

ECONOMIC SYNERGY: LIQUIDITY AND ACTIVITY IN V4 ENTERPRISES

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Cite as: Blazek, R., Korpysa, J., Vytautas, J. (2024). *Economic synergy: liquidity and activity in V4 enterprises*, *Ekonomicko-manazerske spektrum*, 18(1), 1-15.

Available at: dx.doi.org/10.26552/ems.2024.1.1-15

Received: 22 November 2023; Received in revised form: 9 February 2024; Accepted: 15 March 2024; Available online: 30 June 2024

Abstract:

Research background: It is essential to examine the correlation between liquidity and enterprise activity in the Visegrad Group, which comprises Central European countries, given the current economic conditions. These variables are the basis for economic synergy and operate as crucial factors in determining the financial sustainability and competitiveness of firms in the region.

Purpose of the article: This essay aims to offer a comprehensive comprehension of the correlation between liquidity and activity in V4 firms. We examine the reciprocal impact and collective contribution of these two factors on regional economic dynamics. We aim to analyse the fundamental elements that influence this connection and provide precise suggestions for the commercial setting.

Methods: We utilised an amalgamation of quantitative and statistical methodologies in order to accomplish the predetermined goals. Median values for specific liquidity and activity indicators among V4 enterprises were computed using Microsoft Excel for the quantitative analysis. Furthermore, the significance of variations between years was evaluated by employing the Friedman test.

Findings & Value added: Our research demonstrates that activity and liquidity have a substantial effect on the V4 economy. We have identified and illustrated the variation of important factors that influence this relationship across industries. This article enhances comprehension of economic synergy in the region and provides business leaders, economists, and the general public with an interest in Central European business matters with insightful information.

Keywords: Friedman test; liquidity indicators; activity indicators; Visegrad Group

JEL Classification: C12; C13; C52

1. Introduction

The astute administration of liquidity and activity has long been acknowledged as a vital facet of efficient business operations. In today's economic environment, businesses encounter ever-changing obstacles and possibilities, necessitating a strategic approach to navigate through

financial uncertainties. Notable research on effective liquidity and activity management has been conducted by Winarta and Kuntadi (2022), Sipayung et al. (2022), Sewu et al. (2022), and Saputra et al. (2023). These experts have offered unique perspectives on the ever-changing nature of business operations and the shifting tactics necessary to sustain financial strength in today's demanding economic environment. The importance of liquidity, which refers to a company's capacity to fulfil short-term obligations, and activity, which includes operational efficiency and asset utilization, has grown significantly.

The capacity of an organization to convert its assets into cash with minimal loss constitutes liquidity. This particular capability affords enterprises financial latitude and empowers them to efficiently oversee their payment obligations (Mazanec, 2023).

Blazek et al. (2023) they explain that in the contrast, measurable metrics like production rates, sales volume, or other comparable metrics serve to demonstrate the intensity and motion of entrepreneurial endeavours. Enterprise operations comprise the production, commerce, and distribution processes, all of which are integral components of this concept. By employing these definitions as a basis for our subsequent investigations, we are consistently able to assess the correlation between entrepreneurial activity and liquidity within the Visegrad Group. Our objective is to furnish comprehensive frameworks that facilitate comprehension of the economic ramifications of these pivotal factors in the region (Mazanec, 2022).

The study of liquidity and activity has its origins in the early stages of financial analysis, when enterprises aimed to improve their financial well-being. Scholars like Bruggen et al. (2017), Vlaev and Elliott (2014), and Netemeyer et al. (2018) have explored the concept of financial well-being in their respective works, providing valuable insights into the broader context of organizational prosperity. Over time, the emphasis has shifted towards highlighting the complex interplay between liquidity and activity. Researchers such as Susanti and Samara (2021), Lomidze (2016), and Serences et al. (2010) have delved into the intricacies of liquidity and activity, shedding light on their dynamic relationship. These two aspects are interconnected, with each exerting an influence on the other in an intricate manner that defines the entire financial situation of an organization.

Within this framework, the analysis of liquidity often entails a careful assessment of many indicators, with particular emphasis placed on liquidity ratios. Significant metrics, such as the current ratio (liquidity ratio 1st degree), quick ratio (liquidity ratio 2nd degree), and cash ratio (liquidity ratio 3rd degree), offer valuable information about a company's capacity to adequately meet its short-term obligations.

Equally, in the field of activity, important measurements consist of inventory turnover, total asset turnover, and current asset turnover.

Gaining a comprehensive understanding of the interdependent relationship between liquidity and activity has become crucial not just for financial analysts but also for firm executives. In the realm of financial and economic analysis, liquidity and activity are crucial metrics that offer valuable insights into a company's financial well-being and operational efficiency. Researchers such as Mitra and Mitra (2011), Bell and Zaric (2013), Fanning and Grant (2013), and Laursen and Thorlund (2016) have significantly contributed to unraveling the complexities of liquidity and activity. Their studies have provided valuable perspectives, enriching the understanding of how these metrics impact an organization's financial health and operational effectiveness. Management teams analyze these measures to evaluate the company's capacity to fulfil its immediate financial responsibilities and maximize the utilization of its resources.

This article explores the particular circumstances of V4 enterprises, which consist of the Central European nations belonging to the Visegrad Group. Nevertheless, it is crucial to acknowledge that the significance of liquidity and activity extends beyond this specific region.

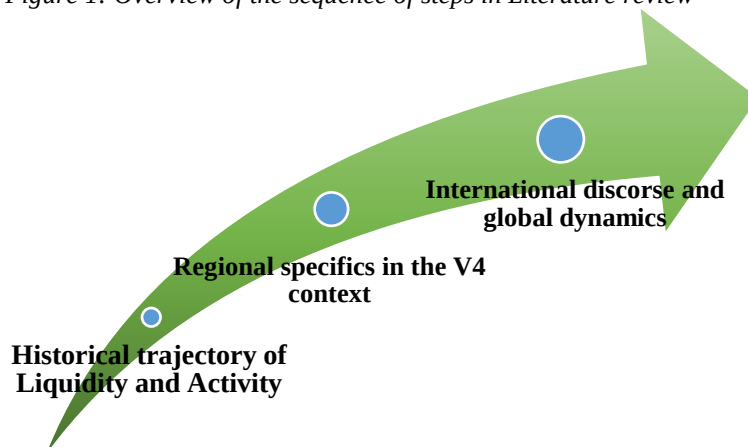
Internationally, there has been an increase in discourse around these crucial financial indicators. The work of researchers such as Dolfín et al. (2021), Pardo and Pascual (2016), Clapp et al. (2017), and Moser and Barrett (2006) has significantly contributed to the broader international dialogue on liquidity and activity. Their studies offer diverse perspectives, enriching the understanding of these financial metrics and their implications for global financial and economic analyses. This article seeks to elucidate the intricate dynamics of liquidity and activity, highlighting their interdependent nature and wider ramifications for global financial and economic studies.

