratic and their multiples.

Afterwards, considering multicollinearity between the explanatory variables in a linear regression model, when there is a strong or precise correlation between the explanatory variables in a linear regression model, this is referred to as multicollinearity, and it distorts or is difficult to estimate the model appropriately. Classical regression models assume that none of the regression regressors in the regression model is multicollinear. This indicates that some or all the explanatory variables in a regression model do not have a "perfect" linear relationship. Nevertheless, multicollinearity is something we wish to avoid in our model. “A variance inflation factor (VIF) is a measure of the amount of multicollinearity in regression analysis. Multicollinearity exists when there is a correlation between multiple independent variables in a multiple regression model.” (Ames Gareth, 2017) this method will be used to test multicollinearity.

Moreover, normality test in statistics is used to examine if a data set is well described by a normal distribution and to estimate the likelihood that a random variable based on that data set is normally distributed. Normality is the assumption that the underlying residuals are normally distributed, or approximately so. Kernel Density Estimation (KDE) and Jarque-Bera (JB) test will be used to analysis the skewness and kurtosis of this model. KDE is a nonparametric method of estimating the probability density function of random variables in statistics. KDE is a basic data smoothing problem that involves inferring information about a population from a small sample of data. And JB test is a goodness-of-fit test that determines whether the sample data exhibit normal skewness and kurtosis.

In addition, the model must be specified. Model specification is the process of determining which independent variables to include and exclude from a regression equation. In general, the specification of a regression model should be based primarily on theoretical considerations rather than empirical or methodological ones. If all important variables are in the model, specification includes selection of correct independent variable, correct functional form, and correct form of random error term. A specification error occurs if one of the options is incorrect. We need to deal with the predicted values and residuals, which means the development must be in the confidence interval. A general specification test for linear regression models is the Ramsey regression equation specification error test. It examines if nonlinear combinations of fitted values aid in the explanation of the response variable in more detail.

3.2 Economic theory

In general, the food and beverage sector occupies the intermediate and lower levels of the industrial value chain in the country's economic system, typically serving consumers directly or through terminal channels like catering.

The food sector consists mainly of the production of food, beverages, alcohol, tea, and other alcoholic beverages. The food manufacturing sector includes, among others, the production of baked goods, confections, chocolates and candied fruit; convenience foods; dairy products; canned foods; seasonings; fermented products; and milk beverages; while the beverage manufacturing sector includes the production of carbonated beverages, bottled drinking water, fruit and vegetable juices and juice beverages; alcohol production comprises the production of alcohol, liquor, beer, and alcohol, among other beverages; tea production includes the production of white tea, black tea, dark tea, and scented tea, among other beverages. In this paper, we focus on alcohol, beverage, and tea manufacturing industry.

The growth rate of the Chinese social retail industry is gradually slowing down as a result of stable economic growth, but the alcohol, beverage, and tea manufacturing sector still experiences relatively rapid growth. Despite the fact that the overall state of affairs has declined during the course of COVID-19, there are clear signs of recovery from the end of 2021 to the beginning of 2022, and growth will be introduced.

Companies will have a significant impact on the supply chain of the alcohol, beverage, and tea manufacturing sector as a basically retail industry. The number of supply ends in the industry will obviously change as a result of the profitability and operational circumstances of the businesses. As a result, the relationship between the overall profit and the influencing variables of this industry will be the main topic of this article. Expenses of companies, inventory, and macro indices (including leading and lag indicators) that influence consumption are the key effect variables. The linear relationship between the variables and the influencing factors can be discovered by performing linear regression using the time series analysis approach. Through data analysis of Chinese industry during the last 10 years (Feb. 2011 to Sep. 2022), the status of development is understood.

3.3 Data and software

This set of data comes from the Wind database from February 2011 to September 2022. The unit of these data is hundred million of CNY. This article will continue to use this set of data for time series analysis in Chinese alcohol, beverage, and tea manufacturing industry, which means data aggregated from the whole industry.

For software, we will use StataIC 15, which is a statistical software.

4 Empirical Results

Analyse the data using a time series approach to track each variable's changing trend. The linear model is formulated by an equation in the following form

$$y_t = \beta_0 + \beta_1 x_{1t} + \beta_2 x_{2t} + \beta_3 x_{3t} + \beta_4 x_{4t} + \beta_5 x_{5t} + \beta_6 x_{6t} + \beta_7 x_{7t} + \beta_8 x_{8t} + \beta_9 x_{9t} + \beta_{10} x_{10t} + \beta_{11} x_{11t} + \varepsilon_t \quad (4.1)$$

where y_t is total profit in hundred million, x_{1t} represents total companies in this industry, x_{2t} represents operating expenses in hundred million, x_{3t} represents financial expenses in hundred million, x_{4t} represents management fees in hundred million, x_{5t} represents account receivables in hundred million, x_{6t} represents inventories in hundred million, x_{7t} represents average balance of circulating funds in hundred million, x_{8t} represents debt to asset ratio in percentage, x_{9t} represents CICC Cyclical Momentum Index (CMI) price index, x_{10t} represents Consumer Price Index (CPI), x_{11t} represents consumer confidence index, β_0 is the level of constant, and $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11}$ are regression parameters.

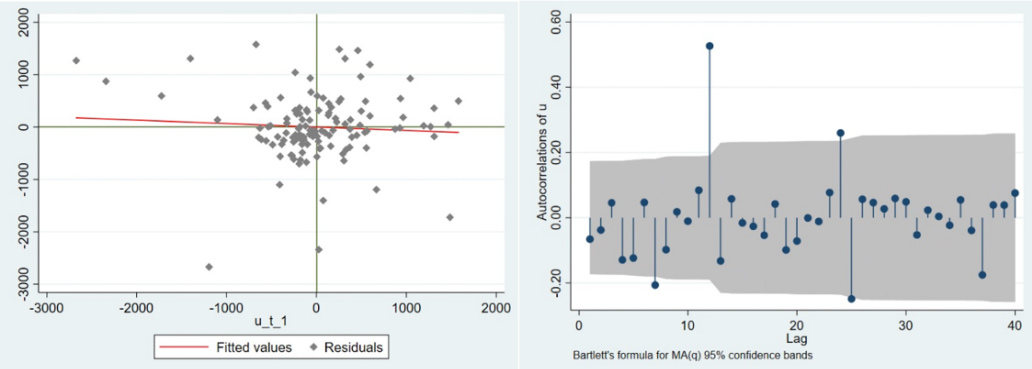
The hypothesis about behaviour of regression coefficients for this model, with respect to partial hypothesis are – when $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11} > 0$, shows there are positive relationship between total profit and variables; when $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11} = 0$, shows there are no relationship between total profit and variables; when $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}, \beta_{11} < 0$, shows there are negative relationship between total profit and variables.

Additionally, adjusting the original data model using the difference approach and, after Pearson's correlation analysis, deleting variable dx_2 and variable dx_3, because the absolute value of these variables is greater than 0.8. Then, time series correction is done by cross-correlation, adjusted the variables dx_5 to dx_{5+8t}, dx_8 to dx_{8+2t}, dx_{10} to dx_{10+11t}, and dx_{11} to dx_{11+2t}, the final variables in this regression model are for dy, dx_1, dx_4, dx_{5+8_t}, dx_6, dx_7, dx_{8+2_t}, dx_9, dx_{10+11_t}, and dx_{11+2_t}. The linear model is formulated by an equation in the following form

$$y_t = \beta_0 + \beta_1 dx_1 + \beta_2 dx_4 + \beta_3 dx_{5+8_t} + \beta_4 dx_6 + \beta_5 dx_7 + \beta_6 dx_{8+2_t} + \beta_7 dx_9 + \beta_8 dx_{10+11_t} + \beta_9 dx_{11+2_t} + \varepsilon_t \quad (4.2)$$

For autocorrelation analysis, which refers to the correlation between the expected values of random error terms, the results are shown in Figure 1. There is a negative relationship between residuals and delay residuals. The autocorrelation shown in Figure 1, which illustrates the first-order residual is inside the shaded portion of the 95% confidence interval, demonstrating the viability of the model.

Figure 8. 1st order autocorrelation



The residual coefficient is then subjected to the DW test, where $DW = 2.12768$, out of the critical interval $[1.88\,, 2.12]$, indicates that there is autocorrelation at first order. So, we will continue to use the Cochrane-Orcutt model, which is only for the first order of autocorrelations, the result is $DW = 2..002561$, which means correct successfully.

For heteroskedasticity analysis, testing the model's error is also important to test the entire model. the result shown in Figure 2. It can be stated that since the value of p (i.e., $(Prob > chi^2) = 0.0000$) is smaller than 0.05. We support the alternative hypothesis, which shows that the model exhibits heteroscedasticity when the 95% confidence interval is met. The method is to assign different weights according to the heteroscedasticity of variables to reduce the impact on regression.

Figure 2. Calculation of White test

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(54)     =    116.07
         Prob > chi2  =    0.0000

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	116.07	54	0.0000
Skewness	27.90	9	0.0010
Kurtosis	3.34	1	0.0677
Total	147.31	64	0.0000

For multicollinearity analysis, a Variance Inflation Factor analysis was carried out on the available data to further confirm whether there is a major impact on the model. The result is shown in Figure 3. There was no significant multicollinearity among the explanatory variables (VIF = 1.65, which is less than 10).

Figure 3. Variance Inflation Factor

Variable	VIF	1/VIF
dx6	3.64	0.275028
dx4	2.85	0.350276
dx7	1.56	0.641480
dx8_2t	1.23	0.815565
dx1	1.21	0.827658
dx10_11t	1.17	0.851506
dx11_2t	1.14	0.878653
dx5_8t	1.05	0.949987
dx9	1.05	0.956444
Mean VIF	1.65	

For normality analysis, The JB test helps to decide whether the sample data shows normal skewness and kurtosis. Figure 4 shows that the main hypothesis is rejected because the p_{value} (i.e.,$Prob > chi2$) is less than 0.05, specifically 0.0000. As a result, the residuals do not follow a normal distribution. This fact may be due to a lack of observational data, thus, it is taken into consideration but not further examined.

Figure 4. Jarque–Bera test

Skewness/Kurtosis tests for Normality

				joint	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
u	128	0.0028	0.0000	20.84	0.0000

Moreover, after econometric analysis, Ramsey RESET test will be used to propose a general test of specification error that enables the detection of potential misspecification, which is shown in Figure 5. We can infer that the $\boldsymbol{p_{value}}$ is smaller than 0.5 (i.e., $(\boldsymbol{Prob > F}) = \mathbf{0.0000}$), which means that is accepted and the model is not specified. Since there are few observational data, and the observational data is not comprehensive, personal suggestions is in search of additional time series data; add additional independent factors, such as information on the shipping procedure, that could have an impact on the overall profit.

Figure 5. Ramsey-RESET test

```
Ramsey RESET test using powers of the fitted values of dy
       Ho:  model has no omitted variables
                 F(3, 115) =      9.92
                  Prob > F =      0.0000
```

The regression model is ultimately identified by the collecting and adjusting of the initial data, and the chosen model may effectively describe the relationship between the independent variable and the dependent variable. The result has been shown as follows in Figure 6.

Figure 6. Regression of time series

```
. regress dy dx1 dx4 dx5_8t dx6 dx7 dx8_2t dx9 dx10_11t dx11_2t
```

Source	SS	df	MS	Number of obs	=	128
				F(9, 118)	=	397.99
Model	1.5098e+09	9	167756643	Prob > F	=	0.0000
Residual	49738370.5	118	421511.614	R-squared	=	0.9681
				Adj R-squared	=	0.9657
Total	1.5595e+09	127	12279906.7	Root MSE	=	649.24

dy	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dx1	.6187975	.3845095	1.61	0.110	-.142636	1.380231
dx4	2.699682	.0757859	35.62	0.000	2.549606	2.849759
dx5_8t	-.085033	.066477	-1.28	0.203	-.2166755	.0466096
dx6	-.7634584	.3208389	-2.38	0.019	-1.398807	-.1281101
dx7	.1692515	.0348067	4.86	0.000	.1003247	.2381783
dx8_2t	148.4873	91.11025	1.63	0.106	-31.93581	328.9104
dx9	-11.75754	14.36044	-0.82	0.415	-40.19513	16.68005
dx10_11t	-10.43118	93.98473	-0.11	0.912	-196.5465	175.6842
dx11_2t	32.10704	20.5132	1.57	0.120	-8.51468	72.72877
_cons	-1.066059	60.80336	-0.02	0.986	-121.4733	119.3411

The linear deterministic model is formulated by an equation in the following form

$$y = -1.07 + 0.62dx_1 + 2.70dx_4 - 0.09dx_{5+8_t} - 0.76dx_6 + 0.17dx_7 + 148.49dx_{8+2_t} - 11.76dx_9 - 10.43dx_{10+11_t} + 32.11dx_{11+2_t} \quad (4.3)$$

The constant value is -1.07; If there are one more company, the overall profit will increase 62 million; The overall profit rises 270 million if management fees rise 100 million; If the accounts receivable increase 100 million, the total profit decreases by 9 million; If the inventory increases 100 million, the total profit decreases 76 million; If average balance of circulating funds is 100 million, the total profit will increase 17 million; A 1% rise in the debt to asset ratio results in a 14.849 billion increase in total profit; The total profit decreases 1.176 billion when the CICC CMI Index goes up by one point; While the CPI rose by one-point, total profit dropped 1.043 billion; The total profit will increase 3.211 billion for every point improvement in the consumer confidence index.

5 Conclusion

This article uses data from Chinese alcohol, beverage, and tea manufacturing industry in the past ten years to study the linear relationship between the independent variable and the dependent variable, where the independent variables are total companies, operating expenses, financial expenses, account receivables, inventories, average balance of circulating funds, debt to asset ratio, CMI price index, CPI, and consumer confidence index, and the dependent variable is total profit.

Through time series analysis, we deleted 2 variables – operating expenses and financial expenses and adjusted the rest variables. Then, we use econometric analysis (under 5% significance level) to check the residuals. After this analysis, we can reasonably analyse the regression model. Regression testing reveals that 96.57% of fit-of-goodness is under the 95% confidence interval, which suggests that the model is good. It can be found that the number of companies has a positive relationship with total profit; management fees have a positive relationship with total profit; account receivables have a negative relationship with total profit; inventories have a negative relationship with total profit; average balance of circulating funds has a positive relationship with total profit; debt to asset ratio has a positive relationship with total profit; CMI price index has a negative

relationship with total profit; CPI has a negative relationship with total profit; consumer confidence index has a positive relationship with total profit by Equation (4.3).

In general, we can state that a simple linear relationship was discovered between the total profit and impact variables of China's 10-year's alcohol, beverages, and tea manufacturing industries. Although alcohol, beverage, and tea manufacturing are basic businesses that have developed slowly in recent years, and this industry also been affected by COVID-19. There will be a significant business contraction from 2019 to 2022, and at the same time, it will gradually recover in 2022.

First, there are still challenges in this industry, considering the state of China's economy. The fact that China's consumer industry is currently going through a recovery phase is another major issue. The analysis shows that, despite being in a condition of growth, it is still relatively weak as compared to before, and that, to accelerate economic recovery, new consumption points must be found. Second, it is also clear from the analysis that there are still problems with the model. Despite having a high level of model fitness, the model nevertheless fails the Ramsey RESET test. It might be caused by a lack of data, not only time series, but also dependent variables. Adding dependent variables, such as primary business costs, current assets, industrial production, etc., is a way to improve this model.

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Determinants of the Entrepreneurial Entry with the Focus on the Social Capital: Empirical Literature Review

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Abstract
Entrepreneurship is very important for the development of economy. Today, men and women are both participating in entrepreneurship, but despite the great advancement in gender equality, we can see a lower participation rate of women towards their entrepreneurial journey combined with a low success rate. The paper has focused on entrepreneurial entry from a women's perspective, with the aim of investigating empirical studies of the determinants of starting a business, why there is a gender gap in starting a business, and how networking is important to start a business. The results show that entrepreneurial profile, strategy, business model, and planning are important aspects of entrepreneurial entry. Quality of governance, economic opportunities, resources, and abilities, sociopsychological determinants (e.g., self-actualisation) are a significant determinant of entrepreneurial entry. Determinants such as the survival rate of business, competition, risk-taking attitude, and financial challenges were significant for the gender gap in entrepreneurship. Marriage, work force participation rate, prior experience, institutions are some other factors to determine gender gap. Social capital has focused on structural dimension (knowing someone who has started a business in the last two year), and cognitive dimension (considering entrepreneurship as a desirable career choice in society, high social status, and respect) with the focus on different types of ties (strong and weak), as well as bonding and bridging.

Keywords
entrepreneurship, start-up, GEM, behavior

JEL Classification
M13, O12

1 Introduction

Entrepreneurship has become a very significant topic in the current scenario. It is present all over the world. Some people want to become entrepreneurs to show their own talent through their innovative ideas, while other want to become a boss of their own, some prefer entrepreneurship for financial independence, or some for-time flexibility. Whatever the reason, it has really gained attention over the past two decades. Entrepreneurship not only helps in the development of a country by raising capital and creating more job opportunities, but it also helps to give an identity to the country by showcasing many talents. In fact, developing countries are also actively participating in this entrepreneurial journey. However, becoming an entrepreneur and sustaining in this business is not an easy nut to crack. It requires a lot of contacts, information, experience, and most importantly financial capital. Almost everyone aspires to have their own business, but due to these above-mentioned challenges, they restrict themselves.

The idea of this paper is to bring out information right from the beginning, challenges for women aspirants, and how it can be tackled.Taking these into account, my paper has focused on finding out what are the important requirements to become an entrepreneur, why women are lagging behind in entrepreneurship, and finally how networking (which is a no-cost way) helps towards entrepreneurial journey. Therefore, the paper has done a detailed empirical literature review for all three aspects, i.e., determinants of entrepreneurship, determinants of gender gap, and finally importance of networking.

2 Review of the literature

Researchers such as Ladeira et al. (2019) found that the profile of the entrepreneur, the strategy, the business model, and the planning were significant determinants of entrepreneurship. Thai and Turkina (2013) focused on formal and informal entrepreneurialism, which shows the importance of the quality of governance and economic opportunities. Turkina and Thai (2013) focused on self-actualisation and modernity as an important determinant. Authors like Midderman et al. (2020), Verheul et al. (2006), Coad et al. (2014) focused on sustainable entrepreneurship, entrepreneurial activity of men and women, and start-up size focus on business opportunity, self-efficacy, importance of family, unemployment and life satisfaction, per capita income, parental, and prior business experience as important determinants.

Some researchers have focused on the survival time of entrepreneurship, financial benefits perspective, gender gap index, competitiveness and risk-taking attitude, personality traits, marriage, employment status, prior experience, etc. The reason behind the gender gap for stating a business. (Remeikiene and Startiene, 2008; Patel and Rietveld, 2022; Piegeler and Bonte, 2013; Hisada and Adachi, 2016, etc.)

It is important to have a good network connection to enter into the entrepreneurial journey and its growth. Pindado et al. (2018) and Sara and Jonsson (2014) have focused on the dimensions of social capital, which is structural, relational, and cognitive. Ma et al. (2018) and Jayawarna et al. (2015) have focused on strong-weak ties, as well as bonding-bridging aspects. Research on social capital shows the importance of trust, social networks through family and friends, access to information, etc.

The following three sections will highlight the list of important determinants for each topic.

2.1 Determinants of Entrepreneurship

This section has reviewed various determinants of entrepreneurship, such as entrepreneurial profile, strategy, business model, and planning, from an individual point of view. Quality of governance and economic opportunities for formal entrepreneurship, resources, and abilities in informal entrepreneurship from the government side. Researchers have also emphasised on sociopsychological determinants of entrepreneurial entry; for example, self-actualisation (for opportunity entrepreneurship) helps in developing entrepreneurial spirit and appreciate entrepreneurship. Business opportunities and self-efficacy required for sustainable entrepreneurship. For total entrepreneurial activity, researchers have focused on technical development, economic factors, demographic factors, institutional factors and government intervention, and cultural factors. Importance on the size of the firm has also been given as an entrepreneurial entry determinant.

Ladeira et al. (2019) have conducted a unique study of determinants of digital entrepreneurship using fuzzy cognitive mapping. The article conducted group sessions with a panel of decision makers on the phenomenon of digital entrepreneurship. To develop the basic cognitive structure and calculate degrees of centrality, three sessions were conducted. The first session is about an explanation of the research framework and a brief introduction that helps group the necessary elements to develop a cognitive map using the post-it technique to identify possible determinants (n=186). In the second phase, different determinants were grouped into seven groups. These are innovation, human resources, strategy, business model and planning, technology and equipment, entrepreneurs' profile, financial resources, and external factors. The third phase covers the internal organisation of the clusters. To develop a cognitive map of panel perception and cause and effect relationship, decision explorer software was used. The degrees of centrality for the determinants in the FCM were calculated to identify the most important variable. The entrepreneurial profile was highest with a centrality value of 32.80. This shows profile of an entrepreneur is the most important determinant has more nodes connected to it and covers variables like previous experience, fear of losing control, extreme personality, contacts, risk ability, leadership quality, etc. Strategy, business model, and planning were the second most important determinant highlights of the importance of strategy, business model valuation, information content, sustainability, etc. The degree of centrality showed that the least important determinant of digital entrepreneurship is technology and equipment. Other determinants, such as financial resources, external factors, innovation, and the human resources team, were equally important determinants. The paper also did dynamic analysis at the cluster level and intracluster level to identify important determinants at different variations. Here, the profile and strategy of the entrepreneurs, the business model, and the planning were also an important determinant.

Thai and Turkina (2013a) have worked intensively on the determinants of entrepreneurship. They have worked on two papers. First, I have reviewed their paper on macrolevel determinants of formal vs. informal entrepreneurship. Here, they have used GLOBE indices for 52 countries using cross-sectional data, 2009. The article has worked on two dependent variables, formal entrepreneurship, and informal entrepreneurship. Explanatory variables like economic opportunities, governance quality, resources and abilities, performance-based culture, and socially supportive culture are the main ones including sub variables under each one. The paper conducted a structural equation model and a path coefficient. Here I have interpreted the result on the basis of path coefficient, as it is easy to read. The result of the path coefficient shows that the impact of governance quality and economic opportunities was highly significant ($p<0.01$) for formal and informal entrepreneurship. Resources and abilities have a 5% level of significance in informal entrepreneurship, show their importance in informal entrepreneurship, and no effect in formal entrepreneurship. Performance-based culture is highly statistically significant in formal entrepreneurship at a 1% level of significance. On the demand side, economic opportunities and the quality of governance encourage formal entrepreneurship and discourage informal entrepreneurship. On the supply side, informal entrepreneurship is driven by a socially supportive culture, while a performance-based culture has a strong impact on formal entrepreneurship.

Thai and Turkina (2013b) emphasised the sociopsychological determinants of entrepreneurial motivation. The paper took data from Global Entrepreneurship Monitor (GEM) and World Bank for 56 countries in 2009. The dependent variable – opportunity entrepreneur has been explained by prominent variables such as self-actualisation, modernity, locus of control, and social cynicism. The paper examined sociopsychological determinants of entrepreneurial motivation. Factor analysis using partial least squares confirmatory factor analysis (PLS CFA) for the independent variable. The paper used a multilevel logistic regression model to examine the effects of society-level variables on individual-level outcomes by taking necessity entrepreneurship, economic growth, technology/infrastructure, population, age, etc. as a control variable. I have interpreted two full regression models for companies with less than 10 employees and more than 10 employees. Self-actualisation, modernity, and locus of control were positive and significant for probability of being an opportunity entrepreneur in both models while controlling the levels of necessity entrepreneurship. This shows that people with high self-actualisation help in opportunity entrepreneurship as they develop entrepreneurial spirit and appreciate entrepreneurship, modernity in terms of high score of social and economic structures promotes opportunity entrepreneurship. The lack of control consisting of fate control and religious beliefs of an individual is significant and negatively affects the probability of being an opportunity entrepreneur. The high level of social cynicism (lower life satisfaction) shows low social capital. In the model with more than 10 employees, social cynicism came significant and negatively affects the probability of being an opportunity entrepreneur.

Middermann et al. (2020) emphasised the determinants of sustainable entrepreneurship in the context of exposure to environmental risks. The authors have used data from the Global Entrepreneurship Monitor (GEM) for the 2015 adult population survey and the global risk index. Researchers in this article integrated environmental risk exposure into the theory of planned behaviour using the mentioned database. The paper has used a logistic regression model explaining the dependent variable, sustainable entrepreneurial intention by using explanatory variables such as fear of failure, evaluation of business opportunities, perceived visibility, and self-efficacy. The countries are divided on the basis of their degree of exposure to environmental risk at the country level. Business opportunities and self-efficacy have a positive and high-significancy effect on sustainable entrepreneurial intention at all levels (low, medium, high) of environmental risk exposure. This shows that these two variables are not affected by an increase in the level of exposure to environmental risks. The higher the fear of failure of the respondents, the less likely ($Exp(B)=0.889$) they intend to start a sustainable business in countries with high environmental risk exposure. Perceived visibility has a positive and significant impact ($p<0.0001$) in countries with low exposure to environmental risk.

Verhuel et al. (2006) explained the determinants for female and male entrepreneurship at the country level, by using Global Entrepreneurship Monitor (GEM) data for 29 countries, 2002. The authors have considered four dependent variables, total entrepreneurial activity, female entrepreneurial activity, male entrepreneurial activity, and female share in total entrepreneurial activity. Considering the determinants of entrepreneurial entry, the authors have categorised five groups-technical development, economic factors, demographic factors, institutional factors and government intervention, and cultural factors. The paper has used two measures of female entrepreneurship: the number of female entrepreneurs and the share of women in the total number of

entrepreneurs. The article attempts to explain the variation between countries using both measures of female entrepreneurship. Three regression analyses are used. Total Entrepreneurial Activity (TEA) rates of men and women (regression I), female share in entrepreneurship (regression II), the extent to which the use of gender-specific variables influences the estimation results (regression III). The result of this paper explains that the share of female labour is correlated (ranging around -0.60) with all dependent variables except the share of female labour in TEA. With an additional increase in the importance of family and informal venture capital, there is a 23.86 and 95.24 times increase in TEA, showing a positive and significant impact on TEA. Per capita income has a negative effect on entrepreneurial activity; the impact of per capita income squared is positive, significant for female entrepreneurial activity, showing a U-shaped relation. Unemployment and life satisfaction have a positive influence on the female share of the total number of entrepreneurs. With an additional increase in unemployment, 0.43 times increase in the chance of female share in number of entrepreneurs, and 4.53 times increase with addition of life satisfaction.