2. Literature Review

The investigation into liquidity and activity in the economic sphere has experienced a significant evolution since its inception, progressing from initial financial analyses to the present-day emphasis on complex interrelationships and worldwide implications. Within the framework of Central European countries, specifically those comprising the V4, the interplay between activity and liquidity in terms of economic integration has come to be of critical importance. This chapter undertakes an in-depth exploration of the current corpus of knowledge, encompassing significant historical events, regional distinctiveness, and global viewpoints, in order to develop a holistic comprehension of these pivotal financial indicators.

The subsequent figure (Figure 1) delineates the progression of activities that shall be undertaken during the formulation of the literature review for the present chapter.

Figure 1: Overview of the sequence of steps in Literature review



Source: own research

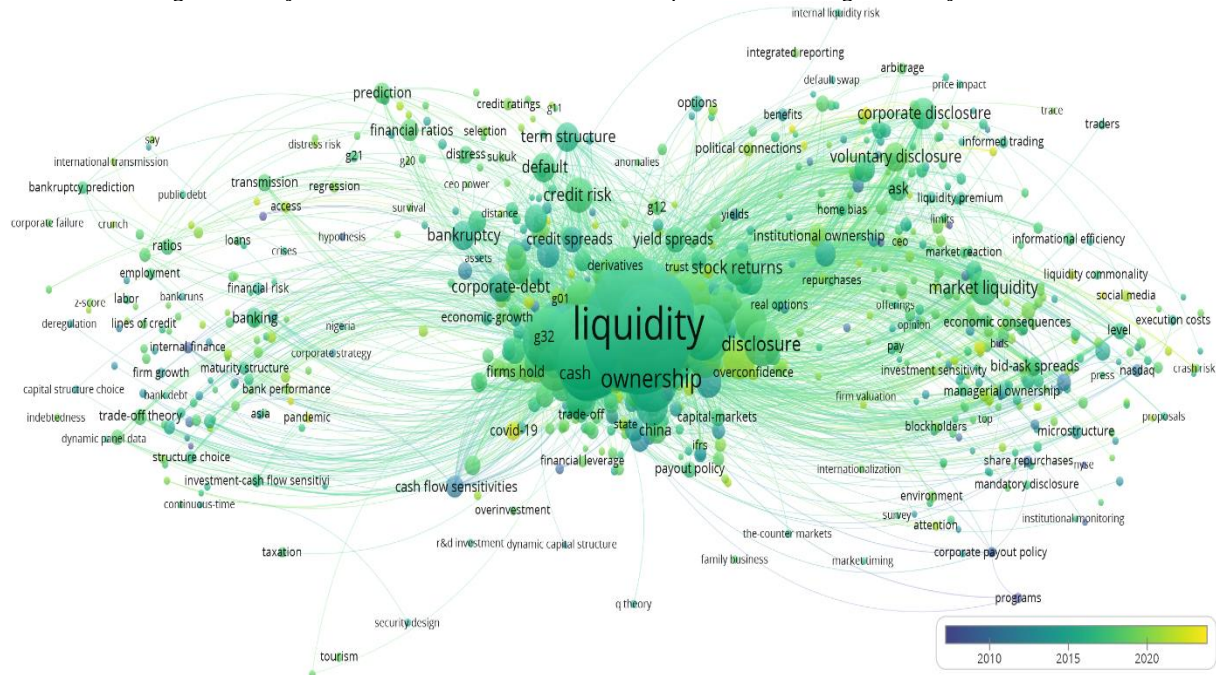
2.1. Historical trajectory of Liquidity and Activity

The historical trajectory of liquidity and activity pertains to the progressive development and progression of these terms within the realm of financial analysis and business operations. The objective of this segment is to trace the historical progression of the perception, comprehension, and implementation of these metrics

We utilised bibliometric analysis to conduct an exhaustive evaluation of keywords associated with activity and liquidity in scholarly articles. The VosViewer tool was employed to generate a graphical depiction of the evolution of frequently used keywords. The utilisation of this visualisation facilitated the detection of patterns in research and emphasised the development of notions pertaining to activity and liquidity. The chart employs colour gradations to denote the temporal dimension; keywords that have been utilised historically are represented

by darker hues, whereas more recent trends are depicted in lighter shades. By employing their respective keywords, we conducted a methodical examination of the progression of research in the domain of liquidity and activity. Figure 2 captures the use of keywords over the years associated with the term business liquidity.

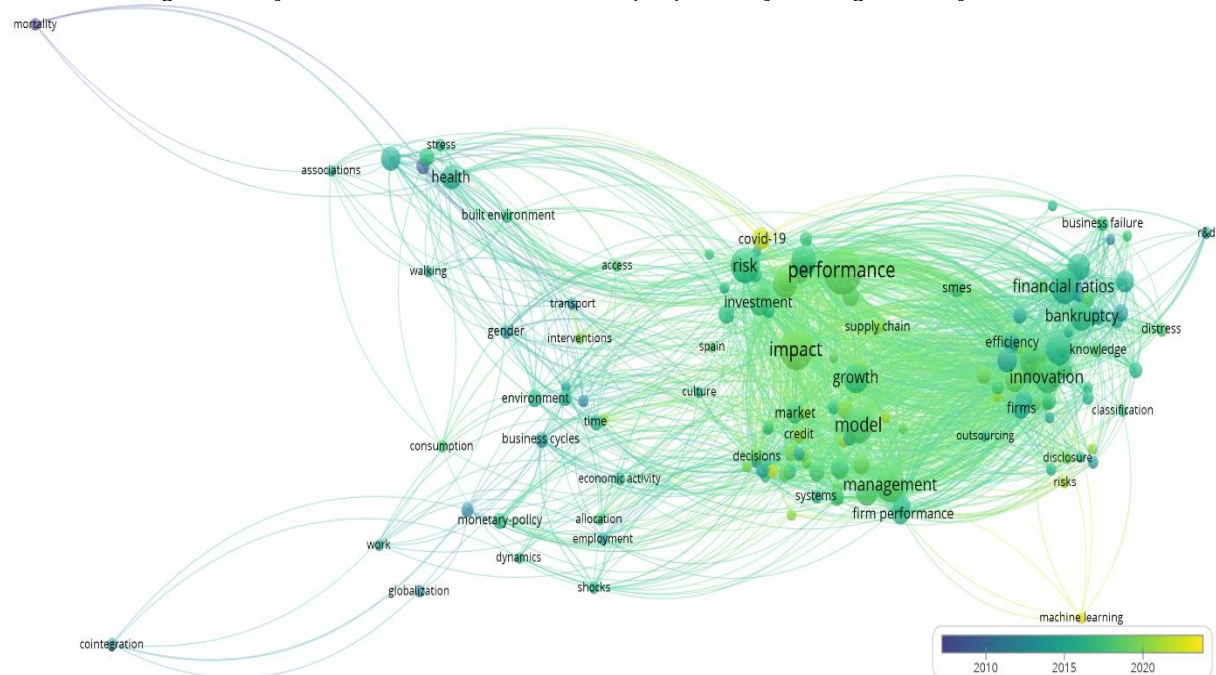
Figure 2: Key terms associated with the term "liquidity" throughout the years



Source: own research

Figure 3 captures the use of keywords over the years associated with business activity.

Figure 3: Keywords associated with the concept of "activity" throughout the years



Source: own research

Evidently, despite the fact that both terms pertain to the business, the emphasis on the keywords used in their respective contexts is quite dissimilar. The quantity of keywords employed to represent the concepts under investigation also exhibits a notable distinction. This leads us to the conclusion that liquidity is a more significant concern for businesses than activity, despite their close relationship.

2.2. Regional specifics in the V4 context

The historical economic alliances of the V4 nations date back to the 1990s, when they first began the process of transitioning to market economies. Slovakia, the Czech Republic, Hungary, and Poland are forging interactive connections in an effort to establish economic foundations and foster mutual development. The establishment of joint membership in the European Union in 2004 invigorated their collaboration and facilitated the unrestricted flow of capital, products, and services. The stability of the economic environment fostered by the V4 countries through synergy and mutual support has stimulated innovation, trade, and investment in Central Europe.

The economic positions of the V4 countries in Central Europe are significantly influenced by geopolitical factors, given that they form a strategic alliance characterised by shared challenges and interests. Their historical connections and central European location make them a vital link between the East and the West. As a result of their increased economic influence and competitiveness, cooperation among the V4 members bolstered their standing in the globalised world. The influence of these factors on regional and global economic policies is crucial.

Within the realm of the V4 economy, the cooperative and dynamic progress in the Central European region presents an intriguing perspective. The varied sectors that underpin the economics of these nations are their critical sectors. Strong industrial sectors, including mechanical engineering, the automotive industry, and electrical engineering, define the Czech Republic. It is renowned for its capacity to attract foreign direct investment and its significant technological potential. Hungary places emphasis on a multitude of sectors, encompassing the automotive, culinary, and electronics industries. Economic strength is attributable to its strategic location as a transit nation for East-West trade. The greatest economy in the V4 region is that of Poland. It is renowned for its dynamic industrial sector, particularly in the metalworking, energy, and mining industries. Due to its robust infrastructure and expansive domestic market, Poland is an appealing location for investment. Despite having a relatively modest economic volume, Slovakia is a leader in the manufacturing of automobiles and electronic equipment. Its sector maintains strong interconnections with neighbouring nations and entities within the V4.

The locations of the V4 countries in Central Europe exert a substantial influence on their business models. They strive to establish regional cooperation and diversify their business relationships. By virtue of their substantial integration into European economic structures, these nations strive to strike a balance between their relations with the EU's internal market and the international community.

The V4 exemplifies prosperous economic integration in Central Europe, wherein every nation made a distinct and valuable contribution to the collective economic prowess of the area. Collaboration in this domain establishes a steadfast foundation for expansion and global competitiveness.

The V4 nations establish a dynamic region in which collaborative economic initiatives serve as the foundation for economic unity. The Visegrad Fund, which promotes collaboration in the domains of innovation, infrastructure, and regional progress, is one such initiative. These

initiatives facilitate the reduction of inequalities among the V4 nations and bolster their economic development.

The impact of cultural subtleties on liquidity and activity in the V4 nations is apparent in their varied business and financial strategies. In Poland, the activity and liquidity of a traditional family business may be significant factors; conversely, in the Czech Republic, technological innovation may be prioritised.

Concurrently, cultural values impact investment and risk management strategies. The inclination towards risk-taking in Hungary could potentially be attributed to a heightened cultural value placed on innovation and novel business prospects, factors that could influence regional liquidity and activity.

In general, cultural nuances and collaborative economic initiatives are significant determinants of activity and liquidity in the V4 nations. Their harmonious integration enhances economic unity in the area while demonstrating due regard for the distinct attributes of each nation.

2.3. International discourse and global dynamics

In an endeavour to maintain a balanced position on the international stage, the V4 nations' international discourse and global dynamics reflect this. The V4 actively participates in international cooperation with regards to politics, industry, and society. Among the current trends are the pursuit of fresh trade relations, political alliances, and cultural exchange opportunities. These characteristics serve as evidence of their capacity to influence international events and participate in global dialogues, all the while preserving their unique identity and adjusting to evolving global trends.

A multitude of factors that influence the economy and business operations in the region are intricately intertwined with ongoing debates regarding liquidity and business activity in the V4 countries. These nations actively participate in the global arena and endeavour to attain a condition of equilibrium in the global economic system. Indicators of the financial sustainability and competitiveness of the business sector in the V4 countries include liquidity and business activity. In the context of regional particulars and global dialogue, the significance of these indicators increases in relation to comprehending the economic unity and interdependencies among the V4 nations.