Balboni et al. (2019) examined the initial business model of a start-up, followed by subsequent changes in design themes, and the combinative effect of efficiency and novelty impact on start-up growth performance. The article is based on a survey of 267 Italian high-tech industries between 2011 and 2015. The paper has used growth performance as dependent variable using explanatory variables like initial business model efficiency, initial business model novelty, initial business model ambidexterity, increase in business model efficiency, increase in business model novelty, increase in business model ambidexterity. The paper used a hierarchical multiple regression model. The changes in novelty and efficiency of the business model were measured by comparing the levels of novelty and efficiency of the business model at the time of founding (T0) with those at the time of the interview (T1=beginning of 2016). The temporal dimension of the ambidexterity of the business model was measured by the difference between the ambidexterity of the business model in T1 (time of interview) and T0 (time of foundation). The result explains that firm size has positive and significant impact in both models- increase in business model design themes and increase in business model ambidexterity (nearly 0.27 times increase in growth performance). Corporate share and initial business model ambidexterity have a significant, though negative, impact in both models. With an additional increase in corporate share, growth performance will reduce 0.11-0.12 times, respectively, and business model ambidexterity will reduce 0.17 and 0.12 times in both models. However, the additional increase in business model efficiency shows an increase in growth performance of 0.20-0.25 times in each model with positive and significant impact. An additional increase in business model ambidexterity leads to a 0.14 times increase in growth performance in the business model ambidexterity model.

Coad et al. (2014) explored the determinants of start-up size that help in entrepreneurial entry. The article used a cohort of 6,247 businesses that started trading in April-June 2004 using data from customer records at Barclays bank. The paper has described the relative size of the start-up as the dependent variable using parental business experience and prior business experience as the main independent variable. The paper has used the method of quantile treatment effect and instrumental variables. The paper has focused on the link between business experience and start-up size, then the paper has presented new evidence introducing variables like business experience, sources of advice, and bank account activity. The article presented predictions of the relationship between start-up size, growth, and survival, where growth is characterised as a random walk process. The size in the current period depends on the size in the previous period, plus a random shock. The result of the paper shows that parental and previous business experience came positive and highly significant, showing that with additional increase in each, the start-up size will increase by 0.089 and 0.332 times. Age and age squared show a significant inverse U-shaped effect on start-up size. Higher-level and A-level education shows a positive impact on start-up size, with 0.217 and 0.133 times. Sources of advice such as an enterprise agency/business link, accountant, solicitor, and college showed a significant impact on start-up size. Bank activity like volatility came highly significant, with additional increase in it, the start-up size will reduce by 0.62 times.

The summarised table of this section can be seen in Appendix (A1) for a glimpse of the research by different authors.

2.2 Determinants of Gender Gap in Starting a Business

This section has focused on aspects of gender gap such as business survival time, competition, risk-taking attitude, and financial challenge. Some areas have also focused on whether female employees have considered

more starting a business or those females who are suitable for paid work. The institutional effect to start a business, if prior business experience is helping women to reduce the gap, are some other determinants. The following studies will give facts and figures on why women are lagging behind men in their entrepreneurial journey.

The Lithuanian study of 20 businessmen by Remeikiene & Startiene (2008) shows that the survival time of men (11 years) for entrepreneurship is longer than that of women (5.5 years). The main objective of starting a business for the majority of men (approx. 80%) is to obtain financial benefits, while for women it is not an important priority. The results of the paper show that about 70% of men run their business in trade, of which 40% are in real estate and other business type. However, we can see in all types of businesswomen have participated nearly equally in percent term like service sector, trade, real estate, etc. with a range from 20% - 30%.

Patel and Rietveld (2022), Piegeler and Bonte (2013), Hisada and Adachi (2016), and Kritikos et al. (2015) have talked about entrepreneurial entry of women in various ways. Involvement in total early-stage entrepreneurial activity (TEA) has been explained by taking two models: Opportunity-driven and Necessity-driven by Patel & Rietveld (2022). The linear probability model result for 97 countries from 2006-2017 from Global Entrepreneurship Monitor (GEM) data shows that an increase in 0.10 in gender gap index is associated with an increase of 0.035 likelihood of being engaged in TEA; however, women being associated leads to a decrease of 0.038 in the likelihood of being engaged in TEA. Piegeler and Bonte (2013) mentioned latent entrepreneurship and nascent entrepreneurship for 36 countries during 2009 in their article, while Hisada and Adachi (2016) mentioned Nascent Entrepreneurs and Nascent Intrapreneurs in their article analysing data in two steps: first, initial screening (September 2005 – February 2006); second, follow-up interviews (conducted until 2010). The result of Piegeler and Bonte (2013) showed that the probability of being latent entrepreneur is 7.79% lower for women employable population and 7.94% lower for woman employees than men. The central point of the paper was competitiveness and risk-taking factor, which shows women are less competitive of becoming a nascent entrepreneur (i.e., there is 6.66% low probability for the female employable section to become a nascent entrepreneur and 6.70% lower probability for women employees of becoming a nascent entrepreneur). There is a 1.89% lower probability of a women's employable population (suitable for paid work) as nascent entrepreneurs. Overall, taking all factors into account, we can see that 1.36% lower probability of employable woman (who are suitable for paid work) for being nascent entrepreneur. On the other hand, the results of the paper by Hisada & Adachi (2016) show that females have 1.6% less likely chance of becoming a nascent entrepreneur than men. The married woman has a weaker (or less) effect on entrepreneurship (1.2% lower probability) than the unmarried woman (2.3% lower probability). The result also shows that a full-time woman worker has a weaker effect of becoming a nascent entrepreneur (1.4% lower probability) than a part-time woman worker (3.2% lower probability). Whereas when we investigate the intrapreneurship result, women prefer to remain employee (2.3% less likely to become intrapreneur), married women are 3.0% less likely to become intrapreneur than unmarried one (2.5%). The full-time worker is less involved (3.8%) than the part-time worker in the intrapreneurship. This draws to the conclusion that the married and full-time woman worker has a weaker effect on starting entrepreneurship or intrapreneurship.

Hagg et al. (2022) shows an interesting result taking Swedish master graduates (2008-2018) in entrepreneurship and innovation into account. Their target was to see whether men and women during their second or third year after graduation became self-employed or not. The result showed that the female student had no effect in starting the start-up. Studies by Kritikos et al. (2015) show the entrepreneurial entry of a representative of a German household between 2000 and 2010. The result shows a statistically negative difference for women for entrepreneurial entry compared to men at $p<0.01$. Men (1.3%) have a higher entry rate than women (1.01%) with a difference of 0.34%.

Dheer et al. (2009) highlighted the gender gap in entrepreneurship across nations. The authors have used multilevel data sources such as the Global Entrepreneurship Monitor (GEM), the World Value Survey (WVS), and Hofstede's (2001) cultural index data set in 2012 for 45 countries. The emerging entrepreneur is the dependent variable with gender, masculinity-femininity index, generalised trust, and institutional noncompliance as an independent variable. The multilevel logistic regression model shows that when the article considered only the main independent variable and the control variables, masculinity and gender inequality were positively ($p<0.01$) associated with the likelihood of starting a venture. This shows a decrease in the probability of women starting a business ($\beta=0.36$, $p<0.01$). The modulating effect of gender ad

masculinity shows that at the lower masculinity index (=10), women are 3% less likely than men to start a business compared to women are 1% less likely than men to start a business ($p<0.01$) when countries have a higher masculinity index (= 87), showing that as the level of masculinity increases, the gap between the probability of men and women of starting a business decreases. The negative moderating effect of trust (β=-0.005, $p<0.01$) shows that women are less likely to start a business with greater generalised trust (as compared to men). When trust is low (=3), women are 1.5% less likely than men to start a business compared to 2.5% less likely than men at the high trust level (=58) to start a business. At a lower institutional non-compliance index (=1.3), women are 3.1% less likely than men to start a business than at a higher end of this index (=3.4), where women are 0.7% less likely to start a business. This shows that as institutional non-compliance level increases, the gap between men and women to start a new business decreases.

Kodama and Odaki (2011) focused on gender differences in the probability of success in starting a business when controlling for managerial experience. The article used survey data for participants in government-sponsored seminars on start-ups between 1999 and 2003 for Japan. The probability of starting a business is the dependent variable and sex, age, education, and prior managerial experience are controlled variables. The result of the marginal effect of the probit model shows that women are less likely to successfully start a business with a 5.9% lower probability of success than men. When controlling for managerial experience, women have 11.0% higher probability (with managerial experience) than men (with no managerial experience) of starting a business. However, men with managerial experience have a 7.7% higher probability of starting a business than women without managerial experience. Using Cox's proportional hazard model, when controlling for managerial experiences, women have a higher probability (1.65 times) of starting a business with managerial experiences than men without prior managerial experience. However, men have a 1.43 times higher probability of starting a business with managerial experience than women without managerial experience.

Schillo and Ebrahimi (2021) have focused on digital start-up with gender distribution and made a comparative study of different venture capital. The paper has used the source CapitalIQ for 8164 venture capital founded in the last 10 years for North America and advanced economies of Europe between 2008 and 2019. The dependent variable is the amount of funding in ($M) digital start-ups compared to hardware and biotechnology start-ups. The proportion of women and the number of venture capital is the main independent variable. The result shows that the box plot diagram shows that more than 50% of companies in all fields do not list women among their professionals. The OLS regression result shows that the proportion of women has a significantly negative impact on the amount of venture funding received by digital, hardware, and biotechnology start-ups. The negative impact is small, showing strongest for digital start-ups (β=-0.070, $p<0.01$), than for hardware start-ups (β=-0.061, $p<0.1$), and biotechnology start-ups (β=-0.049, $p<0.01$). This shows that women's participation is lower in all three types of start-ups. As the amount of funding increases for these three start-ups, the proportion of women in the leading position will decrease.

This section has reviewed five papers that focus on the reason behind the gender gap in entrepreneurial entry, whose summary can be seen in the Appendix (A2).

2.3 Importance of Social Networking for Starting a Business

For smooth entry into business, networking is very important. Why? Because there is no cost associated with it, the government can prioritise it, especially in developing countries, for expansion of business, and it is very effective. Networking helps to build strong bonds, maintain social trust, and bridge the gap. Based on these areas, researchers have focused on the requirement of social capital for entrepreneurial entry with no personal cost to business aspirants. This section will give a good perspective and statistical facts on why networking is important for business aspirants.

Pindado et al. (2018) focused on new entrants in European agriculture focussing on human capital and social capital. Paper has used Global Entrepreneurship Monitor (GEM) database between 2004-2014 for 1,877 new entrants in Europe. The identification of opportunities, i.e., the new agricultural entry in the next six months, is a dependent variable. Structural social capital (knowing someone who has started a business in the last two year), and cognitive social capital (considering entrepreneurship as a desirable career choice in society, high social status, and respect) are the main independent variable. The result shows that in both model 1 (includes individual-level controls and predictors) and model 2 (adds country-level control), structural and cognitive social capital was a highly significant determinant (at $p<0.01$ and $p<0.05$) in identifying opportunities. This

shows that knowing someone who started a business before and considering entrepreneurship as a desirable career have a significant effect on the identification of opportunities.

Steinfield et al. (2010) have explored the use of social capital, as well as other resources, to measure company performance. The data from the online survey are used by 244 biotech companies in the Medicon Valley biotech region that covers Denmark and southern Sweden. Market performance and market exposure are the dependent variables considering the index of social capital (extent to which people in the company knew and trusted others, provided advice and access to information and opportunity) as the main independent variable. The number of employees, R&D, production, and sales are the control variables. Regression analysis was performed to show the effects of social capital on the two measures of performance. Social capital was highly significant for both market exposure ($p<.0001$) and market performance ($p<.05$). The variable of interaction of social capital with primary activity (here, R&D, and production and sales) came highly significant.

Spiegel et al. (2016) has focused on the role of founder social capital in the success of early-stage Internet start-ups using mixed method study. The article conducted a qualitative part study with 17 expert interviews between 2013 and 2014. For the quantitative part, the study paper performed a social network analysis of 70 start-ups on the internet and their 145 founders between 2013 and 2014. Dependent variables are successful and unsuccessful early-stage internet start-ups that take advantage of social capital (centrality of the founder's network) as the main independent variable. Based on the hypothesis that combined social capital of founders has a significant positive impact on the success of their early-stage internet start-up, the two-sided t test showed a significant difference in the means of successful and unsuccessful start-ups at $t=-3.283$, $p=0.002$. However, the exact fisher test in both groups was not significant at $p=0.606$, showing equal variances between successful and unsuccessful start-ups. Of 70 samples, 21 (i.e., 30%) show that social networks have a significant positive influence on the success of their start-ups.

Ma et al. (2018) has focused on the overseas impact of social ties on the venture performance of Chinese returnee entrepreneurs. The article has studied 226 self-administered questionnaires on the venture activities of Chinese returnee entrepreneurs in the Wuxi region in China for 500 start-ups between 2014-2015. Venture performance in China is the dependent variable with domestic and overseas social capital (assessed using indicators capturing bonding-bridging, strong ties-weak ties, personal and social networks generated through family, relatives, friends, trade association, government agencies, etc.) as independent variable. The result shows that domestic social capital leads to a 0.17-fold increase in venture performance of returning entrepreneurs, while overseas social capital leads to 0.16 times ($p<0.05$). The interaction effect of domestic social capital and entrepreneurial environment shows a positive (an increase of 0.13 times) and significant ($p<0.05$) impact on venture performance.

Jonsson (2014) has focused her study on the entrepreneurs' network through the relevance of cognitive social capital. The author has done a case study of six start-up fashion firms in Sweden for 2006. A total of 20 semi-structured interviews consisting of two phases were conducted. The evolution of entrepreneurs' network is the dependent variable, whereas the structural, relational, and cognitive dimensions of social capital are independent variables. The structural dimension is about the pattern of direct and indirect links between the firm and other actors, the relational dimension is about the nature of the relationships that develop between actors, and the cognitive dimension is about the shared system of meaning, representations, and interpretations between parties. Based on the findings of the case studies and interviews, the paper reveals that entrepreneurs create structural social capital (i.e., initiation of new network contacts) through cognitive attributes. The cognitive dimension (like, establishing relationships with actors/agents) has a relevant impact on network evolution in the start-up phase. The article showed the interrelation of three dimensions of social capital. The paper found that the cognitive dimension supports structural social capital, as well as the relational dimension (trust and social obligations) increases the cognitive dimension and vice versa.

Crupi et al. (2020) have focused on the impact of intellectual capital (taking human capital and social capital. Since my focus study is on social capital, I have covered the results based on social capital areas only) on entrepreneurship. The article used the Thomson Reuters Web of Science (WoS) database for cocitation analysis (3,648 publications in 1990-2020) and bibliographic coupling. The result shows a cocitation bibliometric network displaying five interconnected clusters. Cluster 1 showed social capital and its impact on entrepreneurship by investigating the roots of social capital by introducing and illustrating the form in which it can be expressed and occurs (the group showed the 10 most cited articles related to social capital and its

impact on entrepreneurship). This group shows that social capital provides stimuli to potential entrepreneurs, directly and indirectly. The last group, that is, 5 explores the role played by social capital in family firms. The group showed by reviewing 10 most cited articles that family-owned and family-controlled companies are one of the most influential organisational structures in the world, family companies have 'familiness' (source of bonding and capabilities of family firms), and family companies represent organisations that tend to have a dominant group(i.e., the family), where members have positions like employees, managers, or members of the board of directors. From bibliographic coupling analysis, we can see five clusters based on the number of publications, total citations per cluster, and average citation per publication. In Cluster 1, it has highlighted that strong social capital strengthens the relationship between the entrepreneur and external venture capital, which helps to benefit additional funds. Cluster 4 also shows the positive impact of social capital on organisational performance. It shows that social capital builds all kinds of social network at the inter- and intra-firm level, helping entrepreneurs achieve better performance.

Landqvist and Lind (2019) have focused on start-up embedding in three business network settings. The paper conducted case studies on a start-up and its networking behaviours for Sweden between 2015-2016. The result of the study added details along with showing the importance of social ties, the role of venture capitalists and incubators to start-ups, and how specific resources through networking are combined in the use, production, and development settings of a start-up. The article showed that the setting of business networks and the behaviour of networking consist of strong and weak bonds. The paper concludes that strong links are crucial for resource combining when it comes to networking. The paper also emphasised weak links, as it helps in acquiring information and interaction for new opportunities. Therefore, we need to work on both ties – strong and weak - to become embedded in business networks.

Jayawarna et al.(2015) has focused on the influence of gender upon social networks and bootstrapping behaviours by using a sample of 211 respondents for the UK in the year 2004 and 2006. The main variable in this paper is the social network in terms of strong ties, weak ties, and brokerage. The results show that three hierarchical ordinary least squares models are used in relation to the joint utilization method (consist of obtaining loans from relatives/friends, using income from outside employment, using personal credit cards for business, and withheld owners salary if necessary), the payment related method (consist of borrow equipment from other businesses, share employees and share equipment with other business, and hire temporary employees) and the owner related method (here, female owned firms are defined by crowding and low returns, entrance and growth are more risky) by using the bootstrapping technique and social networks. Strong ties ($p<0.05$) and brokerage ($p<0.01$) were significant in all three methods. However, the weak links were significant in the payment-related method only ($p<0.05$). Moderation (i.e., interaction between ties and gender) supports strong female ties and shows a significance for joint utilisation ($t=-2.699$, $p<0.01$) and owner-related method ($t=-2.733$, $p<0.01$). Moderation is also statistically significant between female brokerage and payment-related bootstrapping ($t=-3.174$, $p<0.01$).For weak links, the interaction between men with payment-related bootstrapping was significant ($t=2.105$, $p<0.05$).

I have reviewed few papers (see Appendix A3 for table summary) that emphasise the importance of social capital for entrepreneurial entry.

3 Conclusion

The paper has reviewed several studies on all three different aspects. Determinants of entrepreneurship, determinants of gender gap, and importance of networking for starting a business. We can see in general highlighted areas below.

Determinants like previous work experience, risk ability, leadership quality, strategy, business model, and planning, importance of strategy, financial resources, external factors, innovation, etc. came important in the study by Ladeira et al. (2019). Thai and Turkina (2013a) showed that the impact of governance quality and economic opportunities was highly significant ($p<0.01$) for formal and informal entrepreneurship. Thai and Turkina (2013b) also highlighted self-actualisation, modernity, and locus of control as an important determinant. Business opportunities and self-efficacy were highly significant for sustainable entrepreneurial intention by Middermann et al. (2020). Authors like Verhuel et al. (2006) have focused on unemployment rate and life satisfaction level for entrepreneurship determinants, whereas Balboni et al. (2019) and Coad et al. (2014) have focused on size of firm.

With respect to finding out determinants for gender gap, we can see many areas like, Remeikiene & Startiene (2008) shows that the survival time of men (11 years) for entrepreneurship is longer than that of women (5.5 years). Patel & Rietveld (2022) show that an increase in 0.10 in gender gap index is associated with an increase of 0.035 likelihood of being engaged in TEA; however, women being associated leads to a decrease of 0.038 in the likelihood of being engaged in TEA. Piegeler and Bonte (2013) showed that the probability of being a latent entrepreneur is 7.79% lower for women employable population and 7.94% lower for women employees than men. Hisada & Adachi (2016) show that women have a 1.6% less likely chance of becoming a nascent entrepreneur than men. Kritikos et al. (2015) showed that men (1.3%) have a higher entry rate than women (1.01%) with a difference of 0.34%. Dheer et al. (2009) show a decrease in the probability of women starting a business (β=0.36, $p<0.01$). Kodama and Odaki (2011) focused on gender differences in the probability of success in starting a business when controlling for managerial experience.

For increasing contacts with researchers such as Pindado et al. (2018) highlighted structural and cognitive social capital as a significant determinant (at $p<0.01$ and $p<0.05$) in identifying opportunities. Steinfield et al. (2010) have explored the use of social capital, as well as other resources, to measure company performance. Social capital was highly significant for both market exposure ($p<.0001$) and market performance ($p<.05$). Spiegel et al. (2016) highlighted 70 samples, 21 (i.e., 30%) showing that social networks have a significant positive influence on the success of their start-ups. Ma et al. (2018) show that domestic social capital leads to a 0.17-fold increase in venture performance of returning entrepreneurs, while overseas social capital leads to 0.16 times ($p<0.05$). Jonsson (2014) found that the cognitive dimension supports structural social capital, and the relational dimension (trust and social obligations) increases the cognitive dimension and vice versa. Crupi et al. (2020) show in their cluster analysis the positive impact of social capital on organisational performance. Landqvist and Lind (2019) highlighted working on both ties – strong and weak - to become embedded in business networks. Jayawarna et al.(2015) shows that strong ties ($p<0.05$) and brokerage ($p<0.01$) were significant in their study.

With all the above results, I can produce facts and figures to substantiate my study which can be offered as advice to entrepreneurs and the government to work on increasing the contact area. This will facilitate the expansion of the business. The article has not worked on data from different countries to state and verify the importance of all three studies.

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Appendix

TableA1: Determinants of entrepreneurship

Study	Data	Depending variable	Variable of interest	Control Variable	Result / Conclusion
Ladeira et al., 2019	Two expert focus group. Fuzzy cognitive mapping (FCM) is used to analyse the determinants of digital entrepreneurship	Digital entrepreneurship	Innovation; Human resources; Financial resources; Strategy, Busing model, and planning; Technology and equipment; Entrepreneur profile; External factors.	-	Fuzzy cognitive mapping (FCM) are used. Entrepreneur profile came with the 32.80 centrality value, followed by strategy, business model, and planning with 16.30 value. In all aspects, determinants like entrepreneur profile and strategy, business model, and planning came as the most important and significant one.
Thai, Turkina, 2013	GLOBE indices for 52 countries. Cross sectional data, 2009 (data on cultural variables from 2004).	Formal entrepreneurship, Informal entrepreneurship.	Economic opportunities, Quality of governance, Macro-level resources and abilities, performance-based culture, and socially supportive culture. There are sub-variables under each one.	-	On demand-side, economic opportunities and the quality of governance encourages formal entrepreneurship and discourage informal entrepreneurship. On the supply-side, informal entrepreneurship is driven by socially supportive culture, performance-based culture has a strong impact on formal entrepreneurship.
Turkina, Thai, 2013	Sample of 111,382 individuals in 56 countries, 2009. Source: Global Entrepreneurship Monitor (GEM), World bank data.	Probability of being an opportunity entrepreneur (1=opportunity entrepreneur, 0=other occupation).	Self-actualization, Modernity, Locus of control, Social cynicism. (Under these each variable, sub-variables are there. 8 dimensions total)	Necessity entrepreneurship, and at country level variables are- economic growth, politico-administrative and technology/infrastructure -related factors. At individual level variables are- population, age, household size, education, annual income.	Self-actualization, modernity, and locus of control came positive and significant for probability of being an opportunity entrepreneur in both models, less than 10 employees and more than 10 employees while controlling the levels of necessity entrepreneurship.
Midderman et al., 2020	Global Entrepreneurship Monitor Adult Population Survey (GEM), 2015; WorldRiskIndex	Sustainable entrepreneurial intention	Fear of failure, Evaluation of business opportunities, Perceived visibility, Self-efficacy.	Gender, Age, Education, Social network, Income (all are binary variable).	Business opportunities and self-efficacy have positive and high significancy effect on sustainable entrepreneurial intention across all levels (low, medium, high) of environmental risk exposure.
Verheul et al., 2006	Global Entrepreneurship Monitor (GEM), 29 countries, 2002.	Total Entrepreneurial Activity (TEA), Female Entrepreneurial Activity, Male Entrepreneurial Activity, Female share in total entrepreneurial activity.	Technological development, Economic factors, Demographic factors, Institutional factors and government intervention, and Cultural factors (5 major group with sub - variables in each)		With additional increase in the importance of family and informal venture capital there is 23.86 and 95.24 times increase in TEA, showing positive and significant impact on TEA. Per capita income has a negative effect on entrepreneurial activity. Unemployment and life satisfaction have positive influence on female share in total number of entrepreneurs. With additional increase in unemployment, 0.43 times increase in the chance of female share in number of entrepreneurs and 4.53 times

					increase with addition of life satisfaction.
Balboni et al.; 2019	Survey study, 267 Italian high-tech industries, 2011-2015.	Growth performance (i.e., venture's performance in terms of the growth of full-time equivalent worker).	Initial business model efficiency, Initial business model novelty, Initial business model ambidexterity, Increase in business model efficiency, Increase in business model novelty, Increase in business model ambidexterity.	Age, Size, Industry (four investigated industries), and External investors (like, venture capitals, business angels, universities, other enterprises).	Firm size has positive and significant impact in both models- increase in business model design themes and increase in business model ambidexterity (nearly 0.27 times increase in growth performance). With additional increase in corporate share, growth performance will reduce by 0.11-0.12 times respectively and business model ambidexterity with 0.17 and 0.12 times in both models.
Coad et al., 2014	Cohort of 6,247 businesses started trading in April-June 2004 using dataset on customer records at Barclays Bank.	Relative start-up size (measure as natural log of turnover in the 1st year – natural log of the median turnover in the 1st year for all firms in that sector).	Parental business experience, Prior business experience.	Age, Gender, Education, Source of advice, Number of owners, Legal form, Industry dummies, Region dummies.	Parental and prior business experience came positive and highly significant, showing with additional increase in each, start-up size will increase by 0.089 and 0.332 times. Higher degree education and A-level education shows positive impact on start-up size, with 0.217 and 0.133 times. Sources of advice like enterprise agency/business link, accountant, solicitor, and college showed significant impact on start-up size.