3. Methodology

We incorporated data from the ORBIS database, which was accessible to researchers affiliated with the Department of Economics at the University of Zilina in Zilina, as part of this research endeavour. Our analytical framework comprised a comprehensive examination of the median values of chosen liquidity indicators for the V4 countries, including ratio and difference indicators. Concurrently, the aforementioned process was executed on specific activity indicators within the aforementioned nations. For calculations, we utilized MS Excel software tools, and for statistical analyses, we employed IBM SPSS Statistics.

In order to ascertain substantial fluctuations in activity and liquidity indicators for specific years spanning from 2016 to 2021, we implemented the Friedman test. The aforementioned analytical methodology yielded an exhaustive examination of the dynamics governing the growth of activity and liquidity in the V4 region. By facilitating a more comprehensive comprehension of the economic landscape in a specific region, the assessment of these data can provide a significant aid to both scholars and professionals in the fields of economic analysis

and business administration. The methodology employed is founded on precise data processing, thereby facilitating an impartial evaluation of liquidity and activity in Central Europe.

The median values of specific liquidity indicators for V4 countries are presented in Table 1, while the median values of specified activity indicators for V4 countries are presented in Table 2.

Table 1: The median values of selected liquidity indicators for the V4 countries

	2016	2017	2018	2019	2020	2021
Cash Ratio	0.20	0.20	0.18	0.19	0.24	0.22
Quick Ratio	0.75	0.73	0.62	0.64	0.68	0.64
Current Ratio	1.20	1.17	1.10	1.07	1.14	1.13

Source: own research

Table 2: The median values of selected activity indicators for the V4 countries

	2016	2017	2018	2019	2020	2021
Inventory Turnover	0.21	0.25	0.27	0.25	0.28	0.27
Assets Turnover	0.05	0.05	0.06	0.06	0.06	0.06
Current Assets Turnover	0.08	0.09	0.09	0.10	0.10	0.11

Source: own research

4. Results

The application of pairwise comparison in accordance with the Friedman test serves the purpose of discerning similarities or differences among groups. The Friedman test is a statistical method used to compare numerous groups; however, it does not provide information regarding the specific groups that are similar or distinct from one another. Hence, the pairwise method is employed to ascertain the presence of statistically significant disparities among various groups. Pairwise comparisons involve comparing pairs of groups derived from the Friedman test using a statistical test that evaluates the significance of differences between groups, such as the Wilcoxon test. Subsequently, an assessment is conducted to ascertain the similarity or dissimilarity between each pair of groups, predicated upon the outcome of the test. If the statistical test yields a statistically significant result, it indicates that there is a meaningful distinction between the groups being compared. If this condition is not met, it indicates that the groups exhibit similarities. The utilisation of pairwise comparison, as facilitated by the Friedman test, enables the identification of groups that can be subjected to further scrutiny through the application of other statistical tests.

The data obtained from IBM SPSS Statistics indicated that the distribution of the data does not conform to a normal distribution. Furthermore, as the variables being considered are being compared across different time points, it may be inferred that these variables are dependent on each other. In order to do the extra math, the Friedman test, which is a repeated-measures analysis of variance (ANOVA) test, was used to compare of the selected indicators.

In the context of statistical testing, the formulation of hypotheses holds significant importance since it enables the clear delineation of the research topic being investigated. To maintain the statistical integrity of the hypothesis evaluation, a null hypothesis and an alternative hypothesis were formulated and subsequently evaluated at a significance threshold of $\alpha = 0.05$.

4.1. Pairwise Comparison of Selected Liquidity Indicators Using the Friedman Test

Assessing liquidity is a critical component in the endeavour to attain a thorough comprehension of financial dynamics. Liquidity, an essential component of financial stability,

represents an organisation's capacity to fulfil immediate financial obligations. When scrutinising an intricate network of financial indicators, our focus shifts to a pairwise comparison of particular liquidity metrics. By employing the Friedman test, one can effectively identify substantial fluctuations in these indicators across numerous time intervals. The objective of this chapter is to delve into the intricacies of liquidity ratios as they pertain to the Friedman test. Through the implementation of a reciprocal comparison methodology, our objective is to unveil temporal patterns and possible distinctions among the chosen indicators. The examination is of the utmost importance in uncovering nuanced fluctuations in liquidity, thereby enabling a more profound understanding of the financial robustness of enterprises functioning within the examined geographical area.

For statistical analysis, a null and alternative hypothesis were set, and they were evaluated for statistical significance at $\alpha = 0.05$. For pairwise comparison, the Related-Samples Friedman's Two-Way Analysis of Variance by Ranks was utilized.

H_0 : The distribution of indicators in V4 countries remains consistent, and the size of indicators is not influenced by time.

H_1 : The distribution of indicators is not uniform in V4. The size of indicators is influenced by time.

Table 3: Summary of Test Results

Summary of Test Results			
Indicator	Null hypothesis	Significance	Decision
Cash Ratio	The distributions of Cash Ratio 2021, Cash Ratio 2020, Cash Ratio 2019, Cash Ratio 2018, Cash Ratio 2017 and Cash Ratio 2016 are the same.	<0.001	Reject the null hypothesis.
Quick Ratio	The distributions of Quick ratio 2021, Quick ratio 2020, Quick ratio 2019, Quick ratio 2018, Quick ratio 2017 and Quick ratio 2016 are the same.	<0.001	Reject the null hypothesis.
Current Ratio	The distributions of Current Ratio 2021, Current Ratio 2020, Current Ratio 2019, Current Ratio 2018, Current Ratio 2017 and Current Ratio 2016 are the same.	<0.001	Reject the null hypothesis.
Inventory Turnover	The distributions of Inventory Turnover 2021, Inventory Turnover 2020, Inventory Turnover 2019, Inventory Turnover 2018, Inventory Turnover 2017 and Inventory Turnover 2016 are the same.	<0.001	Reject the null hypothesis.
Assets Turnover	The distributions of Assets Turnover 2021, Assets Turnover 2020, Assets Turnover 2019, Assets Turnover 2018, Assets Turnover 2017 and Assets Turnover 2016 are the same.	<0.001	Reject the null hypothesis.
Current Assets Turnover	The distributions of Current Assets Turnover 2021, Current Assets Turnover 2020, Current Assets Turnover 2019, Current Assets Turnover 2018, Current Assets Turnover 2017 and Current Assets Turnover 2016 are the same.	<0.001	Reject the null hypothesis.