Source: Author

TableA2: Gender differences in entrepreneurship

Study	Data	Depending variable	Variable of interest	Control Variable	Result / Conclusion
Remeikiene, Startiene; 2008.	Lithuania, 2008. Expert Survey of 20 businessmen.	-	-	-	Survival time of entrepreneurship for men (11 years) is more than women (5.5 years). Men has (50%) more benefits to start their business from personal savings or a combination of bank loan & their savings (as their average salary is 218 LTL more than women). Approximately 80% of men start a business to get financial benefits while for women it is not important priority.
Patel, Rietveld; 2022	97 countries, 2006-2017. Global Entrepreneurship Monitor data.	Involvement in Total early-stage Entrepreneurial Activity (TEA, dummy variable). Opportunity driven (dummy variable) Necessity driven (dummy variable).	Gender (dummy variable), Gender gap Index	Age, Education, GDP per capita, Unemployment rate.	An increase in 0.10 in gender gap index overall (regression coefficient of Linear Probability Model) leads to an increase of 0.035 likelihood of being engaged in TEA, whereas being female leads to decrease of 0.038 in the likelihood of engaged in TEA. The model shows a change of 0.10 in Gender Gap Index is associated with an additional increase of 0.015 in the likelihood of being engaged in TEA for females as compared to males.
Piegeler, Bonte; 2013	Flash Eurobarometer Entrepreneurship, 2009 for 36 countries.	Latent entrepreneurship, i.e. preference of being self-	Gender (dummy variable), Competitiveness (dummy variable), Risk	Innovativeness, Autonomy, Proactiveness, General self-efficacy, Internal	Probability of being latent entrepreneur is 7.79% lower for woman employable population and 7.94% lower for woman employees than men, keeping control variable constant at their mean.

		employed (dummy). Nascent entrepreneurship (dummy).	taking (dummy variable).	vs. External locus of control, General optimism. Gender, Perceived social status, Income, age, Education, Occupation, Area, Country.	However, when we consider control variable like competitiveness and risk, we can see 6.66% lower probability for woman employable population and 6.70% lower probability for woman employees of being latent entrepreneur. For nascent entrepreneur, 1.89% is lower probability for woman employable population taking control variable into account.
Hagg et al.; 2022	Sweden 2008-2018. 472 graduates of master programme in entrepreneurship and innovation	Self-employment owns venture in the second and/or third year after graduation.	Gender (dummy variable), Student Gender balance, Mentor gender balance.	Female Student, Track specialization, Prior work experience, Prior start-up experience, Programme leadership, Passion for founding.	The result shows, being a female student have no effect on starting the start-up. Overall, student gender balance is positive and highly significant with $p<0.01$ in stating a business. However, mentor gender balance shows no effect in starting a business. The final model is statistically significant with $p<0.000$, showing significant relationship exists between the entire set of independent variables and the dependent variables.
Hisada, Adachi; 2016	PSED II, 2 data. 1. Initial screening - September 2005 to February 2006. 2. Follow-up: Interviews conducted for nascent entrepreneurs until 2010.	Nascent Entrepreneurs (dummy variable) and Nascent Intrapreneurs (dummy variable)	Gender (dummy variable)	Unemployment rate, Homestead exemption, Median home price, Maximum personal income tax rate, Age, Family, Employment, Firm size, Race, Education, Maximum corporate income tax rate, Sales tax rate	Negative effect of married woman (1.2% lower probability) is weaker for entrepreneurship than unmarried one (2.3% lower probability). Similarly, full time women (1.4% lower probability) have weaker effect on becoming entrepreneurship than part time (3.2% lower probability) woman worker. For intrapreneurship, the negative effect of being a woman is highly statistically significant with 2.3% woman are less likely to become intrapreneur and prefer to remain employee. About 3.0% married woman are less likely to become intrapreneur than unmarried woman (2.5%). Full time woman workers are 3.8% less likely to involve in intrapreneurship than part time.
Kritikos et al.; 2015	Germany, 2000-2010. German Socio-Economic Panel (SOEP).	Entrepreneurial entry (dummy variable)	Gender (dummy variable)	Entry rate, Big five, Other personality trait, School leaving degree, Age, Work experience, Unemployment experience, Disabled, German family, Capital income, Unemployed, Not participating	The result shows there is a statistically negative difference of woman for entrepreneurial entry at $p<0.01$ than men. Openness to experience has a positive and significant effect on the probability of entry for both genders. Increase in one standard deviation, probability of entry increases by 0.12 % for men and 0.21% for women. The result shows annual entry rate for men is 1.3% and women is 1.01% with differential points between them is 0.34%, showing men has higher entry rate.
Dheer et al., 2019	Multi-level data source – Global Entrepreneurship (GEM), World Value Survey (WVS) and Hofstede's (2001) cultural indices dataset. 2012 for 45 countries.	Nascent entrepreneur (1=involved in the process of starting a business, 0=otherwise)	Gender (0=men, 1=women), Masculinity-femininity index, Generalized trust, Institutional non-compliance.	Age, Education, Employment status, Prior entrepreneurial experience (at individual level). Emerging economies – 1 for non-OECD countries (at national level).	Masculinity and gender inequality were positively ($p<0.01$) associated with the likelihood of starting a venture. This shows decrease in the likelihood of female for starting a business ($\beta=0.36$, $p<0.01$). Moderating effect of gender ad masculinity shows at lower masculinity index (=10), women are 3% less likely than men to start a business compared to women are 1% less likely than men to start a business ($p<0.01$) when country have higher masculinity index (=87), shows as the level of masculinity increases, the gap between men's and women's likelihood of starting a

					business decrease (shown by a plot diagram). Negative moderating effect of trust (β=-0.005, p<0.01) shows woman are less likely to start a business with higher generalized trust (as compared to men). When trust is low (=3), woman are 1.5% less likely than men to start a business vs 2.5% less like than men at high trust level (=58) to start a business. At a lower institutional noncompliance index (=1.3), women are 3.1% less likely than men to start a business than at a higher end of this index (=3.4) where woman are 0.7% less likely to start a business.
Kodama, Odaki; 2011	Survey data, for participants of government sponsored seminars on business start-ups, 1999 – 2003, Japan.	Probability of starting business	Gender	Age, Education, Prior managerial experience.	Result shows that female are less likely to successfully start a business with 5.9% lower probability of success than males. When controlling for managerial experience, woman have 11.0% higher probability (with managerial experience) than men (with no managerial experience) to start a business. However, men with managerial experience have 7.7% higher probability to start a business than women with no managerial experience. Using Cox's proportional hazard model, when we control for managerial experiences, women have higher probability (1.65 times) of starting a business with managerial experiences than men with no prior managerial experience. However, men have 1.43 times higher probability of starting a business with managerial experience than women with no managerial experience.
Schillo, Ebrahimi, 2021	Source-CapitalIQ 8164 Venture Capital founded in the last ten years. North America and advanced economies of Europe, 2008-2019.	Amount of funding in ($M) digital start-ups compared to hardware and biotechnology start-ups.	Proportion of women, Number of venture capitals.	Size, Location, Age.	The box plot diagram shows that more than 50% of companies in all fields do not list women among their professionals. The OLS regression result shows that the proportion of women has a significantly negative impact on the amount of venture funding received by digital, hardware, and biotechnology start-ups. The negative impact is small, showing strongest for digital start-ups (β=-0.070, p<0.01), than for hardware start-ups (β=-0.061, p<0.1), and biotechnology start-ups (β=-0.049, p<0.01). This shows that the participation of women is less in all three types of start-ups. As the amount of funding increases for these three start-ups, the proportion of women in the leading position will decrease.

Source: Author

TableA3: Importance of social capital in entrepreneurship

Study	Data	Depending variable	Variable of interest	Control Variable	Result / Conclusion
Pindado et al., 2018	Global Entrepreneurship Monitor (GEM), Adult population surveys (APS), 2004-2014. 1,877 new entrants in Europe.	Opportunity identification (new agricultural entrant, in the next six months will there be good opportunity to start a business or not)	Structural social capital (knowing someone who has started a business in the last two year), Cognitive social capital (considering entrepreneurship as a desirable career choice in the society, high social status, and respect).	Age, Age square, Gender, Firm size, Country wealth (lag of 1 year to avoid reversed causality problem).	In both model 1 (includes individual-level controls and predictors) and model 2 (adds country-level control), structural and cognitive social capital came highly significant determinant (at p<0.01 and p<0.05) in opportunity identification. This shows that knowing someone before who started a business in the last two years and considering entrepreneurship as a desirable career have significant effect on opportunity identification at the individual and country levels.
Steinfield et al., 2010	Online survey data to 244 biotech companies in the Medicon Valley biotech region. Denmark and Southern Sweden.	Market performance, Market exposure.	Index of social capital (extent to which people in the company knew and trusted others, provide advice and access to information and opportunity).	Number of employees, R &D, Production, and sales.	Regression analysis was performed to show the effects of social capital on the two measures of performance. Social capital was highly significant for both market exposure (p<.0001) and market performance (p<.05). The interaction variable of social capital with primary activity (here, R&D, and production and sales) shows the importance of social capital predictor for R&D of start-up firms and for production and sales.
Spiegel et al., 2016	Qualitative part-17 expert interviews, 2013-2014. Quantitative part-Social network analysis of 70 internet start-ups and their 145 founders, 2013-2014.	Successful and unsuccessful early-stage internet start-ups.	Social capital (founders' network centrality).	Human capital factors (education, work experience), Entrepreneurial skills, and Technological skills.	Based on the hypothesis that combined social capital of founders has a significant positive impact on the success of their early-stage internet start-up, the two-sided t-test showed a significant difference in the means of successful and unsuccessful start-ups at t=-3.283, p=0.002. However, the exact fisher test in both groups was not significant at p=0.606, showing equal variances between successful and unsuccessful start-ups. Of 70 samples, 21 (i.e., 30%) show that social networks have a significant positive influence on the success of their start-ups.
Z. Ma et al., 2018	226 self-administered questionnaires on Chinese returnee entrepreneurs' venture activities. Wuxi, China. 500 start-ups, 2014-2015.	Venture performance in China	Social capital - domestic and overseas (assessed using indicators capturing bonding-bridging, strong ties-weak ties, personal and social networks generated through family, relatives, friends, trade association, government agencies, etc.)	Gender, Age.	Domestic social capital leads to 0.17 times increase in the venture performance of returning entrepreneurs, whereas overseas social capital leads to 0.16 times (p<0.05). The interaction effect of domestic social capital and entrepreneurial environment shows a positive (an increase of 0.13 times) and significant (p<0.05) impact on venture performance.
Sara, Jonsson; 2014	Case study of six fashion start-up firms. Sweden, 2006. Total, 20 semi-structured interviews were conducted consisting of two phases.	Entrepreneurs' network evolution.	Social capital: structural dimension (firm's pattern of direct and indirect ties to other actors), relational dimension (nature of relationships that develop between actors), and cognitive dimension		Based on the findings of the case studies and interviews, the paper reveals that entrepreneurs create structural social capital (i.e., initiation of new network contacts) through cognitive attributes. The cognitive dimension (like, establishing relationships with actors/agents) has a relevant impact on network evolution in the start-up phase. The article showed the interrelation of three dimensions of social capital. The

			(shared system of meaning, representations, and interpretations among parties)		paper found that the cognitive dimension supports structural social capital, as well as the relational dimension (trust and social obligations) increases the cognitive dimension and vice versa.
Crupi et al., 2020	Thomson Reuters' Web of Science (WoS). Co-citation analysis (3,648 publications in 1990-2020) and Bibliographic coupling.				Cluster 1 showed social capital and its impact on entrepreneurship by investigating the roots of social capital by introducing and illustrating the form in which it can be expressed and occurs (the cluster showed the 10 most cited articles related to social capital and its impact on entrepreneurship). This cluster shows that social capital provides stimuli to potential entrepreneurs, directly and indirectly. The last group, that is, 5 explores the role played by social capital in family firms. From bibliographic coupling analysis, in cluster 1, it has highlighted that a strong social capital strengthens the relationship between the entrepreneur and external venture capital, which helps to benefit additional funds. Cluster 4 also shows the positive impact of SC on organizational performance. It shows that social capital builds all kinds of social network at the inter- and intra-firm level, helping entrepreneurs achieve better performance.
Landqvist and Lind, 2019	Case studies on a start-up and their networking behaviors. Sweden, 2015-2016.				This study added details along with showing the importance of social ties, role of venture capitalists and incubators to start-ups, on how specific resources through networking are combined in the use, production, and development settings of a start-up. The paper showed that business network settings and networking behaviors consist of strong and weak ties. The paper concludes that strong ties are crucial for resource combining when it comes to networking. The paper also emphasised weak links, as it helps in acquiring information and interaction for new opportunities. Therefore, we need to work on both ties – strong and weak - to become embedded in business networks.
Jayawarna et al., 2015	UK, 2004 and 2006. Sample of 211 respondents.		Social network (strong ties, weak ties, and brokerage)	Age, Education, Firm size, Firm age, Business sector, Home base businesses, Growth aspiration, Gender.	Strong ties and brokerage came significant in all the three methods. However, weak ties came significant in payment related method only. Moderation supports social ties with gender (for female) and was significant in joint utilization ($t=-2.699$, $p<0.01$) and the owner-related method ($t=-2.733$, $p<0.01$). The method related to the female brokerage and payment was significant ($t=-3.174$, $p<0.01$), however moderation supports the male brokerage and joint utilization ($t=2.312$, $p<0.05$). For weak links, the interaction between men with payment-related bootstrapping was significant ($t=2.105$, $p<0.05$).

Source: Author

The Impact of the COVID-19 Pandemic and the Energy Crisis on Municipal Budgeting in Slovakia.

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Abstract
Representatives of Slovak municipalities elected in the 8th election cycle were exposed to two major challenges during most of their mandate. The first challenge began in March 2020 with a situation that had no precedent in the country's modern history. After an almost two-year crisis and an apparent calming of the emergency situation, an unprecedented invasion by the Russian aggressor has been launched in the eastern neighbour. The war in Ukraine triggered not only a humanitarian crisis, which was felt by the local governments, especially in the Prešov and Košice regions. EU countries, including Slovakia, responded to this situation by providing a large amount of financial resources, material aid, but also by introducing additional sanctions against the Russian Federation, which resulted in huge volatility on the energy market.
The aim of our work was to measure the impacts of representatives who led cities and municipalities during the period 2018-2022 and had these experiences. Out of the total number of almost 2900 municipalities, we managed to get 448 responses across the country during the last weeks of the mandate. The results indicate that the majority of municipalities felt negative impacts and had to take restrictive measures, limitations in the provision of public goods and investments. The results also pointed to insufficient assistance from the central government to municipalities.

Keywords
Local government, Municipalities, COVID-19, Slovakia

JEL Classification
H12, H71. H79

1 Introduction

At the beginning of 2020, parliamentary elections were held in Slovakia, the result of which led to a change of government after 8 years of social democrat rule. They were replaced by a coalition composed of centre-right parties. The main topic of political discussions was transparency, corruption, and reforms. However, in the process of transferring power, a new threat emerged that affected the entire world. The coronavirus pandemic has affected every aspect of everyday life, from entrepreneurs, businessmen, employees, children and students to public administration. The government has taken drastic measures in order to reduce movement and fight against the spread of the coronavirus. The government closed many shopping centres, schools, sports and cultural events, which also fell under the jurisdiction of the local governments.

Local governments in Slovakia are composed of regional (8 self-governing regions) and local level, which is quite fragmented in European comparison (141 cities and 2749 municipalities). The COVID-19 pandemic caught municipalities in the middle of the election cycle. At the same time, local governments were exposed to the biggest challenge since their creation in 1990, or since the independence of the Slovak Republic in 1993. The Government of the Slovak Republic has transferred many tasks to local governments, especially from Prime Minister Igor Matovič, who came up with the idea of nationwide testing for COVID-19.

After the apparent recovery from the crisis, in early 2022, the Russian invasion began in the neighbouring country - Ukraine. In this case, municipalities were the first to provide the assistance with registration, accommodation of refugees, provision of information and other activities. Moreover, the effects of the crisis were not only humanitarian, but were accompanied by sanctions on the Russian Federation from the countries of the European Union or NATO. The sanctions work both ways and had the most significant impact on the commodity and energy markets.

The article focuses mainly on local governments and representatives' views on help from the central government in both crises - pandemic and inflation. The main source of municipal income is mainly a single share tax, specifically the tax on the income of natural persons. Its outage could be observed especially during the first months of the COVID-19 pandemic.

2 Literature Review

2.1 Impact of COVID-19

Studies examining the impact of COVID-19 began to appear almost immediately after its global outbreak. Mostly, it was initially about research in the field of medicine or epidemiology. Green, D. and Loualiche E., (2021) focused on research into state and local government job cuts related to the pandemic. Employment in Slovakia was investigated by Kramarova, Švábová, & Gabrikova (2022).

In the summer of 2020, one of the first researches in the field of finance was carried out by the Organization for Economic Co-operation and Development (OECD) and the European Committee of the Regions (CoR). They focused on regional and local governments and their perception of the possible economic impacts of the pandemic. The work resulted in a concern with tax collection and a negative impact on budget revenues and expenses. In particular, larger municipalities expected a greater negative impact than municipalities with a smaller number of inhabitants. In this research, the smaller municipalities were up to 10,000 inhabitants. (OECD - CoR, 2020). Ahrens and Laurence (2020) examined the financial resilience of local governments in England. Nemec and Špaček (2020) examined the impact of COVID-19 on Czech and Slovak municipalities. According to their investigation, the central governments did not respond sufficiently to the situation arising in connection with the pandemic. The provision of resources for the fulfillment of legal tasks was insufficient. Čajková, Šindleryová, Garaj (2021) observed in their analysis how the Slovak government, through the Ministry of Finance of the Slovak Republic, provided additional financing to cities. The analysis was carried out on a sample of all 141 cities and focused on the impacts of COVID-19.

From the point of view of public finances, the role of decentralized units and thus also municipalities was subordinated to the central government during the COVID-19 period. As Agrawal and Bütikofer (2022) point out, in times of emergency, decentralized policy-making may not internalize externalities or address public health spillovers across jurisdictional boundaries. However, the role of regional and local governments was in the administration of orders related to the pandemic - masking orders, decisions to close schools, vaccine distribution, social insurance policies. The main argument for centralization was the classic cross-jurisdictional externalities and spillover effects already mentioned. Local governments in Slovakia assisted, for example, with widespread testing for COVID-19. Slovakia was the first country ever to take such measures. At the end of October 2022, the municipalities, in cooperation with health workers, tested almost all citizens using a rapid antigen test, after which individuals who tested positive and their close contacts were advised to isolate themselves. (Mercer, Salit, 2021).

There are various studies on the research of political leadership and the issue of municipal management, such as Plaček et al. (2021). The authors of the research examined the reaction of municipalities to the external shock caused by the crisis in the Czech Republic. The authors' analysis of the problem of local government responses to the pandemic crisis shows that local government representatives responded with different (non)adaptive strategies. Certain framework factors seem to have influenced the behavior of different local governments. Bouckaert et al. (2020) argued that the coronavirus crisis showed that EU countries are still relatively unprepared for crisis management. They focused on Belgium, France, Germany and Italy, four countries that represent different models of administrative systems in Europe. They point to several factors, such as national administrative standard operating procedures in crisis preparedness and accountability mechanisms, dynamic learning, contingencies, rapid feedback. The document also highlighted the importance of coordination between all levels of government.

2.2 Russian agression on Ukraine and energy crisis in Europe

The February 2022 Russian invasion of Ukraine exposed the shortcomings of energy independence in Europe and the short-sightedness of elected representatives for the past decade. Since 2014, when Russia started the conflict by occupying the Crimean peninsula, Europe has been highly dependent on natural resources from the

Russian Federation, especially fossil fuels and gas (Kuzemko et al., 2022). According to several indicators, the Slovak Republic, as well as other countries within the V4, are one of the most dependent on fossil fuels from Russia and therefore the most vulnerable (Sturm, 2022).

Studies devoted to the impact of the energy crisis are currently very rare, even with regard to the availability of data. Therefore, even this study, carried out as a survey of local governments, should join the dialogue about the impact of the energy and inflation crisis on local governments. In the course of 2022, various political statements are mainly available, which envisaged assistance to municipalities from the central government. On the contrary, the central government adopted measures that had a negative impact on the management of local governments, namely the increase of the tax bonus, which significantly drains the revenues for regional and local governments (Dujava et al., 2022).

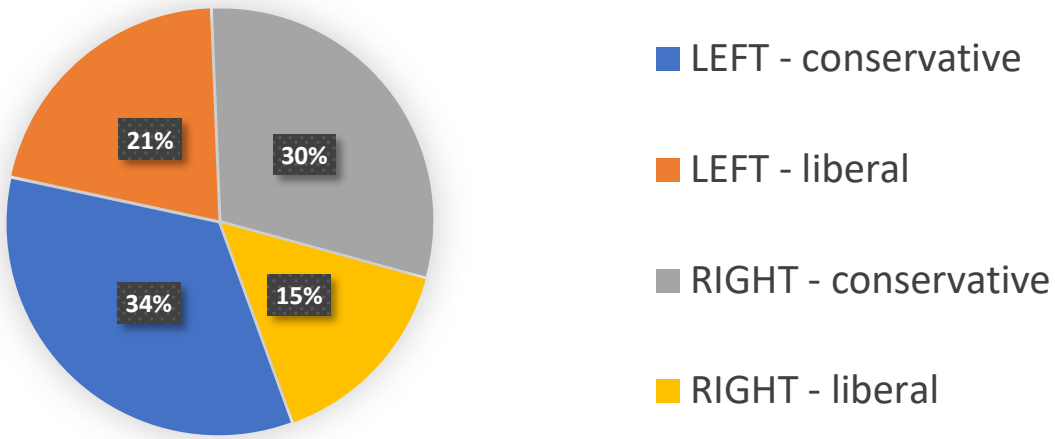
3 Methodology and Data

This chapter focuses on specifying the relevant data collection process and describing the sample we selected. The data was collected in the period from September 28, 2022, to November 21, 2022. The main goal was to present the opinions of local government representatives of the 8th election cycle on two major crises during their mandate in the period 2018-2022.

Out of a total of over 2900 e-mails sent, we managed to contact 1082 mayors, of which 448 filled out the questionnaire completely, 136 elaborated the questionnaire, but did not complete it. The return rate of the questionnaire was 41%. The questionnaire was conducted via the website click4survey.cz with 3 parts. First, the deputies were asked 11 questions, which aimed to categorize the sample according to age, gender, education, profession before the elections, term of office of the mayor/mayor, political affiliation in other elections, political ideology of the mayor, as well as the size of the municipality, region, and the presence of the marginalized Roma community. The second part of the questionnaire was focused on the consolidation reform, which is not part of this research. The last section contained 9 questions regarding the impact of the pandemic on local governments, on the extent of revenue shortfalls caused by crises. Further, the issues of covering these losses and extending assistance from the central government were examined.

The majority of respondents who filled out the questionnaire were men. They accounted for up to 67% (302 responses), in contrast, women accounted for approximately one third (146 responses). In terms of age, up to 42% of all mayors were aged 50-59 and 30% were over 60 years old. From the point of view of education, secondary education with a high school diploma (42.4% - 190 answers) and second-level university education (41.5%, 186 answers) dominated the most. For women, these percentages were slightly higher. Based on political affiliation, independent candidates prevailed, making up 42% of respondents (187 answers). On the basis of party affiliation, SMER-SD had the most representatives with 27% (123 responses), the minority party MOST-HÍD with 6% (26 responses), and Christian democrats from the KDH with 5% (23 responses). Other parties such as SNS, SMK, liberal party SaS (Freedom and Solidarity) had less than 5%. Roughly 10% consisted of various coalitions across the political spectrum.

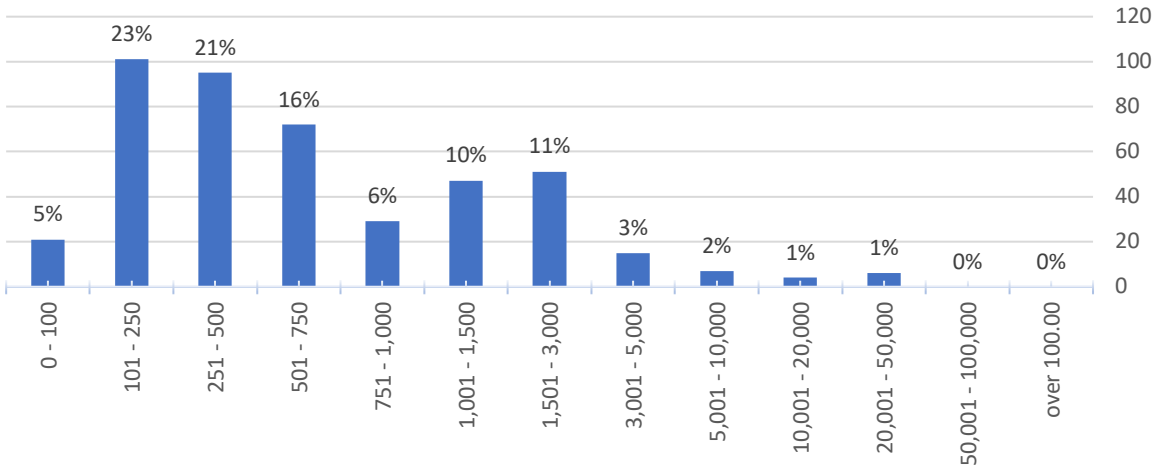
Figure 9. Distribution of municipalities by political orientation



Source: own research

Since it is possible to run as an independent candidate in municipal elections to self-governing units, an option to classify your political ideology was added to the questionnaire. 54 percent of independent candidates (101 responses) were inclined towards right-wing ideologies, where 60% of them were more conservative and 40% liberal minded. The remaining 46% of independent candidates (86 responses) leaned to the left, where the ratio was similar 57:43 in favour of the conservatives. As can be seen in *Figure 1*, from the total sample of 448 respondents, the ratio was reversed, and more left-wing (55%) and conservative politicians (64%) were represented in the questionnaire.