Source: own research

Based on the testing, it was found that all indicators have a significance lower than the significance level α . This implies that the null hypothesis is rejected, and the alternative hypothesis is accepted for all indicators. Therefore, we can conclude that the distribution of indicators in V4 countries is not uniform. With this confirmation, the pairwise comparison of liquidity and activity indicators can proceed.

The test statistic utilised in the Friedman test holds significance as it enables the evaluation of the presence of significant disparities among group results in multiple comparisons. The numerical indicator in question serves as a means of determining whether to reject the null hypothesis, which posits the absence of any differences between groups, or to accept it, given the presence of statistically significant differences. Hence, the inclusion of Table 4 presents the test statistical outcomes for each individual indicator in a pairwise comparison.

Table 4: Results of the test statistics for selected indicators

Sample 1-Sample 2	Cash Ratio	Quick Ratio	Current Ratio	Inventory Turnover	Assets Turnover	Current Assets Turnover
2016-2017	-0.086	-0.102	-0.322	-0.339	-0.322	-0.331
2016-2018	-0.543	-0.788	-0.869	-0.476	-0.098	-0.192
2016-2019	-0.351	-0.894	-0.996	-0.800	-0.959	-0.608
2016-2020	0.269	-0.380	-0.751	-0.651	-0.882	-0.755
2016-2021	-0.012	-0.714	-0.747	-1.053	-0.984	-1.237
2017-2018	-0.457	-0.686	-0.547	-0.137	0.224	0.139
2017-2019	-0.265	-0.792	-0.673	-0.461	-0.637	-0.278
2017-2020	0.355	-0.278	-0.429	-0.312	-0.559	-0.424
2017-2021	0.073	-0.612	-0.424	-0.714	-0.661	-0.906
2018-2019	0.192	-0.106	-0.127	-0.324	-0.861	-0.416
2018-2020	0.812	0.408	0.118	-0.176	-0.784	-0.563
2018-2021	0.531	0.073	0.122	-0.578	-0.886	-1.045
2019-2020	0.620	0.514	0.245	-0.800	0.078	-0.147
2019-2021	0.339	0.180	0.249	-0.253	-0.024	-0.629
2020-2021	-0.282	-0.335	0.004	-0.402	-0.102	-0.482

Source: own research

The significance value obtained from individual pairwise comparisons is used in the Friedman test to inform decision-making. This value indicates whether or not there are statistically significant variations in the group ratings across multiple measurements. By utilising the significance value, one can assess whether the null hypothesis, which posits no differences between the groups, can be refuted in favour of the alternative hypothesis, which asserts the existence of statistically significant differences. We adopt the alternative hypothesis and reject the null hypothesis if the significance is less than the chosen significance level (typically $\alpha = 0.05$). This indicates that there are statistically significant differences between the groups. The significance values that come up from comparing two people pairwise show which groups have different opinions on how to read activity and liquidity indicators.

The following null and alternative hypotheses were chosen:

H₀: The given pair of indicators is not significantly different from each other.

H₁: The given pair of indicators is significantly different from each other.

Table 5: Final significance values for selected indicators

Sample 1-Sample 2	Cash Ratio	Quick Ratio	Current Ratio	Inventory Turnover	Assets Turnover	Current Assets Turnover
2016-2017	0.612	0.546	0.056	0.045	0.056	0.050
2016-2018	0.001	<0.001	<0.001	0.005	0.562	0.256
2016-2019	0.038	<0.001	<0.001	<0.001	<0.001	<0.001
2016-2020	0.111	0.025	<0.001	<0.001	<0.001	<0.001
2016-2021	0.942	<0.001	<0.001	<0.001	<0.001	<0.001
2017-2018	0.007	<0.001	0.001	0.419	0.184	0.412
2017-2019	0.117	<0.001	<0.001	0.006	<0.001	0.101
2017-2020	0.036	0.101	0.011	0.065	<0.001	0.012
2017-2021	0.664	<0.001	0.012	<0.001	<0.001	<0.001
2018-2019	0.256	0.530	0.454	0.055	<0.001	0.014
2018-2020	<0.001	0.016	0.484	0.299	<0.001	<0.001
2018-2021	0.002	0.664	0.469	<0.001	<0.001	<0.001
2019-2020	<0.001	0.002	0.147	0.378	0.646	0.385
2019-2021	0.045	0.288	0.141	0.134	0.885	<0.001
2020-2021	0.096	0.048	0.981	0.017	0.546	0.004

Source: own research

The unmarked values differ substantially from the predetermined significance level, as shown in Table 5. This implies that the null hypothesis is rejected in such circumstances, while the alternative hypothesis is accepted. For the remaining pairings, therefore, no statistically significant distinction can be observed when examining the outcomes of the indicators.