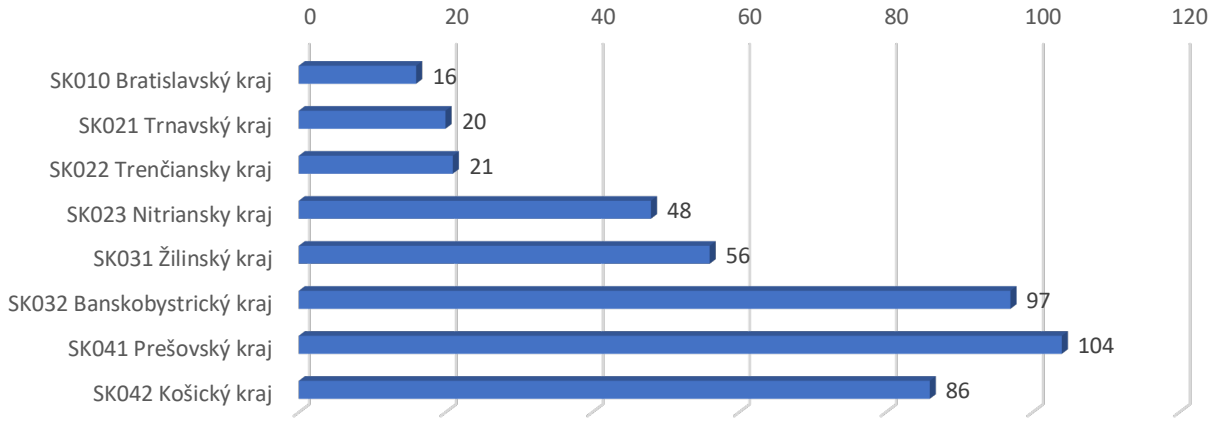
Figure 10. Distribution of municipalities by size group



Source: own research

Figure 2 and show the representation of municipalities in terms of their size and *Figure 3* in terms of the region in which they are located. approximately 45% of the municipalities that we will use in further research as small municipalities have up to 500 inhabitants. Municipalities with more than 500 inhabitants make up 55%, with the absolute majority having a maximum of 5,000 inhabitants. The three most populous regions with the largest number of municipalities - Prešov region, Banská Bystrica region, Košice region - have the largest representation of up to 64%. Representatives from Bratislava and Trnava Regions had the smallest representation (4%).

Figure 11. Distribution of municipalities by region



Source: own research

In the process of interpreting the survey results for municipalities, we will focus not only on political affiliation, which we highlighted here, but also on the geographical and size group of individual municipalities.

Moreover, we are mainly interested in the difference, how these crises were managed by smaller municipalities and what are their expectations for solving the energy crisis.

4 Empirical Results

The following chapter presents the results of our research. The COVID-19 pandemic has affected the majority of Slovak cities and municipalities. As can be seen in Table 1, only 6 percent of municipalities claim that they did not experience any revenue shortfalls in their budgets caused by the measures to suppress the coronavirus. Almost 40 percent of respondents in smaller municipalities did not give an answer, and in larger municipalities with more than 500 inhabitants, approximately 36 percent did not. On the contrary, almost a third of the respondents were affected, regardless of size. Moreover, up to 27 percent of the mayors reported a great influence, in smaller municipalities it was almost a quarter, in larger ones almost a third.

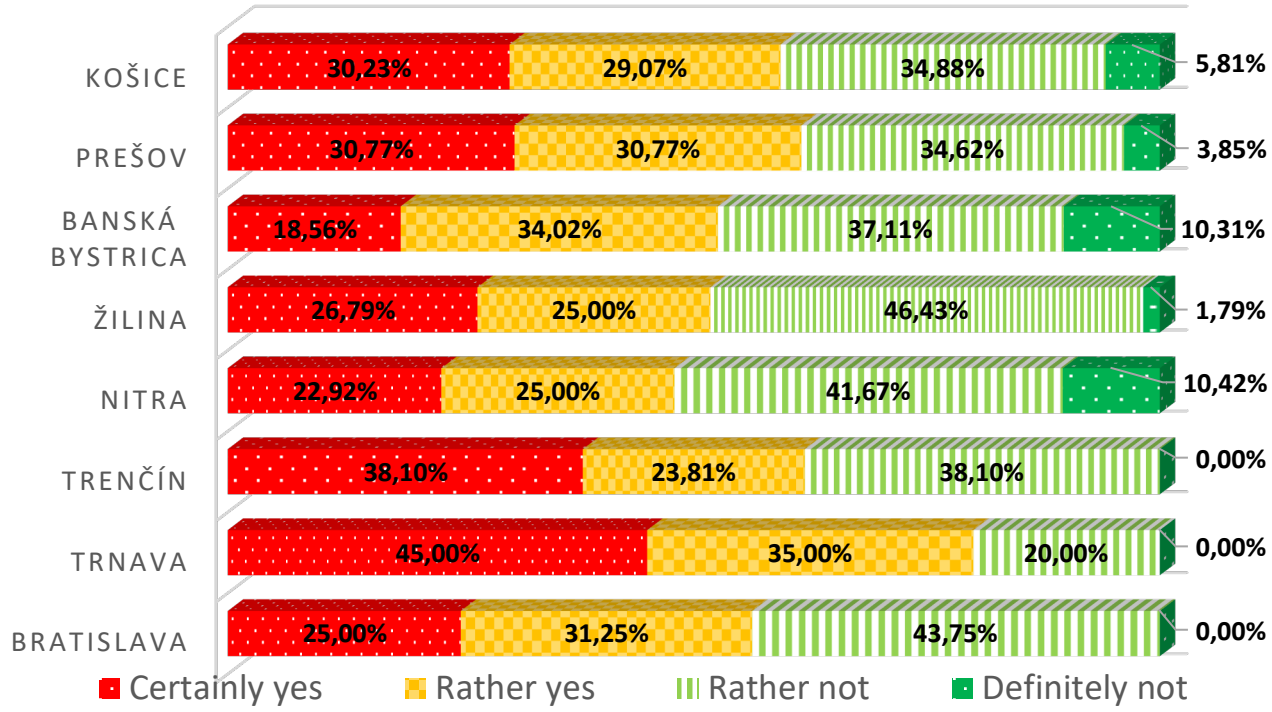
Table 9. Were your municipality affected by a loss of revenue due to COVID-19?

	Full sample	0-500 inhabitants	500+ inhabitants
Definitely not	6%	7%	4%
Rather not	37%	39%	36%
Rather yes	30%	31%	29%
Certainly yes	27%	24%	31%

Source: own data

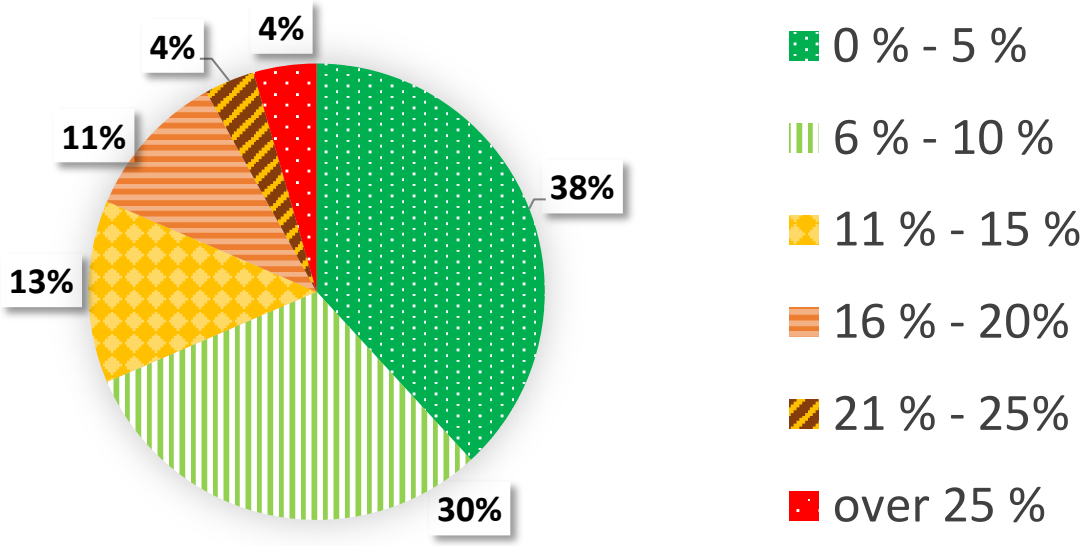
A more detailed geographical overview can be seen in Figure 4, which examines opinions based on the regions to which the municipality belongs. In eastern Slovakia, approximately 60% of municipalities were affected. The figures for these regions are very similar. 30% of all municipalities rather felt the negative impacts of covid on the budget and 30% felt moderately strong impacts. In central Slovakia, where Žilina region and Banska Bystrica belong, similar results were also achieved. Approximately half of all municipalities felt a negative impact on expenses, while in the Žilina region it was more than a quarter of the respondents, in Bánska Bystrica it was almost a fifth of the mayors. In western Slovakia, the smallest impact was in the Nitrian region. The greatest influence was perceived by mayors in Trnava and Trenčín regions. From the point of view of ideology, communities led by right-wing politicians felt more like 60%, left-wing ones about 54.88%. Conservative politicians were also more critical at the level of 60% and mayors with a more liberal political affiliation assessed the impacts at 53%.

Figure 12. Were your municipality affected by a loss of revenue due to COVID-19?



Source: own data

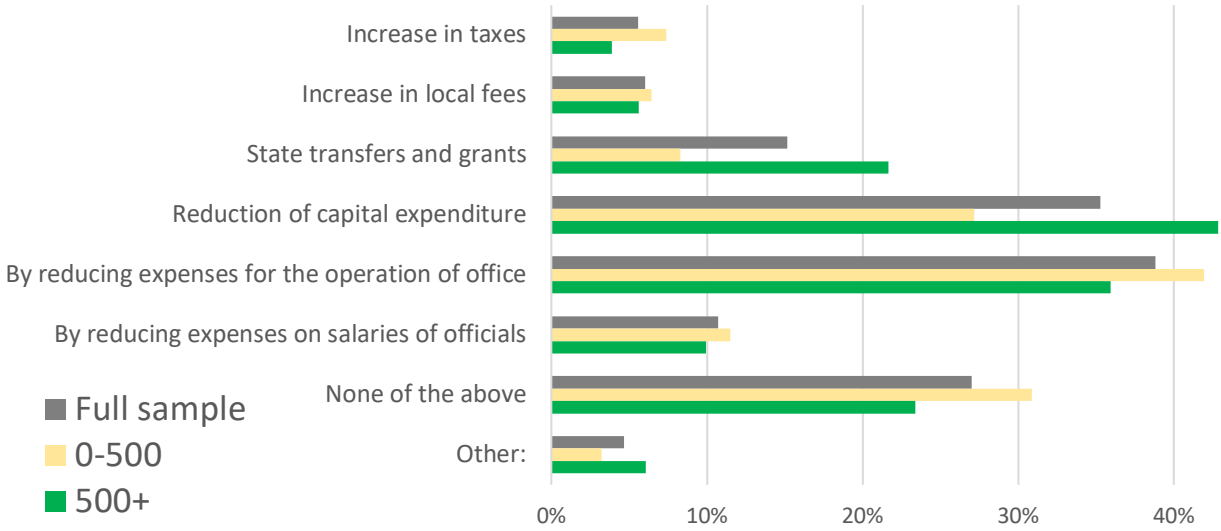
Figure 13. Percentage of revenue shortfalls for self-government as a result of COVID-19



Source: own data

When quantifying the negative impact of covid on income, we can state that up to 38% of the respondents recorded a decrease in expenses of less than 5 percent, as can be seen in *Figure 5*. Based on the regions, the lowest drop was in the Nitra region, where this decrease was up to half, on the contrary, in the Trnava region only a quarter had a shortfall of up to 5 percent. 30% of municipalities had a shortfall in the area of 6% - 10%. Approximately 24% of the mayors reported that their shortfall was in the range of 11% - 20%, and 8% of municipalities recorded a shortfall of income above 20%. Municipalities have taken various measures to cover these shortfalls in the budget, as can be seen in *Figure 6.*

Figure 14. Measures to cover revenue shortfalls during the COVID-19 pandemic



Source: own data

Municipalities tried to save resources mainly on their overheads. This option was mentioned by 39% of the respondents. It was more common in small municipalities than in larger ones. Conversely, larger municipalities with more than 500 inhabitants tried to save by reducing capital expenditures and investments (43%). In smaller municipalities with less than 500 inhabitants, there was a reduction in only 27% of respondents. Up to 22% of larger municipalities covered the shortage through state transfers, smaller municipalities covered these shortages through subsidies only 8%. Every tenth self-governing unit tried to save expenses by reducing the salaries of its representatives. Raising taxes was not the preferred option during the pandemic. Only 6% of local governments used this option. Approximately one third did not use any of the mentioned measures. Respondents who marked the option other mentioned mainly loans, rational management, or interest-free loan.

In the last question regarding the impact of COVID-19, the representatives were confronted with the question of the assessment of the central government and the sufficiency of the measures to help local governments. On a scale of 1 to 5, where 1 – the most negative assessment and 5 the most positive. As much as half of the respondents expressed that the government failed to support local governments, and a quarter of the mayors were more negative. A third of the representatives of local governments could not assess the role of the central government, and only 5% of the respondents perceived the help to local governments positively. In terms of political affiliation, almost 60% were the most critical left-wing politicians, while the right-wing candidates were, on the contrary, the most lenient.

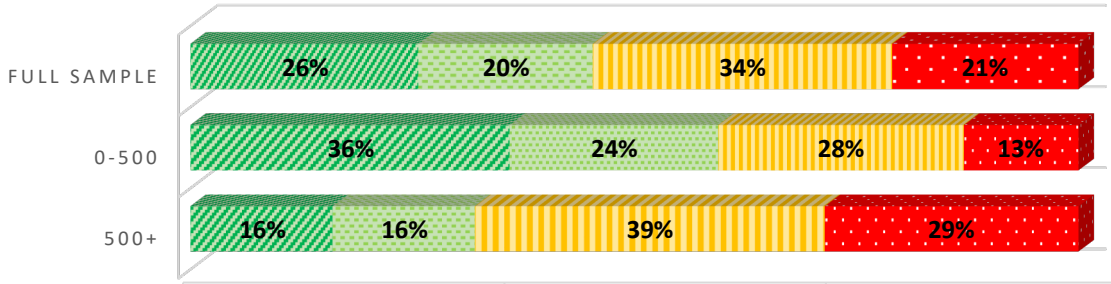
Table 10. Do you think that the central government has done enough support for local governments?

	Definitely not	Rather not	Neither	Rather yes	Definitely yes
LEFT-WING	59,35%	21,54%	15,04%	2,85%	1,22%
RIGHT-WING	43,07%	27,72%	23,27%	4,95%	0,99%
LIBERAL	46,30%	29,63%	17,28%	4,94%	1,85%
CONSERVATIVE	55,24%	21,33%	19,58%	3,15%	0,70%
FULL SAMPLE	52,01%	24,33%	18,75%	3,79%	1,12%

Source: own data

In the second part of the results, we focus on the second main crisis, which tested the representatives of local governments elected in the eighth electoral cycle. The answers show that only a quarter of the municipalities have not felt any consequences so far (as of November 2022). Moreover, one fifth of the mayors describes a slight negative impact of the energy crisis and increased prices. Moderate influence is reported by a third of the elected representatives and significant influence by approximately 21%. It is clear from the data that smaller municipalities have not yet felt the impact of increased electricity and gas prices as in larger municipalities (see Figure 7).

Figure 15. Was your village affected by the effects of the energy crisis?

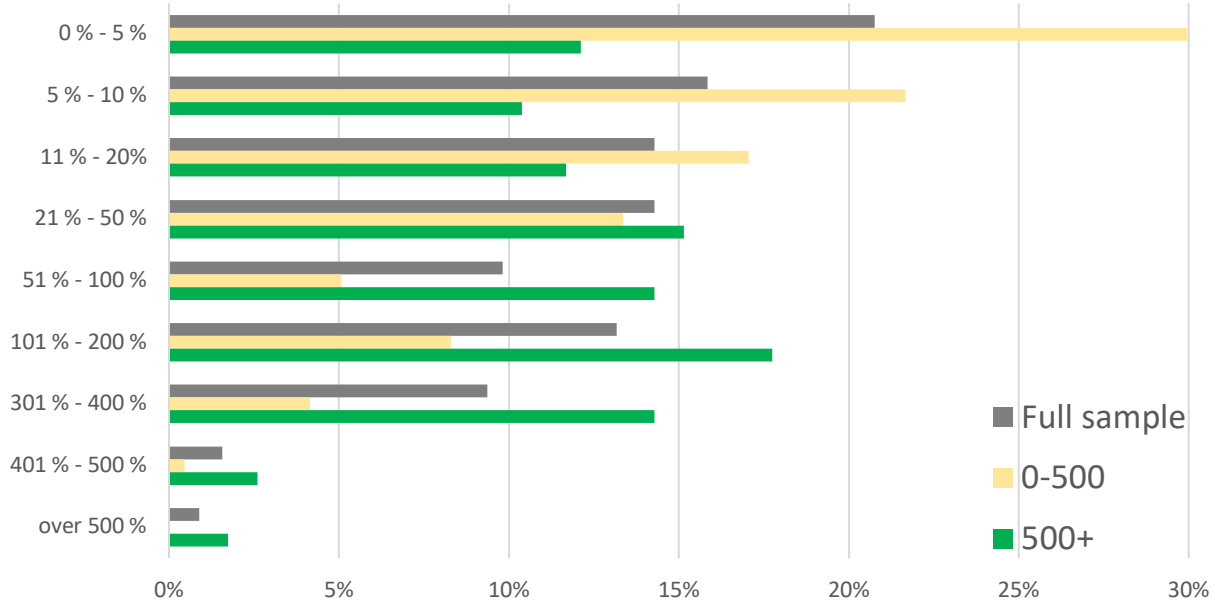


	500+	0-500	Full sample
Not yet	16%	36%	26%
Minimal impacts	16%	24%	20%
Medium impacts	39%	28%	34%
Significant impacts	29%	13%	21%

Source: own data

The specific quantification can be observed in Figure 8, where it is possible to see the increases in energy prices in percentages. It can be observed that half of the municipalities with up to 500 inhabitants had an increase of up to 10%, and only a quarter of the larger municipalities had it. On the contrary, the increase over 100% was only in 12% of smaller municipalities, while the increase was in 36% of larger municipalities. Some local governments even recorded an increase of over 500%.

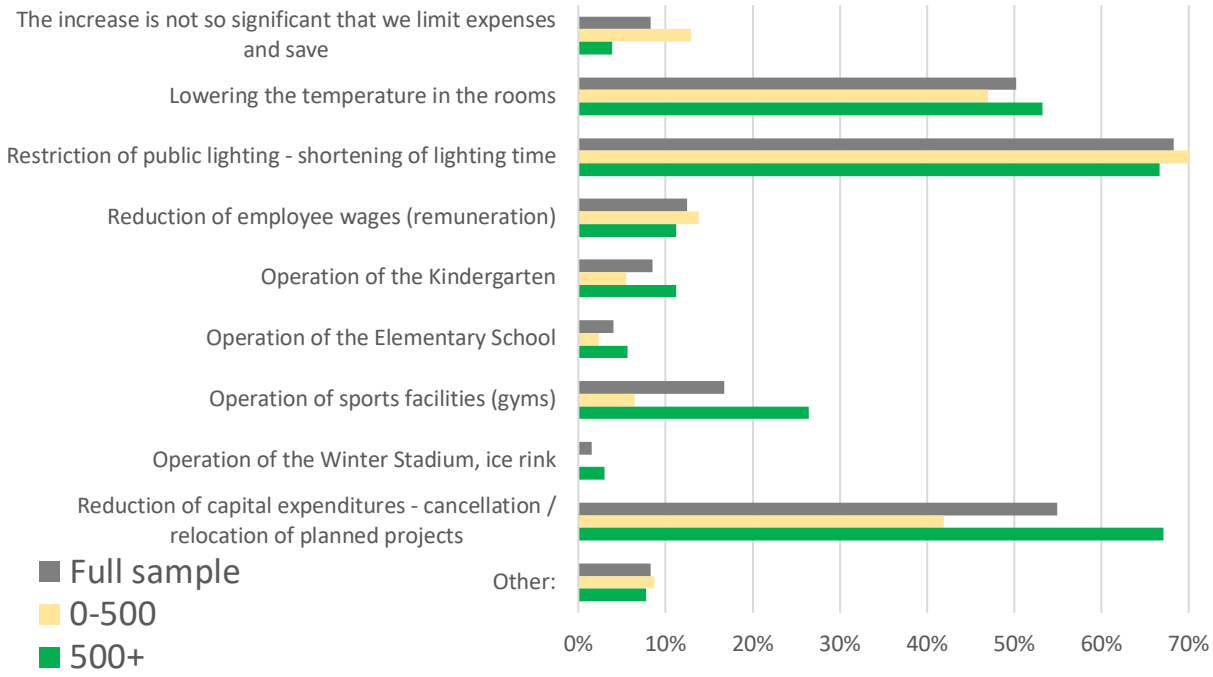
Figure 16. How big an increase in energy have you noticed in the last period?



Source: own data

Based on these figures, almost 70% of local governments, regardless of size, decided to adopt restrictions on public lighting and reduce the time of lighting, or some municipalities limited the lighting of some street lighting poles. Half of the respondents, regardless of the size of the municipalities, accepted saving when setting up the room heating. Similar to the COVID-19 crisis, local governments have cut back on capital spending and many projects. Such Savings were mainly undertaken by larger municipalities (up to 67%) compared to small municipalities, where this number was 42%. Other measures were the reduction of costs for the administration of elementary schools and kindergartens, or the operation of sports halls and facilities. Only 4% of larger municipalities did not have to take any measures, in the case of smaller municipalities it was 13%.

Figure 17. Where will you look for savings in reducing energy expenses?



Source: own data

Regarding the trust of local government representatives in the central government and its ability to manage and solve the problems of high prices for local governments in the coming period. As many as three quarters of the mayors said that they do not expect a solution from the Slovak government (see Table 3). The most skeptical were the left-wing politicians, where the trust was just over 23%, the right-wing mayors had this trust at the level of 37%. From a regional point of view, the greatest level of mistrust was in the Bratislava region and the Žilina region with almost 80% of mistrust in finding a national solution to energy prices. On the contrary, the highest level of trust was in the Košice, Trenčín and Nitra regions, where a third of local government representatives expected a favorable resolution of the impact of the crisis on local governments.

Table 11. Expectation that central government to solve the problem of high energy prices for municipalities

	Definitely not	Rather not	Rather yes	Definitely yes
LEFT-WING	24,39%	52,85%	14,63%	8,13%
RIGHT-WING	18,32%	45,05%	24,75%	11,88%
LIBERAL	16,05%	54,32%	19,75%	9,88%
CONSERVATIVE	24,83%	46,50%	18,88%	9,79%
FULL SAMPLE	21,65%	49,33%	19,20%	9,82%

Source: own data

5 Conclusion

The main goal of this paper was to capture the opinions of representatives of local governments on the two most significant crises in the modern history of the Slovak Republic. On a sample of 448 respondents, who were mayors of municipalities elected in local government elections in the period 2018 – 2022. For the purposes of this study, a questionnaire was implemented at the end of the mandate before the new elections in October 2022. In the questionnaire, we were interested in opinions and perspectives on crisis management and assistance by the central government.

The results of the research indicate that almost 60% of municipalities were affected by negative impacts on the revenue side of budgets. While larger municipalities felt these impacts more intensively than small

municipalities with less than 500 inhabitants. From a regional point of view, representatives from the Trnava region, the Trenčín region and the regions of Eastern Slovakia perceived the consequences the most. The municipalities in the Nitra region and the Žilina region felt the least impact. About 30% of the municipalities experienced outages of more than 10%. In order to compensate for expenses, municipalities tried to save on the running of the administration, regardless of size. Representatives of larger local governments saved more on capital expenditures and financed losses through state transfers. When evaluating the assistance from the central government, only a little over 5% of respondents were satisfied. High dissatisfaction dominated among left-wing politicians sympathetic to the opposition. The least dissatisfied were the elected representatives and the right-wing liberal mayors.

When assessing the impact of the energy crisis in 2022, only a quarter of all municipalities answered that they did not experience any impact of the pandemic. In larger municipalities it was only 16%, the mayors of smaller municipalities did not register the impact of the crisis in about a third of cases. A moderate and very significant impact was felt by up to 68% of municipalities with over 500 parishioners. In 36% of larger municipalities, the increase was over 100%, while some municipalities recorded an increase in energy prices of over 500%. Similar to the COVID-19 crisis, the municipalities did not rely only on state support and took energy-saving measures. Almost 70% of municipalities reduced the time for using public lighting, and roughly 50% tried to save by lowering the temperature in the objects they owned. In larger municipalities, there was again a decrease in capital expenditure. They were also caused by the increase in the prices of building materials. Distrust in solving the problem after the experience with COVID-19 remained at around 70% and only 10% of representatives were convinced that the central government would solve the energy situation.

Limitations of the research clearly include a lack of time, as the questionnaire was conducted during an intense election campaign and a large number of questions. In the future, it would certainly be better to continue to monitor the given issue on a similar sample with a time gap and to ask about the main reasons for the negative assessment of the central government by local government representatives. The results of the contribution are based on a questionnaire survey conducted among representatives of municipalities who were willing to answer the questions sent. As it is known, results based on a questionnaire survey are always highly debatable, and not only because of their return. The relevance of the established facts apparently corresponds to the majority opinion in society. In the future, it would be necessary to compare these answers with real facts from the point of view of the state of municipal budgets, e.g. analysis of income and expenditure budgets, or management of municipalities before and after the realized crisis. In our analysis, we tried to minimize the political reasons for mistrust of the government and therefore also took political affiliation into account. We hypothesized that left-leaning politicians would evaluate state aid more negatively than pro-government-leaning mayors. This was fulfilled to a certain extent, although it would be possible to add a question about government support in the research.