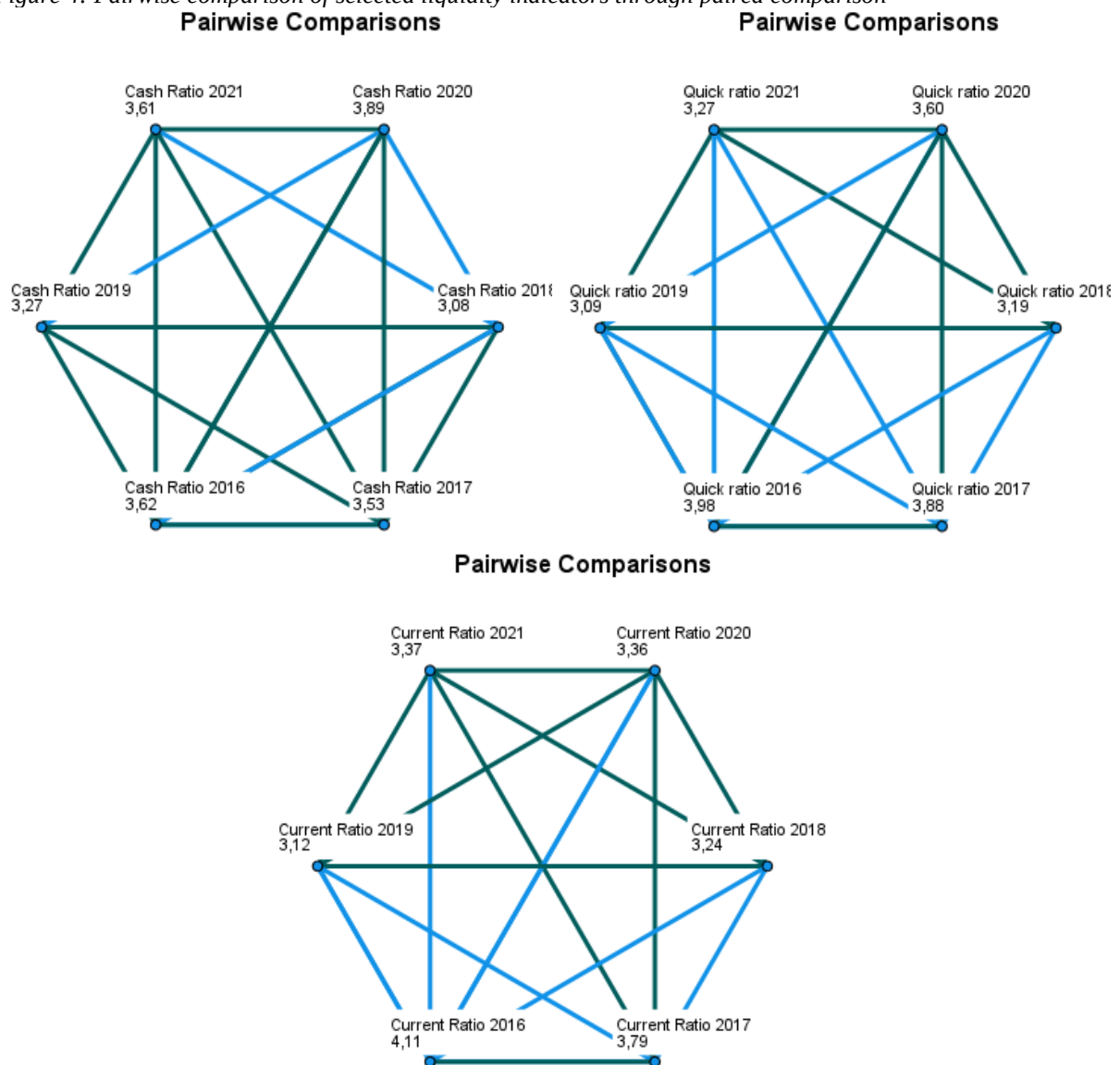
4.2. Graphical representation of calculated statistical values through paired comparison using Friedman's test

Graphical representation of individual results achieved through pairwise comparison by the Friedman test is captured in the following figures.

The graphical representation captures individual years compared for each indicator. The green colour of the line indicates that in the respective pairwise comparison, there are no significantly different values, meaning that the given pair is not significantly different from each other. Alternatively, the indicator did not acquire significantly different values in the observed years.

The blue colour of the line indicates that in the respective pairwise comparison, there are significantly different values, making it the colour for the alternative hypothesis.

Figure 4: Pairwise comparison of selected liquidity indicators through paired comparison