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Review of the Literature on the Use of Multi-Criteria Decision-Making Methods for Employee Evaluation

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Abstract
The organization achieves its goals only if its employees achieve high work performance. Therefore, measuring individual performance is one of the key success factors for any organisation. In practice, several different methods are used to evaluate employees, among which we can also include multi-criteria decision-making methods (MCDM). There are not many literature reviews on the use of MCDM methods in the field of human resources. This paper is focused on the state of the art of existing studies that deal with employee evaluation using MCDM. The aim was to perform a frequency analysis of the methods used in these studies. Furthermore, the advantages and disadvantages of methods encountered by the authors were identified. The occurrence of the evaluation criteria used was analysed, and companies in which the employee evaluation was carried out, also. Other aspects such as dynamics or uncertainty were also analysed. As a result of this paper was the identification of the most used MCDM methods and evaluation criteria that are used in the evaluation of employees. The results were summarised in tables or graphs.

Keywords
employee evaluation, human resources, MCDM, performance management.

JEL Classification
D81, M12, M5, O15, Y1

1 Introduction

Human capital is one of the most important parts of all companies. It helps them achieve their goals and maintains their competitive ability in the market. Therefore are human resources considered a key success factor for the implementation of policies and practices of organizations (Popović, 2021). Human resources must be managed properly to create added value for the organization. Employee evaluation is an effort to make an assessment of one's achievements that aims to increase staff productivity, which can increase company productivity (Nurhayati, 2019). Performance management is critical to HR success.

Performance management is a process used in many organisations to evaluate an employee's performance to increase their future contribution to the organisation. Under the term performance management, we can imagine many things, such as setting work goals, determining performance standards, providing performance feedback, determining training or distributing rewards. Many companies think that the current performance management process is outdated and are looking for new ways to achieve performance management goals (Lidinska and Jablonsky, 2018).

For personal evaluation and selection, it is necessary to use qualitative and quantitative criteria that describe key information about employees. For this problem is very useful multi-criteria decision-making (MCDM) methods (Samanlioglu et al., 2018).

Traditional personal evaluation methods are subjective and one-sided and do not provide objective feedback like the 360° personal evaluation, which according to Gürbütz (2012) was very popular in the last decade. Managers want to motivate and help to advance their employees based on objective sources or information (Gürbüz, 2012). In this situation, multi-criteria decision-making (MCDM) can be used. MCDM is used for performance evaluation or selection of several alternatives or selection of the best alternative from several alternatives. MCDM works on the basis of certain criteria that can be determined by several decision-makers. Some examples of methods are the Technique for Order of Preference by Similarity to Ideal Solution

(TOPSIS), Simple Additive Weighting (SAW), Analytic Hierarchy Process (AHP) and Preference Ranking Organization Method for Enrichment of Evaluations (PROMETHEE) (Widianta et al., 2018).

This paper is focused on an analysis of the literature review. The main topic of the literature review is the use of MCDM methods in human resources. There are 1 main question and 3 other questions, which are in the methodology section. All questions are answered in the result section. The methodology section contains search criteria of the literature, and databases where were found, too. The result section contains graphs and tables which demonstrate answers to all declared questions.

2 Methodology

The main question of this review of the literature is: Which methods of multi-criteria decision-making are used in human resources, namely in the evaluation and selection of employees? Other questions of this research are the following:

- How much and which criteria are used in this problem?
- How much and which alternatives are used in this problem?
- How do authors deal with uncertainty?

The criteria used for the search of the literature were as follows:

- MCDM AND employee evaluation
- MCDM AND human resources
- MCDM AND performance management
- MCDM AND employee selection

The selection of literature relevant to this research was made considering the questions asked previously. The emphasis was placed on articles with practical examples and numerical examples. Some articles were discarded because they were not in English or Czech language. Some articles were too general, so were also discarded. Some articles are cited quite often, with 357 citations (Güngör et al., 2009), others very few, with one citation (Minal and Metkewar, 2016). The literature was searched in databases Scopus, Web of Science, Google Scholar and EBSCO.

3 Results

In the field of human resources, the use of MCDM methods is very common. MCDM methods are used in various countries such as Poland (Kuzior et al., 2022), the Czech Republic (Lidinska and Jablonsky, 2018), India (Haque et al., 2012), Indonesia (Sumarno et al., 2021), Turkey (Samanlioglu et al., 2018), Egypt (Abdel-Basset et al., 2020) and USA (Haddad et al., 2019).

They are used in many companies from different industries, such as university (Erkan and Erdebilli, 2012), dairy company (Samanlioglu et al., 2018), transportation company (Stević et al., 2020), textile factory (Ulutas et al., 2020), automobile manufactures (Nobari et al., 2019), and shipping company (Massami and Manyasi, 2021).

MCDM can be used for employee evaluation (Thakre et al., 2017), employee recruitment (Dursun and Karsak, 2010), or for employee selection for promotion (Akmaludin et al., 2018).

30 relevant articles that met the criteria mentioned above for this review of the literature were selected. These articles are listed in Table 1, which includes the name of the author, year of publication, and a brief description of the article.

Table 1. Description of the selected publications

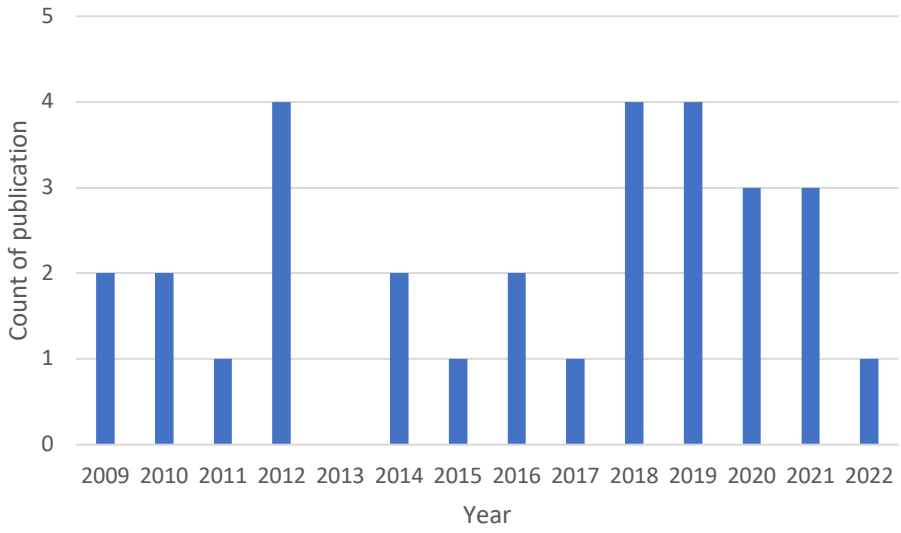
Author and Year	*Main contribution*

Anisseh et al. (2009)	Aggregating group MCDM problems using a fuzzy Delphi model for personnel performance appraisal.
Güngör et al. (2009)	A fuzzy AHP approach to personnel selection problem.
Dursun and Karsak (2010)	Personnel selection using fuzzy TOPSIS.
Lin (2010)	Personnel selection using ANP and fuzzy DEA.
Li et al. (2011)	Building a qualitative recruitment system via SVM with the MCDM approach.
Erkan and Erdebilli (2012)	Selection of academic staff using fuzzy AHP.
Gürbüz (2012)	Multiple criteria human performance evaluation using Choquet Integral
Haque et al. (2012)	Employee selection and recruitment processes of a leading Indian information technology company.
Wu et al. (2012)	Performance evaluation of aircraft maintenance personnel using a fuzzy AHP and VIKOR method.
Gürbüz and Albayrak (2014)	An engineering approach to human resources performance evaluation. ANP, Choquet Integral, and MACBETH are used.
Singh and Aggarwal (2014)	AHP and DEA are used for manpower performance evaluation.
Karabasevic et al. (2015)	Personnel selection by SWARA and ARAS methods.
Ishizaka and Pereira (2016)	Portraying an employee performance management system based on PROMETHEE, ANP, and GAIA.
Minal and Metkewar (2016)	To propose a model for ranking the performance of the employees of the FMCG sector. In this paper, the authors have used the Min-Max method.
Thakre et al. (2017)	A fuzzy logic multi-criteria approach for evaluation of teacher's performance.
Akmaludin et al. (2018)	The employee promotion is based on specification job performance using AHP, and ELECTRE methods.
Lidinska and Jablonsky (2018)	The article is focused on an application of the AHP to the performance evaluation of employees of a management consulting company.
Samanlioglu et al. (2018)	A fuzzy AHP–TOPSIS-based group decision-making approach to IT personnel selection.
Widianta et al. (2018)	Comparison of multi-criteria decision support methods (AHP, TOPSIS, SAW and PROMENTHEE) for employee placement.
Ferreira et al. (2019)	Design of an integrated MCDM model to support the selection of qualified personnel in distribution science with the use of the AHP-TOPSIS method.
Haddad et al. (2019)	Evaluation of employee performance by AHP and PROMETHEE II.
Nurhayati (2019)	Application of the computer-assisted AHP method to evaluate employee performance.
Nobari et al. (2019)	Improve the employee evaluation system in one of the leading automobile manufacturers by designing a fuzzy decision support system.
Abdel-Basset et al. (2020)	Selection of the most appropriate candidates by AHP-TOPSIS to fill well-defined vacancies up.
Stević et al. (2020)	A novel integrated FUCOM-MARCOS model for evaluation of human resources in a transport company.
Ulutas et al. (2020)	A new hybrid MCDM model for personnel selection based on a novel grey PIPRECIA and grey OCRA methods.
Massami and Manyasi (2021)	Analysis of determinants of work performance for seafarers based on fuzzy ELECTRE method.
Popović (2021)	An MCDM approach for personnel selection using the SWARA and CoCoSo methods.
Sumarno et al. (2021)	Employee performance evaluation in the Defense Ministry in Indonesia based on AHP and system dynamics.
Kuzior et al. (2022)	Employee attitudes towards employee evaluation systems.

Source: Own processing

As shown in Figure 1, the use of MCDM in human resources has increased quite a bit in recent years. This indicates that nowadays the use of multi-criteria methods in the evaluation or selection of employees is popular. The most published articles on this topic were in 2012, 2018 and 2019, namely four. In 2013, none of the thirty selected articles were published.

Figure 1. Distribution publication by year



Source: Own processing

The most widely used MCDM method in the selected articles is the AHP method and her fuzzy alternative. AHP appeared in the articles a total of thirteen times, either as the main method or as an alternative intended to be compared with another method. AHP has often been used in combination with the TOPSIS method, where the AHP method was used to define the weights of the selection criteria and TOPSIS was applied to rank alternatives (Abdel-Basset et al., 2020; Ferreira et al., 2019; Samanlioglu et al., 2018). Moreover, TOPSIS was the second most used method after AHP. TOPSIS has been used a total of seven times, as well as AHP also in a fuzzy variant. Analytic Network Process (ANP) has been used three times (Gürbüz and Albayrak, 2014; Ishizaka and Pereira, 2016; Lin, 2010). Stepwise Weight Assessment Ratio Analysis (SWARA) (Popović, 2021; Karabasevic et al., 2015), PROMETHEE (Widianta et al., 2018; Ishizaka and Pereira, 2016), Choquet integral (Gürbüz and Albayrak, 2014; Gürbüz, 2012) and Data Envelopment Analysis (DEA) (Singh and Aggarwal, 2014; Lin, 2010) have been used two times in the selected articles as shown in Table 2.

Table 2. The most used methods in selected articles

Method	*Number of uses*
AHP	13
TOPSIS	7
ANP	3
SWARA	2
PROMETHEE	2
Choquet integral	2
DEA	2

Source: Own processing

In general, it can be stated that the authors used 3-6 main criteria, which were not divided into subcriteria. If sub-criteria were used, their number was usually around 10-17. The maximum of the main criteria was 33, subcriteria was 30. For each job position or employee, the selection of criteria may be different due to different

decision-makers and different companies. However, some groups of recurring criteria can be observed, like communication skills (C1), experience (C2), teamwork (C3), education (C4), knowledge (C5), and personality (C6). As shown in Table 3, the most used criteria are communication skills and experience with 13 occurrences.

Table 3. The most used criteria in selected articles

Publication	*C1*	*C2*	*C3*	*C4*	*C5*	*C6*
Anisseh et al. (2009)	1	1		1	1	
Güngör et al. (2009)	1	1	1	1		
Dursun and Karsak (2010)	1	1				1
Lin (2010)					1	1
Li et al. (2011)						
Erkan and Erdebilli (2012)	1	1	1	1		
Gürbüz (2012)				1		
Haque et al. (2012)					1	
Wu et al. (2012)			1		1	
Gürbüz and Albayrak (2014)		1		1		
Singh and Aggarwal (2014)	1		1		1	1
Karabasevic et al. (2015)	1	1		1		
Ishizaka and Pereira (2016)		1				
Minal and Metkewar (2016)	1	1	1	1	1	1
Thakre et al. (2017)			1			
Akmaludin et al. (2018)					1	
Lidinska and Jablonsky (2018)			1			
Samanlioglu et al. (2018)	1	1	1	1	1	
Ferreira et al. (2019)		1		1		1
Haddad et al. (2019)	1		1			1
Widianta et al. (2018)					1	
Nobari et al. (2019)	1				1	
Nurhayati (2019)						1
Abdel-Basset et al. (2020)	1					1
Stević et al. (2020)						
Ulutas et al. (2020)		1	1			
Massami and Manyasi (2021)			1			
Popović (2021)	1	1		1		1
Sumarno et al. (2021)			1			
Kuzior et al. (2022)	1	1		1	1	1
Count	**13**	**13**	**12**	**11**	**11**	**10**

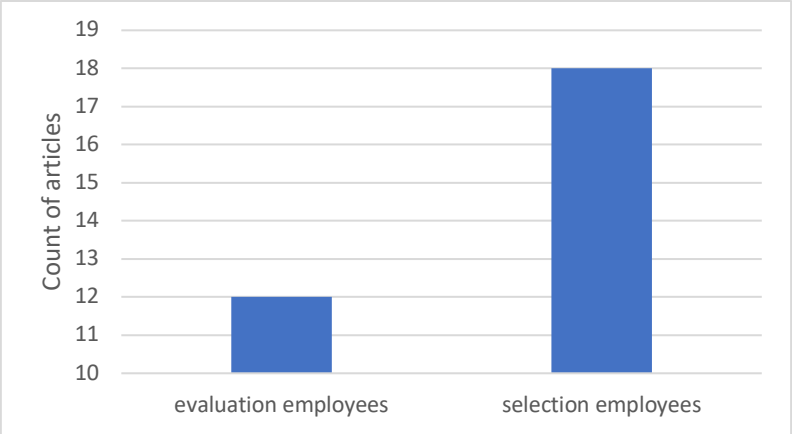
Source: Own processing

Most authors compared a maximum of 10 alternatives. However, there were also those who were able to compare up to 30, 50, 100, 200 or even more than 4000 employees in some cases. For example, teachers, managers, drivers, seafarers, coast guard officers, or electrical engineers were used as alternatives. These alternatives were mostly evaluated by 1-4 decision-makers or an evaluation committee was created.

The aim of MCDM methods in selected articles can be divided into two main categories, evaluation of employees and selection of employees as shown in Figure 2. Employee evaluation includes performance

evaluation that serve for their motivation, placement, dismissal or direction. Employee selection represents the recruitment of new employees or the selection of an employee for promotion. 18 articles focused on selection and 12 on evaluation.

Figure 2. Aim of MCDM methods in selected articles



Source: Own processing

There is often uncertainty about criteria and alternatives, which is typical in employee evaluation and selection. In the selected publication, the authors reach for fuzzy alternatives of individual MCDM methods such as fuzzy AHP (Erkan and Erdebilli, 2012), fuzzy TOPSIS (Nobari et al., 2019), fuzzy ELECTRE (Massami and Manyasi, 2021) or fuzzy Delphi (Anisseh et al., 2009). Criteria are often described using fuzzy numbers. Linguistic terms are often used when evaluating alternatives, as shown in Table 4.

Table 4. Examples of linguistic values

1st example	*2nd example*
	Very high
Not Acceptable	High
Poor	Medium-high
Average	Medium
Above Average	Medium-low
Outstanding	Low
	Very low

Source: Own processing

4 Conclusion

The paper is focused on the literature review of the use of multi-criteria decision-making methods for employee evaluation. The review of the literature shows that the most used MCDM method in the field of human resources is the AHP and its variation, followed by the TOPSIS method. Both methods are often combined.

For personal evaluation and selection, it is necessary to use qualitative and quantitative criteria that describe key information about employees. In general, it can be stated that the authors used 3-6 main criteria, which were not divided into subcriteria. If sub-criteria were used, their number was usually around 10-17. There are, for example, education, experience, teamwork and knowledge, technical skills, communication skills or management skills. Most of the authors compared a maximum of 10 alternatives, which were mainly evaluated by 1-4 decision-makers or an evaluation committee. There is often uncertainty about criteria and alternatives,

which is typical in employee evaluation and selection. Criteria are often described using fuzzy numbers. Linguistic terms are often used to evaluate alternatives.

The actual topic will be more specific in a future paper. The author would do a review of the literature on fuzzy MCDM methods in human resources. A much more detailed analysis of the uncertainty in the monitored area will be carried out.

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Predatory Monetization in MMORPGs

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Abstract
Monetization in Massive Multiplayer Online Role Play games (MMORPG) is a very common occurrence in various forms and it is impossible to find an MMORPG without any monetization. The problem lies within predatory monetization, methods which psychologically manipulates players into spending income and creates unfair advantages in player base. That nurture problems for long-term lifespan and profitability of intellectual property (I.P). The goal is to analyses data from the questionnaire done on the topic of microtransaction in MMORPG and describe theoretical background to support results. Answers are suggesting that players want to have advantages over other players regardless of fairness. Predatory monetization is becoming wider problem in whole gaming landscape. Aim of this paper is to introduce reader to predatory monetization, encourage though of implication, impacts, morality and ethics. Contribution of this paper is to create entry level into the issues for reader and offers different angle for experienced readers.

Keywords:
Customer, Intellectual property, MMORPG, Microeconomics, Predatory Monetization, Video game industry

JEL Classification
M31, D00, D91

1 Introduction

Massive Multiplayer Online Role Play Games in short MMORPG are types of games which offers unique experience on the market and that is playing in online fictional world with countless people in the same time and sharing victory and defeat as a community which is massive multiplayer aspect and the role-play is at the character where user experiences stories, world, and creating own legacy forming bonds with others and live another life as somebody else. [6,1] Among most popular examples can be seen World of Warcraft, Star Wars the old republic, Elder Scrolls Online, RuneScape, FINAL FANTASY XIV: A Realm Reborn. [20,12,19]

Predatory monetization is derivative of standard monetization, at the first glance, this type is very dangerous and harmful to any industry, companies, or customers. [13] Nature of predatory monetization to extract as much financial resources out of customers as possible. Each product is different and needs different approach to monetization for most optimal sales. Psychology behind predatory monetization is key for understanding. This type relays on inflicting fear, encourage fast thinking, creates FOMO (fear of missing out), appeal sense to be unique, creating unhealthy habits very similar to gambling addiction. [5,2]

This topic can be considered unique due to look through MMORPG genre, even though other authors already covered predatory monetization in other spheres of video game landscape, but not from this angle by authors knowledge. primary search for similar topics was done on the Web of Science and Scopus as two of the largest research databases and author did not find paper on this topic.

The aim of this paper is to introduce reader to the issues with predatory monetization, show different types of normal monetization and how these can be transformed into predatory monetization and for experience readers show different angle. Problem exist because this type of monetization generates extreme amount of financial resources for companies at minimal investment of time and resources.

Research methodology is aiming to look from the eyes of the players and find possible explanation why is predatory monetization even exist with added showed frequencies of favourite type of monetization. Collection of data was done through questionnaire on the social media platforms.

Evolution of industry is inevitable and gaming industry is no exception. Predatory practices are used on children, students, adults and elders without hesitation. These methods are unethical, controversial, in some cases criminal and they are accepted because they are implemented in games. [14,32]

The problem lies in implementing which gradually terraform landscape of video gaming not only of MMPROGs into the state where casino practices are used on the average users, mostly children, people at school, universities, working people and older ones. [14] Techniques which are used are unethical, controversial or sometimes criminal, due to lying, not only that but the company which is using predatory monetization slowly and gradually is destroying own intellectual property and company itself. [32]

2 Literature Review

2.1 MMORPGs

In the previous section, Massive Multiplayer Online Role Play games are quite large project for the company taking many resources and time commitment to create open worlds with enough content to keep player base engaged and make that investment worthwhile, meanwhile maintaining servers with regular patches, updates and usually within year a new downloadable content (DLC). Reward for such exception investment in video game industry is strong I.P. stable income and long lifespan of product [12,8]

To expand on the definition of MMORPGs there are certain requirements which classify the genre. First is multiplayer aspect, that is covering half of the name MMORPG. From its meaning the multi-player, more than 2 players in one location that can see other in real-time transmission, creating or work together on the same goal. Not only this feature but to be able interact with hundreds of players on the same place, usually MMORPGs has some kind of hub which is populated at the same time with hundreds of players usually, town centre, space station, main temple etc. [4]

Second is character. Creation of own avatar that can see other players, some MMORPGs have more detailed character customization to give users more freedom to express themselves in a new world. [4]

Third is progression. Steady progressing and introducing new elements of the game to player. To spend hundreds of hours in the MMORPGs, progression changes at the end and player to not progress through story but through higher numbers and better gear. [4]

Forth element is exploration. That is what worlds give immersion. The immersion helps retain players. Exploration of the unknown is nature of human being and open vast world is perfect for this genre. [4]

Fifth element is PVE and PVP content that ties to progression and exploration. PVE is player versus environment and PVP is player versus player. Environment is AI of the game, puzzles, challenges, quests. Player are other people who can be met in arenas or in open world. [4]

Successful MMORPG meets every requirement on the average but needs to have unique feature to stand out from the genre and games in general. Not to mention maintenance. Implementation of these elements gives stable and growing IP, increase goodwill and ensure better position on the market with future and current products. [4]

2.2 Standard Monetization

Monetization is necessary for business to stay alive and in year 2022 already exist many types of monetization. [23,18]

Subscription method is very simple where customers paying for game time. The price is around 10 USD and for 28-30 days where customer can enjoy the game, after given date customer needs to pay again to able to play again. This method is great for generating revenue over a long period of time. As an example, to showcase is Star Wars the Old Republic subscription which grants game time, access to previous expansions, premium currency, access to customization features and unlocking certain conveniences. [27,24,9]

Buying the game could be categorized as the oldest type of monetization where customer pay for the product and will get access to everything without any paywalls. At the beginning customers were buying physicalized copies but overtime with rise of internet and Steam as a game market, library became online purchases. [28, 26]

Pre-order is paying for the product which is still in development in other words ordering something in advance. To encourage customers to pre-order games, developers started to give in-game bonuses to help customers in the early stages in the game or to get prior access to physicalized copy of the game. [26,28]

Loot box is an online box in the product/game which can be opened and gained prize of all kind from lowest quality to most rare items in the game depend only on the developer. Due to regulations loot boxes need to show percentage of possibility to gain desired items. This kind of monetization became very normal on the mobile market and video game industry. Yet it is one of the most dangerous types of monetization. [26,14]

Season pass is a rather unique type of monetization where customer do not get desire items immediately after purchase but need to work for them, work in this case is completing challenges, quests or playing the game. Majority of passes are from level 1 to 100. The length of season pass is usually around three months. Interesting items are at the beginning and at the end. First implementation could be seen at game DOTA2 for their international championship and if customer bought this pass also contribute to overall prize money to winner. To perfection and from that can be seen today is given credit to Fortnite. [26,30,29]

Virtual store, very old monetization method one of the founding methods of monetization. various items, bundles, boosts, cosmetics are available for customer and their character or accounts for certain prices. These prices are either in real world money like dollars, euro, crowns, or premium currency. [26,]

Premium currency one of the last major monetization methods mentioned in this paper. This type is specific by obtainability. It can be obtained only through real world money. This currency is more valuable than the other currencies and give customer advantages through paywall items. [26,16,18]

2.3 Predatory monetization

Predatory monetization is a subcategory. Using psychology to break player into creating habits of spending money on in-game purchases. Each of the method in previous section can be turned into a tool for maximizing financial resources. Chapter show how to transform previous methods, psychology behind them and examples [14,13,17],25

Subscription method, is one of the founding methods. [33] Method has transformed to provide intended experience of the game for player. That means for completing challenges, quests, and other activities, player receives higher rewards, gold or experience which allow him to play the game without struggle. The bonus amount is usually around 25%. By purchasing subscription, player gets premium currency, energy, refills, status symbols, unlocking content. Idea is to lock player behind artificial paywall, slowing down his progress and lock activities. Player will become frustrated but not to the point of uninstalling the game. Public leader boards are great motivation or showing progress of friends who has purchased subscription. [25,7,33,14] Example can be presented at Star Wars the Old Republic title. The game was originally only subscription. Now player who has subscription has access to all expansions, removed level cap, option to equip every item, story to progress, bonus 500 premium currency. Lost ark is another example where player who has “Crystalline aura” gain thirteen benefits, lower cooldowns, discounts, unlocks, faster progress as name a few. [27,11,24]

Buying the game, predatory transformation is through tiers/levels. The base product offers only the game, higher tier or levels adds additional content, season passes, premium currencies, items, subscriptions. Standard Rate is 60 USD from large studious, higher tier offers more and cost more wrapped in a nice name such as bronze, silver, gold, platinum, enhanced editions. Higher tier, better content. Predatory part is offering exclusivity of content, easier progress, sense of superiority, earlier access, for collector nature of individual it is a must buy. [33,28,21] Examples presented here is game Lost Ark, with launch presented three tiers, Apprentice, Explorer and Vanquisher, highest version contains premium account for 30 days, Pet selection, seven skins, mount, Expansion, slot, early access 3 days before release, appearance change for 64,99 Euro yet the game is free-to-play. [28,7,24]

Season pass, as a tool in predatory form is used by locking content, activities, stories, behind paid season pass. Player cannot have fun unless he buys season pass. Pass have usually one hundred levels to progress, first and last have most exclusive rewards and they are unique. The passes are in two levels one is free and second is paid shown next to each other to provide visual references for players that they can get better rewards and player is paying for artificial goal to strive for so the final level can provide massive gratification. Season passes can be found in Fortnite, Star Wars the Old Republic, For Honor, The Division 2, World of Warcraft, Dauntless. [30,29,25]

Virtual store is a standard for every MMORPG, store provide exclusive items and these are generally shinier and better looking than non-paid items or items which give unfair advantages over other player or giving options to skip content and get to the end of the game faster. If a store is in a dreadful state meaning for functioning properly, it is an indication of bad health of the game. Items in the store are not purchasable by playing so appealing on the sense of uniqueness, fear of missing out, fast thinking, sense of superiority is the main point. Prime examples could show in Star trek Online or Neverwinter. [10,22,23]

Premium currency is a tool which allows customers lost their perception of spent money. Customer pays around 10 USD and will get XY amount, for example 1200 crystals this crystal used customer to convert them to 100 gems and these gems converted into 10 pieces of jewellery, now he can put these 10 pieces into a loot box and open at the same time 10 prizes and get guarantied rare item. In this moment, 10 pieces of jewellery do not cost 10 USD because 200 crystals are left and these crystals are reminder that if customer will spend a little bit more, he can transform them into another jewellery or spend them differently. Giving players false sense of having still premium currency, purposely trying to lost their financial balance Examples of this type are more common in Asian type of game called gacha, like Honkai Impact 3RD, Genshin Impact. [31,16,15]

2.4 Customers

In this article these were called users, players, or customers, all have the same meaning, yet every customer is unique and same at the same time. The more detailed look into a player, more diverse customer will be found. It is important to find so called *middle ground* That can be defined in many ways. For the research paper will be used Barle types of players to help understand customer of MMORPGs. [3]

Bartle types of players is focused on categorizing customer into four segment Socializers, Explorers, Achievers and Killers one type cannot exist without the other type and together these types create healthy player base, which could support itself for a long period of time. [3]

First type and most common is Socializers these types of customers are majority of MMORPGs. The main objective of this type is to socialize with other players, creates guilds, beating content together and enjoy time spent with other players. That do not mean they do not have own ambitions and goal to achieve. [3]

Explores are the second type focused as the name suggest on exploring, meaning of that word do not mean only new areas of the map, but items, features of the game, bugs, exploits and sharing it with other players. Explorers do not mind and care about repetitiveness for a long period of time if there is suitable reward for the effort. [3]

Achievers, type of player to achieve and conquer the content games has to offer with optimized strategy. Achiever is about “showing off” the rare items, status, leader boards, achievements, and usually completing the game to 100%. [3]

Killers are the last type and least frequent. Unlike other three type which focuses on the PVE content mostly, Killers are all about player versus player experience. This type knows the best and optimized character for killing other, they are highly competitive in nature and wants to win regardless of fair play. [3]

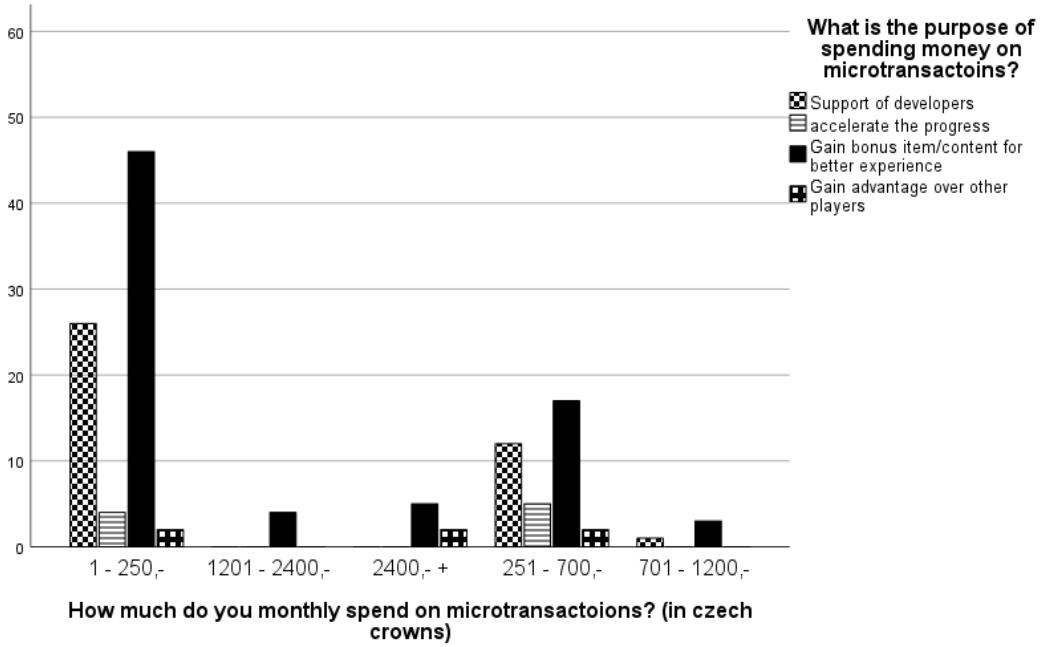
All of these types have symbiosis with each other to survive and thrive. Socializers are about 80% of player base, Explorers are 10% as well as Achievers and killers are 1% of player base. [3]

3 Methodology and Data

For purposes of this paper was used questionnaire with total three hindered respondents from Czech Republic. The questionnaire was running in the social media platform Facebook, specifically Tom

Clancy´s: The Division CZ/SK, Hráči Cz/Sk, Games CZ/SK and second platform Twitch.com, due to high concentration of players. Gathering of data was done from 13.04.2020 to 24.04.2020. The collected data are from authors previous work focused on understanding of monetization in MMORPG genre. Demography about questionnaire is following. 93,1% are man 6,9% female, age 16 – 21 is majority 57,1%, 22 – 45 are 24,5%. Income has 56,4% and 43,6 do not have any type of income. Analysing data will be done through statistic program SPSS and data was gathered from the google forms and exported to SPSS. Creation of hypothesis will test two questions.

Figure 18: purpose and spent money monthly



Source: Own research

H0: There do not exist connection between monthly spent money on microtransaction and purpose of spending money

H1: There exist connection between monthly spent money on microtransaction and purpose of spend money

Table 12: summary

Summary						
	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Number of answers	318	100,0%	0	0,0%	318	100,0%

Source: Own Research

Table 13: Chi-Square Test

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	76,106	20	<,001
Likelihood Ratio	88,962	20	<,001
Linear-by-Linear Association	30,082	1	<,001
Valid Cases	318		

Source: Own Research

By providing chi-square test on the purpose to find connection between purpose and spent income. Yet significance is lower than alfa (5%) and alternative hypothesis is rejected. On the graph can be seen rather interesting results which are described more in the empirical section.

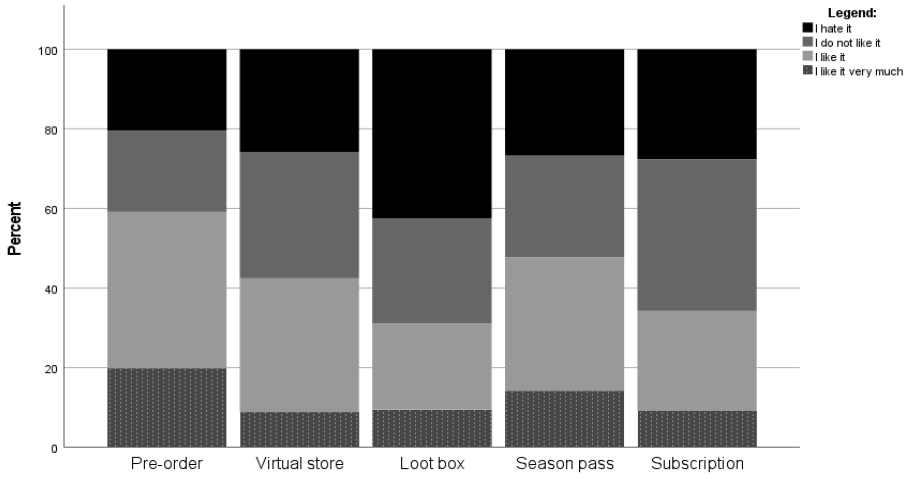
Question 13 Please rate these types of microtransaction from your own experience. Is focused on the perception of the major microtransactions which is player introduced in games.

Table 14: Frequencies

	Pre-order	Virtual store	Loot box	Season pass	Subscription
I hate it	20,4%	25,8%	42,5%	26,7%	27,7%
I do not like it	20,4%	31,8%	26,4%	25,5%	38,1%
I like it	39,3%	33,6%	21,7%	33,6%	25,2%
I like it very much	19,8%	8,8%	9,4%	14,2%	9,1%

Source: Own Research

Figure 19: Types of microtransactions



Source: Own Research

Figure 2, Question 13 ask for their own opinion on the topic of different monetization methods. Combining likeness an unlikeness of types can be seen that Pre-orders and most likeable (59,1%) followed by Season pass (47,8%) and least likeable type is loot box (31,1%)

4 Empirical Results

Results show that alternative hypothesis was denied and there do not exist correlation between amount of money spend on the microtransactions and purpose. Yet in the graph can be seen that most of the people are paying for the bonuses/content in the game which suggesting that microtransaction make them feel more unique over the other players, surprisingly gaining advantage over other players are seeking very low percentage of participants in the questionnaire, that may lead to conclusion that they do not have access to this type of content or they are not aware of this fact. Support of developers in interesting topic which would be interesting to probe further in another research. As for second graph the results were not surprising as pre-orders are giving players exclusivity and uniqueness in the game regardless of genre, season pass found its second place and shows that players do not mind to pay for artificial goal with constant feel of gratification seeing their level in season pass nearing to maximum. Loot boxes are in player communities the most hated form of microtransaction due to its nature which work as lottery.

5 Conclusion

In conclusion, Video game industry is not a charity it is an industry made of companies oriented on profit. More companies in the video game sphere are using aggressive and predatory methods how to gain more financial resources out of players due to success of other companies which implemented such methods. Results in the paper did not confirm correlation between amount money spend and purpose yet they suggested that player wants to be unique, have exclusive items/content and to have advantage over other players not in power but in beauty and uniqueness. As for types which revealed pre-order and season pass as most likeable methods of microtransaction and least likeable method end up loot box, which already caused issues on the international scale in the case of Star Wars the Battlefront II.

Suggestion for further research can be explored in the purposes as an example further explained why is one of the most answered option support developers but through qualitative method if the players do not lie to themselves for the reasons. Another research could be initiate interviews with players about their experiences with gaming and monetization. Research can be taken from the annual reports of the major players in the industry and go through their history and probe how much the company was changed.

Shortcoming and limitation of this research paper are not optimal questions for the discussed topic yet these questions were chosen based on the likeliness to find interesting results from the questionnaire.

The paper presented dangers of the discussed topic and tried to introduce reader into the problematic of predatory monetization and experienced reader show different angle.

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The Influences of e-WOM on Vietnamese Generation Z Purchase Intention In F&B Industry

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Abstract
The development of the Internet and Social Media platforms such as Google, YouTube, Facebook, TikTok allows people to share information, experiences, emotions which leads to the rapid growth of electronic word of mouth (e-WOM). Review has almost become an important tool to help food service businesses be widely known, creating an advantage for themselves in the fiercely competitive market of the F&B industry. Thus, the paper aims to find out the influencing attributes of e-WOM on the intention to choose a place to have meals of Generation Z in Vietnam. The data was collected from 330 respondents by the convenience sampling technique, then it was analyzed using SPSS 20 to conduct scale tests using Cronbach's Alpha coefficient, after that, exploratory factor analysis (EFA) was executed before correlation analysis, and regression analysis in the final. Research results confirm that five attributes of e-WOM including Reliability of e-WOM sources, Usefulness of e-WOM, Quantity of e-WOM, Quality of e-WOM, and Using Experience of e-WOM all affect the intention of Vietnamese young people to choose a restaurant. In which, the Quality of e-WOM has the strongest impact. This study would help businesses better understand the important attributes of e-WOM and how to utilize e-WOM as an effective marketing tool to conquer potential and current customers through some recommendations at the last part.

Keywords
e-WOM, Gen Z, purchase intention, F&B, Vietnam.

JEL Classification
Must be provided (Choose JEL Classification codes from the list: http://www.aeaweb.org/jel/jel_class_system.php). Max. five.

1 Introduction

The development of the Internet and Social Media platforms such as Google, YouTube, Facebook, TikTok allow people to share information, experiences, emotions which leads to the birth and rapid growth of electronic word of mouth (e-WOM). In 2021, the population of Vietnam reached around 97.8 million people, in which, about 68.17 million people were using the Internet (accounting for 70.3% of the population) with an average duration of 6 hours 47 minutes (VNetwork, 2021). This makes the Internet more powerful with the power of electronic word of mouth.

According to a preliminary survey by UNICEF (2021), 1 in 3 Internet users are under the age of 18 and the group of 15-24 years old is the most connected worldwide. The Covid-19 pandemic has accelerated the unprecedented speed of digital access, even in remote areas. Only in the last few years, social networks such as Facebook, Twitter, TikTok have become a miniature society, which not only reflects every aspect of real life but can have a significant impact on real life. According to Google (2021), 97% of Vietnamese users search for information through handheld devices such as smartphones and tablets, making the online market full of potential. E-WOM is more important than ever for both businesses and customers.

Review has almost become an important "tool" to help restaurants be widely known. Reviewers provide information about food and restaurant relevant variables which offers consumers more choices for their purchase decisions. Many restaurant owners also admit that their business thanks to the reviewer's extensive introduction to get noticed (Jeong and Jang, 2011 as cited by Kudeshia & Kumar, 2016). If in the past, restaurants developed based on their products, delicacies, and strengths, today whether the shop is popular or not depends a lot on the "introduction" and eye-catching images from the young people on the review group. In fact, the more compliments the post, the more crowded the restaurant is (Arnieyantie et. al., 2020).

Many Vietnamese restaurants have targeted the youth segment. It can be said that young people are always leading the trend, always updating, and accessing everything very quickly from food, entertainment to travel. They tend to become more active in sharing commercial information and trust information given by other young people rather than information given by sellers or marketers. Several of researchers have indicated the significance of e-WOM on food purchase intention (Hamdani & Maulani, 2018; Shashikala & Thilina, 2020; Arnieyantie et. al., 2020). However, determining the influence of e-WOM attributes on Vietnamese youth is remain less focus and need to be investigate further. Therefore, this paper was executed to measure the effect of e-WOM on the intention to choose a place to have meals of Generation Z in Vietnam. Since then, the authors hope to help dinners make the right choice and help food service businesses build suitable marketing strategies for potential and current customers.

2 Literature Review

2.1 E-WOM

Before the appearance of the Internet, consumers shared product-related experiences with each other through traditional word of mouth (WOM) such as discussions with friends and family (Sundaram et al., 1998). Electronic word of mouth (e-WOM) is a form of word of mouth over the Internet, a form of online communication. Due to the rapid spread and worldwide coverage of the Internet, e-WOM has characteristics such as widespread information and rapid propagation (Helm, 2000, Henning-Thrau et al. al, 2004). Information providers and recipients can remain anonymous, without having direct contact with each other (Chatterjee, 2001; Helm, 2000). E-WOM information can be viewed and read by anyone, anytime, anywhere with devices with Internet connection (Chatterjee, 2001; Cheung & Lee, 2012). The information is presented and displayed in the form of text, images, videos, etc. and is easy to copy, save, reprint, and send to others (Cheung & Thadani, 2012). The influence of e-WOM on consumer decision making is well established in academic theories (Steffes & Burgee, 2009). Advances in technology have allowed consumers to create, exchange, and share their experiences and opinions through electronic word of mouth (e-WOM) on several social media platforms. According to Arnieyantie et. al. (2020), e-WOM is online consumer review which has affected purchasing behavior in the F&B industry.

2.2 Information Credibility

Reliability of e-WOM sources is understood as the extent to which consumers perceive a review or comment as reliable, reflecting the truth from reality (Cheung & Lee, 2012). In the internet environment, users can only judge whether the food is good or not or if the restaurant has good service based on the trust of online sources via the media and the relationship with the information providers. According to Khoa (2021), the reliable source of information is an important predictor in the early stages when consumers seek information about the product they intend to purchase and contributes to the perception of the reliability of the information. It can be said that information credibility is a decisive factor in the consumer decision-making process. Therefore, hypothesis H1 is proposed:

H1: The reliability of e-WOM information has an impact on young people's intention to choose a place to eat.

2.3 Usefulness of e-WOM

The influence of information usefulness on purchase intention has been demonstrated in the studies of Liu and Zhang (2010) and Khoa (2021). The association between the usefulness of e-WOM and purchase intention has also been confirmed by several researchers (Cheung & Thadani, 2012; Erkan & Evans, 2016). In short, people tend to engage with information when they consider it useful. Especially when consumers search for

restaurants on the internet, there is a lot of information on many social networking platforms such as Facebook, Youtube, Tiktok, so they will tend to access information that is considered useful. Thereby, hypothesis H2 is proposed:
H2: The usefulness of e-WOM has an impact on young people's intention to choose a place to eat.

2.4 The Quality of e-WOM

Defined as the degree to which consumers perceive an offer or rating to be reliable and accurate (Cheung & Lee, 2008), the quality of information is an important factor that people use to evaluate the information transmitted. The quality of e-WOM information will directly affect consumers' attitude, especially in the online environment. If the e-WOM is perceived as having strong argumentative power, the online users will develop a positive attitude towards the information received and they will believe that the information is factual and reliable. In fact, if the message is of high quality, it will increase the intention to buy the product, while the message of low quality will make consumers feel confused about the product and lead to a decrease in the intention to purchase (Huyen & Costello, 2017). Hence, hypothesis H3 is proposed:

H3: The quality of e-WOM has an impact on young people's intention to choose a place to eat.

2.5 The Quantity of e-WOM

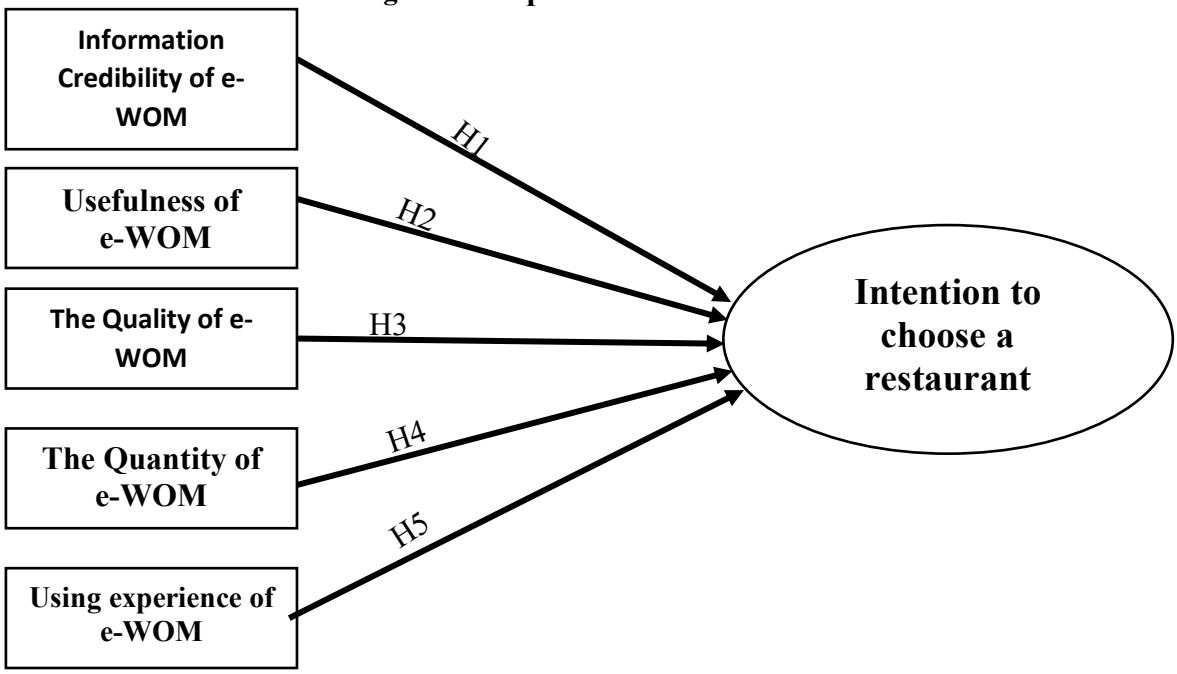
The quantity of e-WOM is the number of reviews or comments about a certain product or service on all Web sites (Fan et al., 2013). The amount of information on e-WOM correlates significantly with its impact on consumer behavior. According to Huyen & Costello (2017), the number of reviews may represent the number of consumers who are interested in that product; the number of opinions can be considered as an indicator of product performance in the market, so consumers can make inferences about the quality of the products based on the number of e-WOM. Cheung and Thadani (2010) also argue that online reviews of products and services are easy to observe and search, and the higher the number of e-WOM, the more popular the product is. Thus, e-WOM is a factor that positively affects consumers' purchase intention. Therefore, hypothesis H4 is proposed:

H4: The number of e-WOMs has an impact on young people's intention to choose a place to eat.

2.6 Using Experience of e-WOM

The volume of review information about restaurants is too large for consumers to read and process. Not all individuals have the same experience in finding the information they need. People with less experience with the Internet will search for information in a less efficient way than those with more experience because they lack the knowledge and skills to evaluate sources more than qualified experienced users (Chevalier & Kicka, 2006; Liu & Shrum, 2009). As a result, it will be more difficult for them to distinguish between alternatives, and they will be more likely to think that online consumers' opinions are unbiased. However, as the experience increases, consumers' perception of e-WOM's reliability may increase. There is a lot of variation in the quality of online information, so previous negative experiences can reduce the credibility and impact of online opinions (Cheema & Papatla, 2010). What's more, experienced audiences will know exactly where to find good sources of information – in fact, they may have a favorite set of websites since these sources have previously made successful recommendations (Heath et al., 2006). For these individuals, the information found will have a greater influence on decision making. As a result, the hypothesis H5 is proposed:
H5: Using experience of e-WOM has an impact on young people's intention to choose a place to eat.

Figure 1. Proposed research model



3 Methodology and Data

This study used a combination of both qualitative and quantitative methods. Firstly, the research concentrated on qualitative approach using focus group. 10 students were interviewed to modify and refine the scale items from translated scales. Quantitative main survey was executed with a convenient sample of 330 Gen Z living and working in Ho Chi Minh City, Vietnam by online survey with a structural questionnaire. The methods of data analysis included testing Cronbach's alpha, Exploratory Factor Analysis (EFA) using SPSS version 20, and Regression analysis.

The questionnaire was developed to collect data to validate the constructs and theory pointed in the research framework. This questionnaire was divided into three parts. The first part of the survey instrument was designed to get information about the respondents' general information with the purpose was to select interviewees in the research market. The second part contains questionnaire items that measure six constructs in the proposed model. These questionnaire items were measured using a five-point Likert scale (from 1- strongly disagree to 5- strongly agree). These items were selected from previous related research and subsequently modified to fit Vietnamese context. The third part of the survey included questions regarding personal information of interviewees.

Six constructs were used in this study: Information Credibility of e-WOM, Usefulness of e-WOM, the Quality of e-WOM, the Quantity of e-WOM, Using Experience of e-WOM and Intention to choose a restaurant. After modifying, scale of Information Credibility of e-WOM consisted of 5 items adopted from (Prendergast & Sin, 2010). Scales of Quantity and Quality of e-WOM included 9 items, which adopted from Park et al. (2007) and Utami et al. (2020). Scale of Usefulness of e-WOM included 5 items which were modified basing on scale of Chi & Nghiem (2018). Scale of Using Experience of e-WOM consisted of 5 items, which adopted from Park et al. (2011). Scale of Intention to choose a restaurant included 3 items, which adopted from Coyle & Thorson (2001) and Erkan and Evans (2016). Totally, measurement scales included 27 items had been used to formulate the questionnaire survey.

4 Empirical Results

4.1 Sample Profile and Descriptive Analysis

The demographic characteristics are provided in Table 1. According to the results, 203 respondents were male and 127 were female (61.5% vs. 38.5%). The survey objective of this research is gen Z, so they are between 10 to 27 years old. Of the 330, only 12.4% are between 10 to 18 years old, 56.1% are between 18 to 23 years

old, 31.5% are between 23 to 27 years old. Most of them are working while 40% of them are students. There is almost equality across income groups.

Table 1. Sample characteristics

Variable Name	Variable options	Frequency	Percentage (%)
Gender	Male	203	61.5
	Female	127	38.5
Age group	10 - 18 years old	41	12.4
	18 – 23 years old	185	56.1
	23 – 27 years old	104	31.5
Occupation	Pupil/ Student	132	40
	White-collar worker	91	27.6
	Businessman	73	22.1
	Freelancer	33	10
	Others	1	0.3
Income level	Below 5 million VND	95	28.8
	5 - 8 million VND	78	23.6
	8 - 10 million VND	72	21.8
	10 million VND or more	85	25.8

4.2 Reliability Analysis

Cronbach's alpha is the most widely used method to measure the internal consistency of reliability of test. Hence, it was conducted to make sure that each scale in this research model was reliable in measurement. According to Pallant (2001), the scale is accepted when Cronbach's alpha coefficient is above 0.6.

The table below showed the summary of the results of each construct's reliable test.