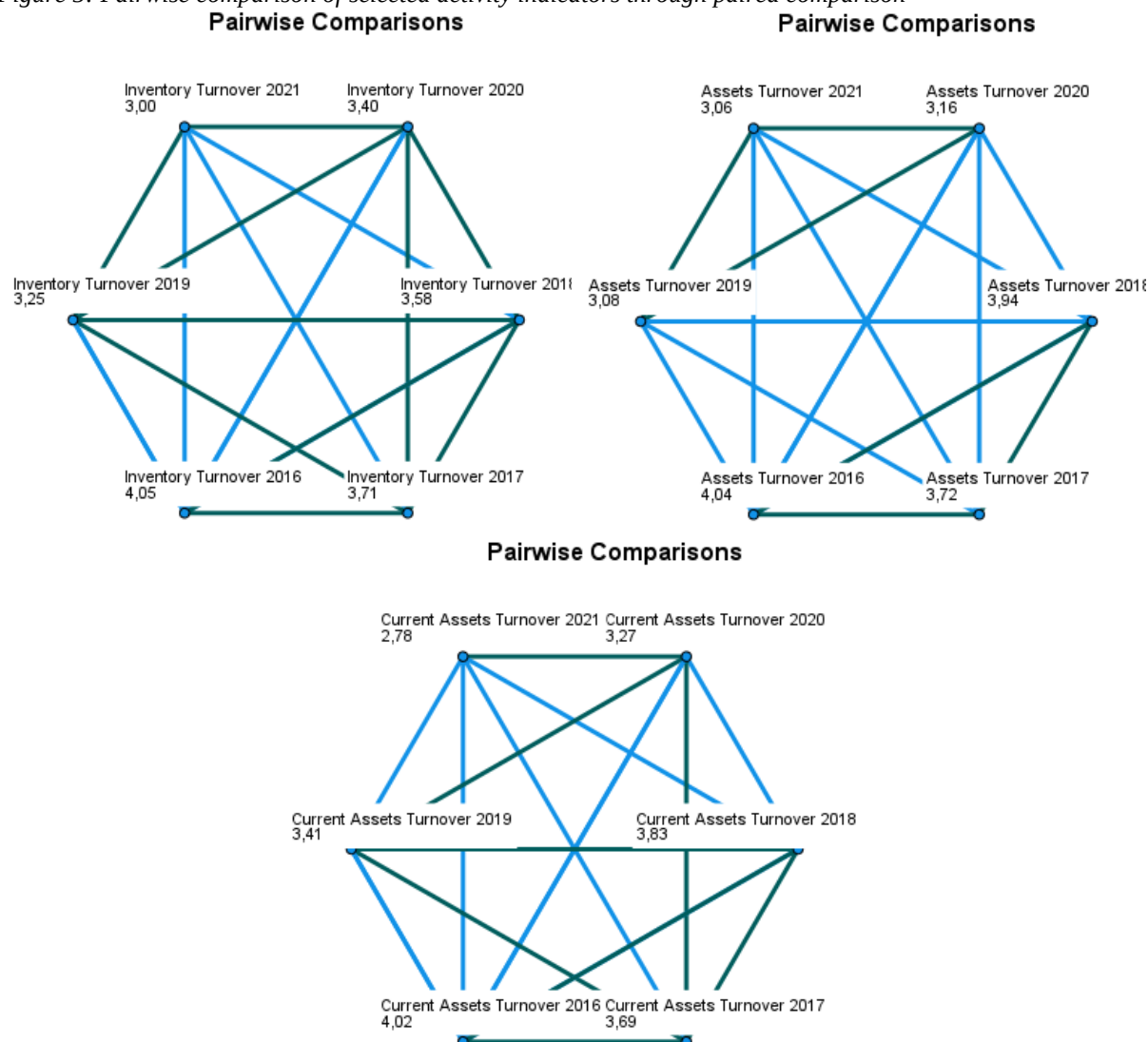


Source: own research

Similarly, we compared selected activity indicators. Once again, we maintained the colour meanings, where a green line signifies that there are no significantly different values in the

paired comparison, representing the null hypothesis. In the case of a blue line, it indicates the presence of significantly different values, representing the alternative hypothesis.

Figure 5: Pairwise comparison of selected activity indicators through paired comparison



Source: own research

When we focused on the connection between liquidity and business activity in the Visegrad Group, we found that it can be influenced by various factors. Among these factors may include (i) a variety of legislative and regulatory measures may have an impact on the operations management and liquidity of enterprises in the Visegrad Group countries; (ii) phases of economic cycles, including periods of expansion, contraction, or stabilization, can exert a substantial influence on the operational and financial standing of enterprises; (iii) the banking sector's credit accessibility and the state of financial markets may have an impact on businesses; (iv) foreign investment inflows and outflows have the potential to impact the liquidity and operational activities of companies affiliated with the Visegrad Group; (v) the degree of confidence that investors and businesses have in the political environment may have a significant impact on their levels of liquidity and operational engagements; (vi) trade relations and commodity price fluctuations are just two examples of how global macroeconomic trends can affect the business environment; (vii) advancements in technology and innovations have the potential to impact the operational effectiveness of businesses as well as their capacity to

oversee activities and liquidity; and (viii) changes in consumer behaviour and demographic developments may have an impact on the liquidity and operations of businesses.

Additionally, it is critical to note that the Visegrad Group as a whole places considerable emphasis on country-specific macroeconomic indicators. Hence, in order to elucidate the effect of macroeconomic indicators on the activities and liquidity of the businesses comprising this group, the facts may include (i) business law encompasses a set of regulations and laws that dictate the formation and functioning of organizations; this includes commercial contracts, registration, licenses, and bankruptcy law procedures; (ii) employment law encompasses a range of regulations that govern contractual agreements, working conditions, contributions, and employment relationships; these laws establish duties for employers and safeguard the rights of employees; (iii) tax systems and regulations pertaining to fiscal regulation govern income taxes, VAT, and additional levies; businesses may experience an effect on their expenses and profits due to fiscal regulation; (iv) legal protections are in place for consumers, and consumer rights, product labelling, and dispute resolution procedures are all governed by these regulations; (v) environmental regulation consists of legislation that tackles a range of concerns, such as the management of refuse, emission standards, and the safeguarding of nature; (vi) regulations that protect client interests and ensure the stability of the financial system are in place to govern the banking and financial sector; (vii) investments in the digitization of public services and e-government are made gradually. Electronic citizen identification, online services, and electronic forms are all included; (viii) legislation, including patents, intellectual property protection, and tax incentives for research and development, may foster an environment conducive to innovation.

5. Discussion

The research findings initiate a substantial discourse among scholars in the field, stimulating an examination of diverse viewpoints and possible directions for additional inquiry. When contrasting our findings with those of other scholars, it is imperative to recognise the distinctive circumstances of our research, which centred on the economic dynamics of the V4 nations.

To begin with, the unforeseen pattern observed in 2020, wherein a considerable percentage of indicators exhibited values surpassing expectations, calls into question established beliefs regarding the pandemic's effect on enterprises. This discovery compels us to examine the unique socioeconomic circumstances of the V4 region, which may deviate from worldwide patterns. Prominent academics, including Siekelova et al. (2019) and Crhova et al. (2016), have investigated comparable economic transformations within distinct settings, placing significant emphasis on the influence of regional factors on monetary results.

By contrasting the years 2016–2019 with the following year, 2020, a temporal dimension is added to the discussion. Our observation is consistent with the findings of Suler and Machova (2020), who documented significant economic expansion in the V4 countries during 2019. This underscores the importance of historical trajectories in comprehending fluctuations in the economy. However, alternative explanations for economic shifts during this time period are proposed by Valaskova et al. (2020), who emphasize the significance of geopolitical factors.

In preparation for the future, Dutta (2023)'s suggested research agenda is consistent with our strategy to integrate metrics for profitability and debt. Gajdosikova et al. (2023) concur with the notion that indicators of indebtedness may provide insightful information regarding the financial strategies implemented by companies amidst the pandemic. Furthermore, Markova and Svihlikova (2019) emphasize the interdependence of liquidity, activity, and indebtedness,

arguing that a thorough examination of these elements is crucial for comprehending the dynamics of profitability.

In summary, the results obtained from this research make a significant contribution to the continuous dialogue surrounding economic indicators. Through active collaboration with fellow scholars, our objective is to contribute to the scholarly dialogue and stimulate additional inquiries concerning the complex dynamics of financial metrics, particularly as they pertain to unparalleled worldwide occurrences such as the COVID-19 pandemic.