Table 2. Reliability Results

Observed variable	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item Total Correlation	Cronbach's Alpha if Item Deleted
Information Credibility of e-WOM (IC): Alpha = 0.860				
IC1	13.62	15.804	0.725	0.818
IC2	14.07	18.311	0.646	0.838
IC3	14.11	17.826	0.686	0.829
IC4	14.04	18.290	0.646	0.838
IC5	13.60	16.356	0.695	0.826
Usefulness of e-WOM (UF): Alpha = 0.866				
UF1	13.05	23.590	0.686	0.838
UF2	13.25	23.178	0.706	0.833
UF3	13.28	22.606	0.736	0.825
UF4	13.10	23.492	0.670	0.842
UF5	12.82	24.887	0.639	0.849
The Quality of e-WOM (QL): Alpha = 0.8				
QL1	12.33	19.055	0.565	0.767
QL2	12.30	18.350	0.589	0.760
QL3	12.29	18.268	0.599	0.756

QL4	12.23	19.161	0.561	0.769
QL5	12.34	18.256	0.597	0.757
The Quantity of e-WOM (QT): Alpha = 0.695				
QT1	9.85	7.875	0.461	0.644
QT2	9.82	8.135	0.497	0.620
QT3	9.70	8.010	0.521	0.605
QT4	9.66	8.359	0.441	0.655
Using experience of e-WOM (EX): Alpha = 0.804				
EX1	12.81	17.591	0.541	0.780
EX2	12.47	15.964	0.565	0.776
EX3	12.76	17.654	0.564	0.774
EX4	12.72	16.672	0.630	0.754
EX5	12.25	16.008	0.651	0.746
Intention to choose a restaurant (IT): Alpha = 0.795				
IT1	7.90	3.869	0.612	0.753
IT2	8.15	3.284	0.652	0.707
IT3	8.09	3.195	0.661	0.698

In Table 2, the results indicated that the Cronbach alpha for all the constructs were well above 0.6 as recommended by Pallant (2001). Cronbach alpha for the constructs ranged from the lowest of 0.695 (The Quantity of e-WOM) to 0.866 (Usefulness of e-WOM). In conclusion, the results showed that the scores of the Cronbach alpha for all the constructs used in this research exceeded the preferable scores of 0.6 and this indicated that the measurement scales of the constructs were stable and consistent.

4.3 EFA – Exploratory Factor Analysis

In the first round, factor analysis was appropriate because the value of Kaiser-Meyer-Olkin (KMO) was 0.905 (between 0.5 and 1.0) and the significant value in Bartlett's Test of Sphericity equaled 0.000 that was smaller than 0.5. Thus, conditions to run EFA were approved. The total extracted variance for five factors was 55.375% which showed that these extracted factors could explain 60,423% variation of the data. However, in terms of convergent validity, the item QT4 had factor loading smaller than 0.50, so it did not reach the convergence value. The difference between the maximum load factor and the minimum load factor was larger than 0.3. Therefore, the QT4 factor was eliminated. Similar to the 2nd run, UF5 was also disqualified for violating the discriminant value.

In the last round of EFA, all indices of KMO & Bartlett's Test remained good value. KMO was 0.894 and Sig. 000. Furthermore, after eliminating improper variables, five factors, which had eigenvalue (7.322, 1.965, 1.739, 1.487, and 1.081), were extracted as expectation of the research. The total extracted variance for five factors was 61,794% which showed that these extracted factors could explain 61,794% variation of the data. The results of EFA analysis from the factor rotation matrix showed that the loading coefficients of all factors were greater than 0.5, reaching the convergence value of the factors. The difference between the maximum loading factors and the minimum loading factors were larger than 0.3, reaching the discriminant value.

4.4 Regression analysis

Table 3 showed R2 = 0.517 proved that the independent variables explained 51.7% of the dependent variable. In other words, 51.7% of Gen Z intention to choose a restaurant was explained by the regression model. The rest was due to other factors and errors. Durbin Watson test = 1,276 was in the range [1 < D <3], showing no correlation of residuals.

Table 3. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	0.719[a]	0.517	0.510	0.619	0.517	69.487	5	324	0.000	1.276
a. Predictors: (Constant), EX, QL, UF, IC, QT										
b. Dependent Variable: IT										

Table 4. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	133.172	5	26.634	69.487	0.000[b]
	Residual	124.189	324	0.383		
	Total	257.362	329			
a. Dependent Variable: IT						
b. Predictors: (Constant), EX, QL, UF, IC, QT						

Table 5. Coefficient Matrix

Coefficients[a]								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.401	0.148		9.448	0.000		
	IC	0.153	0.041	0.177	3.696	0.000	0.649	1.541
	UF	0.165	0.033	0.233	4.994	0.000	0.686	1.457
	QL	0.199	0.039	0.237	5.162	0.000	0.707	1.413
	QT	0.172	0.044	0.188	3.897	0.000	0.641	1.561
	EX	0.125	0.043	0.142	2.939	0.004	0.641	1.560
a. Dependent Variable: IT								

Sig. values showed high reliability, all were less than 0.05, linear regression model fitted the data. In addition, the VIF coefficients were all less than 2 and the Tolerance coefficients were both > 0.5, indicating that there was no multicollinearity phenomenon, the model had the independent variables closely correlated with each other.

Then the standardized multiple regression equation was as follows:

IT=0.177*IC + 0.233*UF + 0.237*QL + 0.188*QT + 0.142*EX

5 Conclusion

Today, Gen Z is used to using smartphones to constantly update and share news. Therefore, searching for information on the internet before choosing a restaurant has also become popular among the youth. Eating is one of the essential needs of people, so many new restaurants are opened regularly to meet the various needs of consumers. Under competitive pressure, restaurants that win the attention of the online community will get a competitive advantage in this race. Based on the regression results, the quality of e-WOM has the greatest impact on the intention to choose a restaurant of Vietnamese young people. Therefore, restaurants should

regularly update information from websites, fan page or food delivery applications to see the reviews of their business from customers, thereby building suitable business strategies. Restaurant businesses can organize food related contests on social networks to promote the restaurant's dishes, space and services with beautiful images and videos under the unique and creative look of the diners.

The usefulness of e-WOM has the second highest impact on young people's intention to choose a place to eat with a standardized beta coefficient of 0.233, followed by the quantity of e-WOM (standardized beta of 0.188), third is the information credibility of e-WOM (with a standardized beta of 0.177) and the last is using experience of e-WOM (with a standardized beta of 0.142). Thus, to ensure that information about the restaurant is widely spread on the Internet and that the e-WOM information about the business becomes reliable for young people, the owners or managers should focus on the quality of their food, service, employees' attitude, as well as provide accurate customers' feedback. Marketers also need to refrain from hiring influencers to exaggerate or tell lies about their business, because the more consumers expect, the more they will be disappointed, thereby affecting their trust in the restaurant.

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The Portfolio Strategy under the Influence of Attention

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Abstract
There is growing interest in the financial community in combining market attention with stock price forecasting. However, the research literature has rarely examined the application of market attention to portfolio selection problems. It is crucial to consider market attention in portfolio allocation and its optimization. In this paper, we focus on the relationship between market attention and portfolio optimization. We take the Google Trends time series to measure attention and apply it to the appropriate model. We compare how traditional portfolio optimization results differ from the results of adding attention to portfolio optimization. We observe that combining market attention and portfolio optimization results in an enhanced portfolio selection strategy.

Keywords
Portfolio optimization, Sentiment analysis, Google trends, Time series analysis.

JEL Classification
C0, G11.

1 Introduction

Since Markowitz (1952) proposed the mean-variance portfolio theory, portfolio optimization has been an issue of great interest to scholars and practitioners. In the traditional portfolio optimization theory, the impact of market attention on the stock market is minimal. However, more and more recent studies have shown that it is crucial to take market attention into account in portfolio optimization, for example, Yu and Yuan (2011) and Fu et al. (2015).

In recent years, social media and search engine data have become one of the factors influencing business markets as more and more users access the virtual web. Particularly in the financial and economic sectors, search engine data has attracted attention as an indicator of investor attention.

The purpose of this study is to test whether the addition of the attention factor to portfolio optimization provides better performance and to compare it with a portfolio optimization strategy without the attention factor. In this study, we refer to a diversification strategy proposed by Kristoufek (2013) to explore whether incorporating attention data in portfolio optimization can diversify risk and improve Sharpe ratio. We further discuss and focus on the out-of-sample forecasting framework, and we compare the performance indicators of the Conditional Value at Risk portfolio model to the model with attention data. To determine their effectiveness in the portfolio, the Hang Seng Index is used as a benchmark. We use the search volume of stock codes in Google Trends as an indicator of market attention. According to Kristoufek (2013) we expect that the higher the search volume of a stock code, the higher the risk of a given stock. Therefore, in the final portfolio, stocks with high search volumes are given lower weights, and stocks with low search volumes are given higher weights to reduce the total risk of the portfolio.

The structure of the paper is as follows. In the next section, we briefly discuss the literature review. In the section 3 we briefly describe the basic information about the stock portfolio, the Conditional Value at Risk model and the Sharpe ratio. In the section 4, we describe the data applied and the results obtained. The final section is the conclusion.

2 Literature Review

Portfolio optimization is the process of selecting the best portfolio from all the portfolios to be considered. Markowitz (1952) proposed the mean-variance portfolio optimization model considering the trade-off between investment returns and risk. However, traditional modern portfolio theory assumes that all information is instantly reflected in stock prices, so that market sentiment has very little predictive value for the stock market. So qualitative analysis incorporating investor opinion is a reasonable alternative to improve portfolio optimization. (Yu et al, 2022)

From the perspective of financial markets, sentiment is the general beliefs of investors about the market and can be considered as the general attitude towards the market, reflecting the speculative tendencies of investors (Baker and Wurgler, 2006). Earlier studies, which have explored the origins of expectations contained in sentiment, have shown to some extent that market sentiment is following market trends (Solt and Statman, 1988). Later studies have benefited from the availability of broader data sets and have yielded more accurate results.

Tetlock (2007) takes the "pessimism factor" from the Wall Street Journal column and argues that media pessimism exerts negative price pressure on the daily returns of the Dow Jones stock index. Da et al (2011) argue through their analysis that market sentiment has an impact on stock prices. Kim and Kim (2014) analyzed the impact of qualitative textual components in the news and the internet on stock prices.

Attention is the ability of a person's mental activity to be directed and focused on something.

In addition to the literature exploring attention and stock prices and returns, Hamid (2015) uses search engine data as a measure of investor attention and applies Google Trends to find that in-sample period volatility and investor attention shows a strong correlation in the short run. Kristoufek (2013) proposes a new approach to portfolio diversification using search engine data, arguing that attention can diversify risk. Sentiment also has an impact on portfolios, and Fu et al. (2015) extend Markowitz's portfolio optimization strategy to include sentiment, which they argue can influence investors to choose the optimal portfolio.

Although various empirical studies have examined the impact of sentiment on returns and volatility, there has been little research on sentiment on portfolio optimization to date.

3 Methodology

We focus mainly on analyzing and comparing the out-of-sample performance of the Conditional Value at Risk model with the diversification strategy under the influence of attention. Applying the weights calculated from the in-sample period to the data in the out-of-sample period can be more useful to see the performance of the diversification strategy under the influence of attention. Standard deviation and Sharpe ratio are the two performances of interest, as we focus on the usefulness of Google Trends' search volume for portfolio optimization.

The most basic information for constructing a portfolio is to calculate the return of a stock. In the discrete case, the return $R_{i,t}$ is calculated as the relative change in stock price $P_{i,t}$, with $P_{i,t}$ denoting the stock price of asset i at time t and $P_{i,t-1}$ denoting the previous stock price of asset i at time *t–1*. The formula is as follows:

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}. \tag{1}$$

After calculating the return of stock, we should consider the return of stock portfolio. The return of the portfolio $R_{p,t}$ is given as the sum of the products of the specified return of stock $R_{i,t}$ and the weight of each stock w_i in the portfolio. The formula is as follows:

$$R_{p,t} = \sum_{t=1}^{N} w_{i,t} \cdot R_{i,t}. \tag{2}$$

To explore how attention can be incorporated into portfolio optimization, we apply Kristoufek (2013) diversification strategy. To distinguish the popularity of stocks, a power-law rule is used to obtain the portfolio weights. Define $V_{i,t}$ as the stock code search heat for stock *i* in week *t*. The $V_{i,t}$ represent the search heat relative

to the specified area and the highest point in the specified time period. The higher the stock search volume, the higher the search heat. Therefore, in week *t*, the weight of stock *i* in the portfolio is $w_{i,t}$:

$$w_{i,t} = \frac{{V_{i,t}}^{-\beta}}{\sum_{j=1}^{N} {V_{j,t}}^{-\beta}}, \tag{3}$$

where *N* denotes the number of stocks in the portfolio. The β is a power-law parameter that measures the screening intensity of the frequently searched stocks. If β is greater than 0, it means that the more searched stocks will be given lower weights. If β is equal to 0, it means that each stock in the portfolio has a weight of $w_{i,t} = \frac{1}{N}$. If β is less than 0, it means that stocks with higher search heat will be given higher weights. Applying the power-law rule ensures that the stocks with the highest and lowest number of searches are given a certain weight.

3.1 Conditional Value at Risk

In the Markowitz model, variance is used as a risk measure, but in some cases, this may lead to erroneous conclusions. Conditional Value at Risk (CVaR) is an extended measure of value at risk used to quantify the average loss in each period for unlikely scenarios that exceed the confidence level. Rockafellar and Uryasev (2000) show that CVaR considers the stock return distribution in asymmetries and fat tails and quantifies downside risk better than the traditional Markowitz model.

To calculate the CVaR it is necessary to obtain the VaR at a confidence level α. The corresponding formula is shown as follows：

$$VaR_{X,\alpha} = -inf\{x \in R: F_X(x) \geq \alpha\}, \tag{4}$$

where F_X is the cumulative distribution function. *X* is the random variable profit, which can be calculated at time *t* as the wealth at time *t–1* multiplied by the random portfolio return at time *t*. And the α is the significance level, i.e., the probability that the observed loss can exceed the VaR of the estimated loss. The most common α is 5%. Therefore, the formula for CVaR is shown as follows：

$$F_\alpha(X, v) = \frac{1}{\alpha} \cdot \sum_{i=1}^{N} P_i \cdot [max(v - \sum_{j=1}^{N} x_j \cdot r_{ij}, 0)] - v, \tag{5}$$

where F_α denotes CVaR at a confidence level of α, P_i denotes probability, v denotes VaR, x_j denotes the weight of each stock, and r_{ij} denotes stock returns under the scenario.

In order to find the optimal portfolio when using CVaR model, the objective function requires the data tool solver to find an efficient portfolio of assets with a minimum CVaR subject to constraints. The constraints include that the weights of all stocks add up to 1 and that the weights of all stocks cannot be less than 0.

3.2 Sharpe Ratio

The Sharpe ratio is a measure of the risk-adjusted return of a financial portfolio and is used to help investors understand the return on investment compared to risk. The higher the ratio, the higher the risk compensation provided by the investment. Investors will therefore prefer investments with a high Sharpe ratio or investments that increase the Sharpe ratio of the portfolio as a whole through diversification. The formula for the Sharpe ratio is as follows:

$$Sharpe\ ratio = \frac{E(R_p) - R_f}{\sigma_p}, \tag{6}$$

where $E(R_p)$ represents the expected return of the portfolio, R_f represents the return of a risk-free asset or the return that can be obtained with little or no risk and is applied as a benchmark. And σ_p represents the standard deviation of the portfolio's return.

4 Data and Empirical Results

In this study, we have selected the top 30 stocks by market capitalization that are constituent stocks of the Hang Seng Index on 1st January 2023 and are listed on the Hong Kong Stock Exchange. The Hang Seng Index is the most important index of the Hong Kong Stock Exchange. We created a dataset for a five-year time period from 1st January 2018 to 31st December 2022. These stocks fit the time period of the data. The data is presented as weekly data of the stock's adjusted closing price, so there are approximately 260 weeks of stock price data. We assume no transaction costs for each week of the portfolio. The sample period for the stock portfolio is divided into an in-sample period (1st January 2018 – 28th June 2020) and an out-of-sample period (5th July 2020 – 31st December 2022). Stock prices are expressed in Hong Kong dollars (HKD). Based on the World Government Bond8, then the 5-year Hong Kong Government Bond has a return of 3%. Initial wealth on 5th July 2020 is HKD 1.

In order to measure investor attention, we chose Google Trends to search the search heat of the selected stocks for each week of the decade. Since Google Trends uses a weekly time period from each Sunday to the following Saturday, the weekly time period of our selected stock prices is matched accordingly.

Table 15. Google search hotness of the applied exponential moving average in-sample period

Stock code	*Google Search heat*	*Stock code*	*Google Search heat*
HKG:0700	55.22	HKG:3988	39.39
HKG:0939	59.26	HKG:1211	48.97
HKG:0941	14.14	HKG:0066	37.47
HKG:0005	50.49	HKG:0267	9.35
HKG:1299	56.65	HKG:0001	15.36
HKG:0388	42.91	HKG:0669	9.52
HKG:2318	56.64	HKG:0027	32.43
HKG:1398	32.43	HKG:0002	21.13
HKG:2388	30.49	HKG:0003	35.25
HKG:0011	42.30	HKG:2331	4.95
HKG:0688	12.74	HKG:2319	6.60
HKG:3968	18.90	HKG:0012	5.29
HKG:0016	19.95	HKG:2007	9.58
HKG:1109	1.94		

Notes: *the applied exponential moving average (N=10, the selected time period; K=2/(N+1), the weighting factor) shows the trend followed by Google Trends search heat over a specific time period.*

Source: own elaboration based on data from Google Trends (2023)

For the search words entered into Google Trends, we focused on ways to maximize all the selected stocks that could be searched. This means entering the abbreviation for Hong Kong (HKG) plus the stock code. For

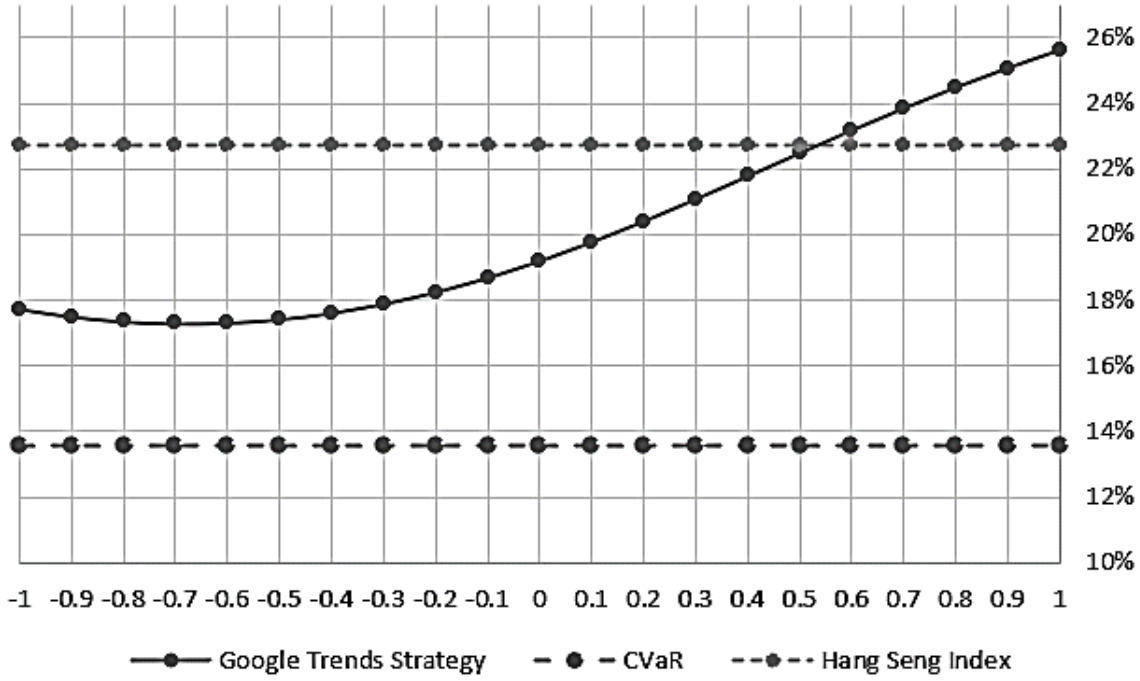
[8] http://www.worldgovernmentbonds.com/bond-historical-data/hong-kong/5-years/, search on 25th January 2023.

example, when searching for Tencent Holdings Limited, the search word "HKG: 0700" was entered into Google Trends. However, we had to remove the data for CHINA Longfor CO Ltd, ANTA Sports Products Ltd and Shenzhou International Group Holdings Limited because there was still not enough search data for these search words.

The Google Trends search heat shown in the Table 1 is the value of the applied exponential moving average for the last week ((21st June 2020 to 28th June 2020) of the in-sample period. Having obtained the attention factor, we then apply it to (3) to calculate the weights of the portfolio under the influence of different β power-law parameters. Based on the portfolio weights under the influence of different β power-law parameters, the portfolio return, risk, and Sharpe ratio are calculated.

We focus primarily on discussing the practicality of analyzing diversity strategies, so we are interested in performance over the out-of-sample period.

Figure 2. Comparison of standard deviation between Google Trends Strategy, CVaR Model and Hang Seng Index



Notes: *The x-axis representing the different β power-law parameters. The y-axis representing the standard deviation. The discrimination parameter β ranges between –1 and 1 with a step of 0.1.*

Source: Own elaboration based on data from Yahoo (2023) and Google Trends (2023)

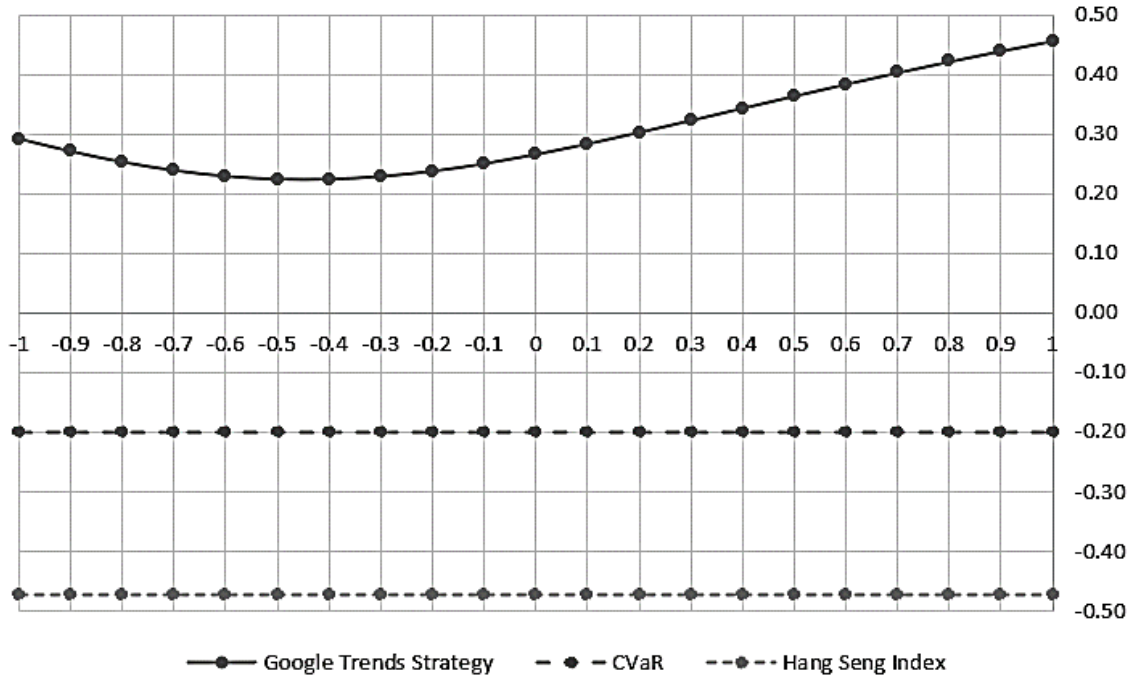
In addition to comparing the standard deviation of the Google Trends strategy and the CVaR model, we add the standard deviation of the Hang Seng Index as a benchmark. Figure 2 shows the standard deviation for different strategies in the out-of-sample period.

It can be observed that the CVaR models have the lowest risk because they focus on controlling downside losses. For the Google Trends strategy, the standard deviation between $\beta = -1$ to $\beta = 0.5$ is less than that of the Hang Seng Index. This indicates that in most cases, the Google Trends strategy can diversify the risk well. And the Google Trends strategy starts to show a significant upward trend from $\beta = 0$ to $\beta = 1$. Considering the existence of a situation where higher standard deviations are offset by increased returns, we also looked at the performance of the Sharpe ratio.

Figure 3 compares the Sharpe ratios of the Google Trends strategy, the CVaR model, and the benchmark Hang Seng Index in the out-of-sample period. It can be visually seen that the Hang Seng Index as a benchmark has a negative and minimal Sharpe ratio during the out-of-sample period, and the CVaR model also has a negative

Sharpe ratio. The Google Trends strategy, on the other hand, has a positive Sharpe ratio for the out-of-sample period. It is worth noting that the Sharpe ratio for the Google Trends strategy shows a slight downward trend from $\beta = -1$ to $\beta = -0.4$, while the Sharpe ratio keeps trending upward when it goes from $\beta = -0.4$ to $\beta = 1$. Moreover, when β is greater than 0, the rise is increasing and the Sharpe ratio reaches its highest value of 0.457448 at $\beta = 1$. Comparing the Sharpe ratios of the Google Trends strategy and the CVaR model in the out-of-sample period, the Sharpe ratio of the Google Trends strategy is consistently greater than that of the CVaR model.

Figure 3. Comparison of Sharpe ratio between Google Trends Strategy, CVaR Model and Hang Seng Index



Notes: *The x-axis representing the different β power-law parameters. The y-axis representing the Sharpe ratio. The discrimination parameter β ranges between –1 and 1 with a step of 0.1.*

Source: Own elaboration based on data from Yahoo (2023) and Google Trends (2023)

Comparing the performance of the Hang Seng Index and the Google Trends strategy over the out-of-sample period, we find interesting results. The Google Trends strategy is able to diversify risk to a greater extent than the Hang Seng Index, even considering only a fraction of the components (27 in Google Trends strategy compared to 76 in Hang Seng Index). The Google Trends strategy has a smaller standard deviation than the Hang Seng Index for all 3/4 parts of the β power-law parameters –1 to 1. At the same time, the Google Trends strategy obtains a much higher Sharpe ratio than the Hang Seng Index. This suggests that the Google Trends strategy is effective.

And comparing the performance of the CVaR model and the Google Trends strategy over the out-of-sample period, we find that while the Google Trends strategy does not perform as well as the CVaR model in terms of risk level, this is also due to the CVaR model focusing on controlling downside risk rather than chasing profits. When comparing the Sharpe ratios of the Google Trends strategy and the CVaR model, the Google Trends strategy outperformed the CVaR model.

In summary, when considering standard deviation, the Google Trends strategy does not perform as well as the CVaR model but is better than Hang Seng Index. However, when considering Sharpe ratio, Google Trends strategy outperforms both the CVaR model and the Hang Seng Index.

5 Conclusion

The purpose of this study is to test whether the addition of the attention factor to portfolio optimization provides better performance and to compare it with a portfolio optimization strategy without the attention factor. We focus on whether the strategy can diversify risk and get a better Sharpe ratio.

We search Google Trends for the code of the selected stock and get the weekly attention heat of the selected stock. This is taken into account as an attention factor in the diversification strategy.

We compare the diversification strategy with the CVaR model and use the Hang Seng Index as a benchmark. The results find that the diversification strategy is effective in that it can diversify the risk to some extent and get a better Sharpe ratio. However, the diversification strategy is slightly inferior to the CVaR model in its ability to diversify risk, mainly because the CVaR model focuses on controlling downside risk.

Therefore, future research could focus on further risk reduction in diversification strategies that are influenced by attention factors. In addition to this, in the original paper, Kristoufek (2003) found that the positive β value leads to better diversification. However, we found that in order to minimize risk, in other words to have better diversification, β should be negative. The reasons for such a difference also require further analysis.

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Is there a Relationship between the Unemployment Rate Based on Google Trends and Macroeconomic Indicators? Evidence from the Czech Republic

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Abstract
Unemployment is a fundamental economic quantity that determines the economic balance, but time is dynamic and as we can see economic crises affect countries more and more often. As a result of economic imbalances and crises, there is an increase in the unemployment rate all over the world. In this study, we will focus on the interdependence between unemployment and macroeconomic indicators. The unemployment rate will be compiled on the basis of Google Trends, as the abundant use of Internet data is an opportunity to monitor the activity of users on the Internet in searching for a job. Different types of confidence indicators were chosen as macroeconomic indicators. To analyse the relationships, VAR models will be constructed with the subsequent application of Granger causality.

Keywords
Google Trends, Granger causality, macroeconomic indicator, unemployment.

JEL Classification
B23, E24

1 Introduction

It is essential that public authorities, businesses and the public have access to up-to-date and official labour market data, as this enables them to respond appropriately to emerging events. In order to minimise information gaps for market participants, Google search data has been examined in recent years with a view to constructing key economic indicators. The large volumes of data collected through internet surveys provide a wealth of information and can be a way to obtain more timely data. In addition to data from national statistical offices, high-frequency indicators may also be available to economic actors that are not only obtained through surveys, reports and manual collection methods (Roopnarine and Spencer, 2021). Tuhkuri (2014) also sees potential in predicting the present and near future using data from Google. He sees their benefits especially in times of economic downturn when it is useful to have timely information on unemployment. As the data is publicly available in real time, it can be used as a tool to estimate the current unemployment rate, which is uncertain. Google searches can also be combined with expectations of future unemployment and can therefore be useful for forecasting unemployment for several future periods.

Over the past decade, Google Trends has grown in popularity in the area of scientific interest. The studies are based on the assumption that the function of Google data is not only information retrieval, but that data is an important information carrier (Jun et al., 2018). However, the studies do not draw conclusions that can be described as consistent. The existence of these studies was the initial impetus for further exploring the correlation between unemployment and macroeconomic indicators. This study, however, does not work with conventional unemployment rate indicators, but with unemployment rates constructed from Google search queries, in an attempt to shed light on the potential of the unique nature of this readily available data. This paper analyses whether this alternative approach to measuring unemployment rates can be causally linked to real economic indicators in any way. The research on the link between the Google Trends-based unemployment rate and economic indicators is focused on the Czech Republic, for which there is no such specific study yet, as the vast majority of authors in their papers analyse either large economies such as the US or underdeveloped countries where unemployment data are provided with a large time lag.

2 Literature Review

The results of previous work on the phenomenon of online search and its use to predict economic variables suggest that Internet text data can indeed be considered an important variable in the process of estimating the development of macroeconomic indicators. Studies that focus on testing the relationship between economic variables and Internet searches for job offers can be divided into two groups. The first group are studies dealing with the so-called nowcasting. In this case, the analysis focuses only on the immediate time period and is a kind of monitoring of the current state of the variables. On the other hand, there is the so-called forecasting, the essence of which is the creation of economic forecasts, working with specifically targeted keywords as a leading indicator; this type of study is predominant, but nowcasting and forecasting studies may overlap. The study of internet leading indicators is by Nagao et al. (2019), who use search intensity data from Google Trends to assess the current unemployment rate in the US, i.e. nowcasting, and thus fall into the first group of authors. Based on the results of the comparison, they find that there is no significant improvement by adding the Google index to the AR model, representing a higher level of prediction accuracy. Woloszko (2020) uses Google Trends to construct a tool that will be used to track economic activity. According to the simulation results, he concludes that it is also possible to use the tool to reliably predict business cycles. The tool's predictive capabilities prove particularly useful during economic recessions, when it plots phases of decline and subsequent growth. The vast majority of authors, such as Nagao et al. (2019), D'Amuri and Marcucci (2017), as well as Zhi Su (2014), have focused on large developed countries when it comes to predicting unemployment using online activity. Pavlicek and Kristoufek (2015) are the authors who focus their research on the small economies of the Visegrad Four. The authors have shown that online job search data provide a basis for building unemployment models, but the results they arrive at vary from country to country in the framework.

Google search volumes are used by Kohns and Bhattacharjee (2022) to capture real GDP developments. Thanks to Google Trends, the authors have been able to improve nowcasting in the current quarter, making it unnecessary to wait for the publication of macroeconomic forecasts. According to them, keywords with high search frequency have a good economic interpretation and reflect the main economic signals or uncertainties during the recession and the subsequent recovery period. Therefore, they again caution against Google data having the nature of sparse searches, where research on such topics can be severely limited. The relationship between Google Trends and gross domestic product has also been discussed by Bantis et al. (2022), Ferrara and Simoni (2022), and Nakazawa (2022). All of these authors agree that the inclusion of Google data in the construction of GDP models has a positive impact on forecasting results. Ferrara and Simoni (2022) in particular highlight the benefit for nowcasting when macroeconomic forecasts are not available for the first four weeks of the quarter. The moment official forecasts are released, the power of nowcasting declines. Thus, they identify Google Search data as a reliable alternative tool for measuring GDP when official data are not available. Nakazawa (2022), compared to Ferrara and Simoni (2022), even extends the horizon of the use of internet search volume to a period of up to two months before the release of official GDP figures.

On the other hand, we have authors who doubt Google Trends as a data source. Cebrian and Domenech (2022) are undoubtedly one of these authors. According to their studies, data cannot be considered as a quality source of information. Their belief stems from the inaccuracies found in the nature of the data. Thus, the authors who work with Google data in their research point out that enriching models with these sources can have a negative effect on the results, as Google Trends can introduce a significant element of inaccuracy and bias into the models.

The following part of the text deals with forecasting. D'Amuri and Marcucci (2017) evaluate the performance of the Google job search intensity index as a leading indicator for predicting the monthly unemployment rate in the US. Their paper used new unemployment claims, surveys on unemployment dynamics among consumers and employers, an index of economic policy uncertainty, and the Google index as leading indicators. The authors reach a finding that supports the presumption of Google Trends as a leading indicator, as models based on Google data predicted the unemployment rate better than when other leading indicators were included, regardless of the length of the time series considered. The same conclusion was reached by Tuhkuri (2016), who, after examining the correlation between Google search volume and the unemployment rate, finds that the predictive ability of Google queries improves especially during recent recessions. Vázquez and López-Araiza (2020) also work with Google job searches, identifying

it as a leading indicator for future unemployment rates. They see potential in this Google data capability, particularly in the public policy arena, as a way to improve tools for policy interventions. Niesert et al. (2020) validate the ability of user search activity on Google not only to predict unemployment, but also to estimate future developments in the consumer price index and consumer confidence. They suggest that Google job search has the highest predictive power for macroeconomic series that are closely related to users' online behavior. This relationship can be explained using the following example. A person who has a current employment status may have already known in advance that he is at risk of losing his job, which is what caused his specific online job search behavior, and hence the dependency is stronger in this case. On the other hand, a person has little ability to accurately predict future consumer price values, so his online search activity in this context is very heterogeneous and hence the interdependence of these variables is lower. A similar situation arises in the case of consumer trust, where trust is formed on the basis of each individual's circumstances. In contrast, Eichenauer et al. (2022), in their work on the construction of economic sentiment indices using Google search volumes, find that the resulting indices are significantly correlated with leading economic indicators. Like D'Amuri and Marcucci (2017), Choi and Varian (2012) and Woloszko (2020), Eichenauer et al. (2022) see the benefit of the index primarily during crises as it reflects large downturns in real time.

Medeiros and Pires (2021) are others who strengthen their ability for forecasting purposes with new findings in both nowcasting and forecasting Google Search data. However, they point to limiting features of Google Trends. If monitoring or forecasting is done for topics that are not as frequently searched or if queries are filtered back many years, web search may not be a relevant indicator. On the other hand, however, they recommend averaging many different data samples with the same specification (working with the same topic at the same time and location) to strengthen the accuracy of the forecasts.

Zaiyang (2017) discusses the integration of user search on Google into consumer trust predictions. In his study, he concludes that Google Trends increases the accuracy of predicting consumer confidence, which is at odds with the findings of Niesert et al. (2020), who instead assess the strength of the relationship between Google Trends and a macroeconomic variable based on the online behavior of a specific individual. According to him, an individual does not have the ability to express his user preferences well through the Google search engine. Zaiyang (2017), on the other hand, evaluates Google Trends as a means through which a reflection of consumer confidence can be faithfully captured. In addition, he also positively evaluates the availability of Google data over time, as the use of this data is a means to fill in time gaps before consumer confidence reports are published.

3 Research objective, data and methodology

For the purposes of the analysis, a period of 16 years was chosen, with the start of the monitoring period being the first month of 2007 and the end being the tenth month of 2022. The original intention was to examine the maximum possible period for which data are available. This would therefore be research from 2004, when Google Trends data starts. However, the data in the first three years were characterised by high volatility and therefore, to ensure robustness of the results, it was necessary to start the research from 2007. This brings the total number of periods to 190 months, and the research was conducted for the Czech Republic. The data needed to carry out this work were obtained from public sources that can be considered reliable. Unemployment rates were approximated using Google Trends time series, whereby the frequency of searches for a given term in the Google search engine is tracked relative to the total volume of searches during a certain time period through search phrases called keywords. As the aim was to portray as accurately as possible the activity of users searching for jobs, 11 Czech keywords that are characteristic for job searches (including the names of Czech job portals) were used. Indeed, as D'Amuri and Marcucci (2017) state, job searchers on the Internet will obtain the status of unemployed sooner or later, even though they are not yet unemployed at the moment of the search. Both time series were created for each keyword separately and an aggregate time series was created that is the median of the 11 keywords, as including all keywords can provide a more realistic picture of the unemployed population. The reason for choosing the median was based on its characteristics, as it is a robust level characteristic that does not give a biased result about the overall level of values and thus its value is in magnitude from the median level. Confidence indicators were obtained from the Czech Statistical Office. Monthly confidence indicators representing individual sectors were selected. Namely, the confidence indicator for industry, construction, trade, selected

services, the corporate sector, consumer expectations and the aggregate indicator for the economy. The confidence indicators come from the CSO's Conjunctural Surveys (2022), which are designed to capture expected future developments. These surveys are reflective of the business environment, consumer behaviour and various industries, making them a carrier of information well in advance. It is also for this reason that confidence indicators are often referred to as leading indicators. They are not based on specific quantification, but on the identification of the trend itself and provide answers to questions about the present and the expected future using terms such as 'increase', 'decrease' or 'stagnation'. The results of conjoint surveys are evaluated using a conjoint balance, i.e. the higher the positive balance of responses in the survey, the more optimistic the answer obtained (and vice versa). Last but not least, it should be mentioned that all time series were subjected to seasonal adjustment using the X-13-ARIMA-SEATS method.
The investigation of the relationship between the unemployment rate constructed from Google Trends and the confidence indicators was carried out by building VAR models, followed by the application of Granger causality.

4 Empirical Results

VAR models were constructed for each time series of the unemployment rate and the confidence indicator. The order of the VAR model was determined based on the VAR select function, through which the values of the Akaike, Hannan-Quinn and Schwarz information criteria and the final prediction error criterion were calculated. The criteria that took the smallest values indicated the appropriate order of lag of the VAR model. The types of estimated VAR models are as follows: both, const, trend and none. The VAR model of both type represents a model in which both const and trend were significant regressors of the variables and therefore both were included in the model. However, if the model is of type const or trend, only one of these variables was significant. For the const type, only the constant was included, whereas in the case of the trend type, only the trend was included in the model. Conversely, for the none type, neither variable was significant and therefore could not be included in the model. As mentioned in the methodology section, testing for causality requires stationarity of the time series. Furthermore, testing the autocorrelation of the residuals of the random component is also necessary when constructing VAR models. The residuals should be uncorrelated random variables. The last prerequisite for obtaining the so-called BUE estimators is the necessary assumption of a normal distribution of residuals. All these assumptions have been tested in VAR models using appropriate tests. Estimates that do not satisfy the assumption of a normal distribution of the error term are referred to as BLUE estimates - only the assumption of uncorrelated residuals of the random component is satisfied.

The first type of the null hypothesis of Granger causality leading in the direction from the unemployment rate to the confidence indicator reads as follows: 'first differences in the unemployment rate are not Granger causal with respect to changes in first differences in the confidence indicator'. The second opposite type of causality is the null hypothesis which reads as follows: 'first differences of the confidence indicator are not Granger causal with respect to changes in first differences of the unemployment rate'. The test is evaluated at the 5% significance level. Thus, in order to find causality, the null hypothesis must be rejected, with the result that at least one of the variables is non-zero and therefore Granger causal.

The following tables provide an overview of the results found from the VAR models. Each table shows the direction of causality, the type of VAR model, the significant lags, and the type of estimation (BUE vs. BLUE). First, VAR models were constructed for the time series of the unemployment rate expressed through the median of all keywords analyzed along with the individual confidence indicators. The table shows that there is unidirectional causality between the median unemployment rate and the confidence indicator for industry, construction, business, selected services and trade. In contrast, there was no causality between unemployment and consumer behaviour and the aggregate economic indicator. In terms of the direction of causality, confidence-leading causality is the predominant type, which was evident in the indicator for industry, construction, business and selected services. For the trade indicator, it is an unemployment-following causality. Thus, one could say that the degree of interdependence between the variables is quite strong, as out of the seven confidence indicators, causality was demonstrated in five cases, where the predominant type is a VAR model of order 5. The confidence indicators among which causality was demonstrated can be used as a baseline for determining unemployment trends.

Table 16. Testing Granger causality for the summary unemployment rate indicator (median) and individual confidence indices

	Variables	*Direction of causality*	*VAR*		*Significant lag*	*Type of estimation*
			order	*type*		
median U	d_I	I → U	none	5	d_CI_lag4	BLUE
	d_C	C → U	none	3	d_CI_lag1 d_CI_lag2 d_CI_lag3	BLUE
	d_BI	BI → U	none	5	d_CI_lag5	BLUE
	d_SS	SS → U	none	5	d_CI_lag2 d_CI_lag5	BLUE
	d_T	T ← U	both	8	d_U_lag1 d_U_lag5 d_U_lag6 d_U_lag7 d_U_lag8	BLUE

The following tables focus on the investigation of causality between the time series of individual keywords and the selected trust indicator. It can be seen that the causal dependence has largely disappeared.

Table 17 . Testing Granger causality for the economic sentiment index for industry and individual keywords

Variable	*Direction of causality*	*VAR*		*Significant lag*	*Type of estimation*
		Order	*Type*		
“hledám práci” (looking for a job)	Neutral				
“volná místa” (vacancies)					
“kariéra” (carrers)	I ↔ U	None	6	d_CI_lag3 d_U_lag1 d_U_lag2 d_U_lag6	BLUE
“pracovní nabídka” (job offer)	Neutral				
“jobs.cz”					
“práce” (jobs)	I → U	None	4	d_CI_lag1 d_CI_lag4	BLUE
“nabídka práce” (offer a job)	Neutral				
“životopis” (CV)					
“pohovor” (interview)					
“jenprace.cz”					
“volná pracovní místa” (job vacancies)					

Table 18 . Testing Granger causality for the economic sentiment index for construction and individual keywords

Variable	*Direction of causality*	*VAR*		*Significant lag*	*Type of estimation*
		Order	*Type*		
"hledám práci" (looking for a job)				Neutral	
"volná místa" (vacancies)					
"kariéra" (carrers)					
"pracovní nabídka" (job offer)					
"jobs.cz"					
"práce" (jobs)					
"nabídka práce" (offer a job)	C → U	Both	5	d_CI_lag3	BLUE
"životopis" (CV)	C → U	None	6	d_CI_lag5 d_CI_lag6	BUE
"pohovor" (interview)				Neutral	
"jenprace.cz"					
"volná pracovní místa" (job vacancies)					

Table 19 . Testing Granger causality for the economic sentiment index for trade and individual keywords

Variable	*Direction of causality*	*VAR*		*Significant lag*	*Type of estimation*
		Order	*Type*		
"hledám práci" (looking for a job)				Neutral	
"volná místa" (vacancies)	T ← U	Both	5	d_U_lag1 d_U_lag2	BLUE
"kariéra" (carrers)	T → U	None	6	d_CI_lag1 d_CI_lag2 d_CI_lag6	BLUE
"pracovní nabídka" (job offer)				Neutral	
"jobs.cz"					
"práce" (jobs)	T ← U	None	8	d_U_lag4 d_U_lag6 d_U_lag7 d_U_lag8	BLUE
"nabídka práce" (offer a job)				Neutral	
"životopis" (CV)					
"pohovor" (interview)					
"jenprace.cz"					
"volná pracovní místa" (job vacancies)					

Table 20 . Testing of Granger causality for the economic sentiment index for selected services and individual keywords

Variable	*Direction of causality*	*VAR*		*Significant lag*	*Type of estimation*
		Order	*Type*		
"hledám práci" (looking for a job)				Neutral	
"volná místa" (vacancies)	SS ↔ U	None	2	d_CI_lag2 d_U_lag1 d_U_lag2	BLUE
"kariéra" (carrers)	SS ↔ U	None	6	d_CI_lag1 d_CI_lag2 d_CI _lag4 d_U_lag1	BLUE
"pracovní nabídka" (job offer)				Neutral	
"jobs.cz"					
"práce" (jobs)	SS → U	None	4	d_CI_lag1 d_CI_lag4	BLUE
"nabídka práce" (offer a job)					
"životopis" (CV)					
"pohovor" (interview)				Neutral	
"jenprace.cz"					
"volná pracovní místa" (job vacancies)					

Table 21 . Testing Granger Causality for the economic sentiment index for business indicator and individual keywords

Variable	*Direction of causality*	*VAR*		*Significant lag*	*Type of estimation*
		Order	*Type*		
"hledám práci" (looking for a job)				Neutral	
"volná místa" (vacancies)	BI ↔ U	None	3	d_CI_lag2 d_CI_lag3 d_U_lag1 d_U_lag2	BLUE
"kariéra" (carrers)	BI ↔ U	None	6	d_CI_lag1 d_CI_lag4 d_U_lag1 d_U_lag4	BLUE
"pracovní nabídka" (job offer)	BI → U	None	4	d_CI_lag1 d_CI _lag4	BLUE
"jobs.cz"				Neutral	
"práce" (jobs)	BI → U	None	4	d_CI _lag1 d_CI _lag4	BLUE
"nabídka práce" (offer a job)					
"životopis" (CV)				Neutral	
"pohovor" (interview)					
"jenprace.cz"					

"volná pracovní místa" (job vacancies)					

Table 22. Testing Granger Causality for the economic sentiment index for consumer indicator and individual keywords

Variable	*Direction of causality*	*VAR*		*Significant lag*	*Type of estimation*
		Order	*Type*		
"hledám práci" (looking for a job)				Neutral	
"volná místa" (vacancies)					
"kariéra" (carrers)	BI ↔ U	none	7	d_CI_lag1 d_CI_lag6 d_CI_lag7 d_U_lag2 d_U_lag5 d_U_lag7	BLUE
"pracovní nabídka" (job offer)				Neutral	
"jobs.cz"					
"práce" (jobs)					
"nabídka práce" (offer a job)					
"životopis" (CV)					
"pohovor" (interview)					
"jenprace.cz"					
"volná pracovní místa" (job vacancies)					

Table 23. Testing Granger causality for the economic sentiment indicator and individual keywords

Variable	*Direction of causality*	*VAR*		*Significant lag*	*Type of estimation*
		Order	*Type*		
"hledám práci" (looking for a job)				Neutral	
"volná místa" (vacancies)	ESI ↔ U	Const	3	d_CI_lag3 d_U_lag1 d_U_lag2	BLUE
"kariéra" (carrers)	ESI ↔ U	None	6	d_CI_lag1 d_CI_lag4 d_U_lag1 d_U_lag4	BLUE
"pracovní nabídka" (job offer)				Neutral	
"jobs.cz"					
"práce" (jobs)	ESI → U	None	4	d_CI_lag1 d_CI_lag4	BLUE
"nabídka práce" (offer a job)				Neutral	
"životopis" (CV)					
"pohovor" (interview)					

"jenprace.cz"	
"volná pracovní místa" (job vacancies)	

5 Conclusion

Google search queries closely related to the job search of a person unemployed or soon to be unemployed have been used in this paper to construct an alternative type of indicator of the current and expected future state of the labour market. The results confirm the interdependence between Google queries and confidence indicators, however, the direction of causality is not clear in all cases. Three types of causality were identified - confidence-leading, unemployment-following and feedback hypothesis, with confidence-leading being the predominant type of causality in all VAR models. Thus, confidence indicators predict the trend in unemployment. Furthermore, according to the results of the VAR models, there is clearly a higher forecasting accuracy when more keywords are used, as job-seeking behaviour is better depicted. A person does not search for a job using only one keyword, but enters multiple variations into a search engine and it is therefore appropriate to construct an indicator using multiple combinations of keywords. Specifically, in this study, the median frequency of all keywords was used to construct the unemployment rate. Using the median of all keywords, causality was evident between the median unemployment rate and the confidence indicator for industry, construction, corporate, selected services and trade. In terms of direction of causality, confidence-leading is also the predominant type of causality, which was evident for the indicator for industry, construction, business and selected services. For the trade indicator, it is an unemployment-following causality. The better provision of prediction result when using multiple keywords is in line with the claim of Nagao et al. (2019), who recommend working with multiple words precisely because of the high accuracy of predictions. When working with the median, causality between unemployment and consumer behavior and the aggregate economic indicator was not demonstrated. The fact that no causal relationship was found between consumer behaviour and the unemployment rate refutes the findings of Zaiyang (2017) who sees a higher dependence where there is a higher element of association between the consumer and the real economic variable. He argues that the relationship of specifically unique consumer behaviour should further enhance the strength of the dependence between the variables. However, this conjecture is not confirmed in this study as neutral causality was identified between the consumer behaviour indicator and the unemployment rate. Thus, the results of this paper are consistent with Niesert et al. (2020) who contradict the views of Zaiyang (2017). Eichenauer et al. (2022) mentioning only the general relevance of constructing economic sentiment indices using Google data is also supportive of the results of this study. Chadwick and Sengül (2012) talk about the usefulness of search terms that link to web portals where job postings can be advertised. Two web portals, jobs.cz and jenprace.cz, were also used in this research. Despite the results from Chadwick and Sengül's (2012) study, the relationship between keywords that specifically refer to job portals and trust indicators was not demonstrated in this study. For the Czech Republic, these job portals probably do not have a high enough search frequency among users. When working with the selected indicators and individual keywords, the rate of finding causality was lower because, as already mentioned, consumer online searches using a single keyword do not have sufficient power to show a statistically significant relationship. Focusing on the results for the industry index, it is possible to identify causality for unemployment with the keyword career, where causality is bidirectional. The second causality occurs with the keyword job, where it is a confidence-leading type. Only two causalities were found for the confidence indicator in the construction industry. The keyword job offer and resume are causally related to the time series of unemployment. Confidence-leading causality was found for both keywords. In the case of the business confidence indicator, causality was identified with three keywords, namely job vacancies, career and job. The unemployment-following type of causality is the same for vacancies and jobs, which can be viewed as words having synonymous character, hence the direction of causality is also the same. The keyword career is related to unemployment through confidence-leading causality. Another indicator targets selected services, which is causally dependent with the words vacancies, career and job. Jobs and career are linked to unemployment through bidirectional causality, and for the keyword job it is confidence-leading causality. The confidence indicator for the business environment is one of the most causally related when we talk about the construction of VAR models based on time series of a single keyword. Vacancies and careers are linked to unemployment by bidirectional causality. Another causality was identified for the words job supply and job, where it is a confidence-leading causality. The penultimate consumer behaviour indicator found a single causal

relationship with the word career and this is a bidirectional dependency. The last indicator is the aggregate economic indicator. Causality was found for this indicator with the keywords vacancies and careers. Confidence-leading causality was identified for the keyword job. It can be noticed that the keywords career and job interact the most with each confidence indicator. This fact is probably due to the fact that these words are so unique in job search that they are able to confirm statistical significance. Finally, it is necessary to confirm the existence of a causal relationship between the unemployment rate, when the source for this indicator is Google Search, and the confidence indicators. However, the strength of the causal relationship is influenced by the strength of user searches, where the correlation may disappear when certain keywords are searched at a lower frequency. It is therefore important to work with an indicator that will consider a combination of multiple keywords. In this study, the median was considered as it is a robust level characteristic that is not affected by extremes compared to the mean. The degree of interdependence between the variables is quite strong in the case of the median unemployment rate, since out of the seven confidence indicators, causality has been demonstrated in five cases, where the predominant type is a VAR model of order 5. The confidence indicators among which causality has been demonstrated can be used as a baseline for determining unemployment trends or as a predictor for future labour market developments. In this sense, the indicator can be seen as a kind of additional type of confidence indicator for the labour market. A particular contribution of this study is the identification of the direction of causal dependencies, which is lacking in previous studies. In further investigating this issue, it would be worth considering whether it would provide better results with the use of lower order VARMA models, as only higher order VAR models were implemented in this paper.

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