6. Conclusions

The findings from the Friedman test indicate that a significant proportion of indicators (66 percent) attain significance values surpassing the predetermined level of significance between 2019 and 2020. This discovery is noteworthy, given that the year 2020, which is characterised by the pandemic, is anticipated to demonstrate the most distinctive values in comparison to other years. This, surprisingly, does not hold true. It is possible that businesses did not perceive adverse effects from the economic measures implemented to contain the spread of COVID-19 during the pandemic. Nevertheless, significant observations emerge when analysing the period spanning from 2016 to 2019, during which each chosen indicator experiences a substantial fluctuation in value. Comparatively to the preceding year, the economies of V4 nations exhibited substantial growth in 2019. The reason for this is that the economies entered a phase of expansion, which caused the individual indicator values to increase substantially. Enterprises were flourishing, and had it not been for the repercussions of the worldwide pandemic in 2020, we contend that year would have stood out supremely among the years that have been observed. The findings presented in this scientific article offer novel perspectives that will significantly enhance subsequent investigations, specifically in regard to monitoring the progression of these metrics in the forthcoming period, specifically until 2022. Our objective is to further develop this research in the future by incorporating profitability and indebtedness indicators. We are convinced that indicators of indebtedness will produce intriguing values, particularly given the fact that numerous businesses were compelled to borrow funds in order to maintain their market position throughout the pandemic. Costs incurred as a result of forced business closures were not offset by revenues since organisations were unable to carry out their routine operations. Additionally, the interaction of activity, indebtedness, and liquidity indicators will offer an intriguing vantage point for profitability indicators. Indicators of profitability reflect the collective endeavours of organisations to attain their primary objective of producing financial gain. However, the interrelated dynamics of liquidity, activity, and indebtedness indicators have had a substantial influence on profitability indicators amidst the pandemic.

Author contributions: All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding: This research received no external funding.

Data Availability Statement: The data used in this study are not freely accessible and originate from the ORBIS database. The paid version of this database is available to the Department of Economics at the University of Zilina.

Acknowledgments: The paper is an output of the Ministry of Education, Science, Research and Sport of the Slovak Republic and Slovak Academy of Sciences project VEGA 1/0677/22:

Quo Vadis, Bankruptcy Models? Prospective Longitudinal Cohort Study with Emphasis on Changes Determined by COVID 19.

Conflicts of Interest: The authors declare no conflict of interests.

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EVALUATING THE PRODUCTIVE EFFICIENCY OF PUBLIC TRANSPORT COMPANIES USING ADDITIVE APPROACH

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Cite as: Domeny, I. (2024). *Evaluating the Economic Efficiency of Public Transport Companies Using Additive Approach*, *Ekonomicko-manazerske spektrum*, 18(1), 16-27.

Available at: dx.doi.org/10.26552/ems.2024.1.16-27

Received: 1 December 2023; Received in revised form: 4 February 2024; Accepted: 15 March 2024; Available online: 30 June 2024

Abstract:

Research background: The effectiveness of public transport is currently a very significant topic, which is also influencing the total efficiency of the public budget (state or regional). Public transport companies (bus, rail) are usually providing their services under the public contract with the state or regional authority responsible for the ordering of these services, and they are receiving subsidies from the public budget. It is in the interest of all inhabitants that these funds will be used properly, and they will receive the corresponding quality of public transport services.

Purpose of the article: The main aim of the article is to evaluate the productive effectiveness of chosen public transport companies operating in the suburban bus transport in Slovakia and Czech Republic.

Methods: For evaluating the effectiveness of specific groups of specific groups of public transport companies, an additive (weighted) approach of Data envelopment analysis (DEA), so-called slack-based model is used. Based on the results from SBM model, individual hypotheses about the significance of efficiency rate are tested using non-parametric Wilcoxon tests for one sample and Mann-Whitney test for independent samples.

Findings & Value added: From the results of the efficiency evaluation using SBM DEA model it is obvious that the average productive effectiveness of public transport companies operating under PSO contracts is in general low, with two or three DMU's achieving maximum efficiency within the given group. The significance of the difference in efficiency rate between two compared countries is also negligible. The main advantage of using the additive approach for this evaluation consists in considering the weights of inputs and outputs in the model. Suggested methodology can also be used by public authorities responsible for ordering transport services which are supported from the public budget.

Keywords: public transport; economic efficiency; additive model; data envelopment analysis

JEL Classification: C44; L91; R40

1. Introduction

Public transport forms an important part of the state public sector and economy. For the purpose of this study, by the public transport company we understand every enterprise or undertaking, which main activity consists in the provision of passenger transport services (e.g., bus, rail) for general public, in general to satisfy the transport requirements of inhabitants and ensuring the transport accessibility of the specific territory (state or region). This sector of the public economy is also known as low-profitable, due to the cost burden in combination with price regulation of public transport services, which leads to lower revenues. This begs the question how to evaluate the economic efficiency of these companies, which requires special approach considering that net profit is not the key indicator of company performance. Companies operating the passenger public transport are generally depended on subsidies from public authority (state or regional), which cover the difference between economically justified costs related to the operation of transport services, and real revenues from passenger's fares. The amount of this subsidy is usually referred to as a key indicator of efficiency when considering the public budget. For the company, it is more important to look at the operational costs, which optimization could result in the reduction of subsidy required from the state budget, and thereby to the satisfaction of all subjects on the public transport market.

In this paper, we are focusing on the specific approach for evaluating the productive efficiency of a specific sector of the economy, which is represented by companies or group of companies within a regional authority, operating public transport services under public interest. The evaluation of efficiency will be performed on the sample of chosen suburban bus public transport companies from Slovakia and Czech Republic, which are depended on subsidies from state or regional budget, using the additive (weighted) approach of Data envelopment analysis (DEA). One of the main aims is to compare the economic efficiency both within and between the individual countries and set the methodology of outputs and inputs to the model for this "unusual" sector of public economy.

2. Literature review

In the literature we can find several authors, who were dealing with the issues of measuring the performance or efficiency of individual sectors of public or private economy, including the transport sector (both freight and passenger). Anguita Rodriguez et al. (2014) focused in their study on 12 urban transport operating companies, considering different variables related to the management and financing of these companies. Bagatska et al. (2023) clarify the local authority approach to determining the efficiency of municipal-owned enterprises in the capital of Ukraine, including the public transport enterprises. In their research, the dynamic and distribution of budget funds between the municipal-owned enterprises were studied, including the dynamics of their return on assets. Authors came to the conclusion, that availability and level of budget financing of investments of municipal-owned enterprises do not have a significant impact on their profitability. Lukasik et al. (2022) analysed and evaluated the planning process in a transport company. Wurtz and Sandkuhl (2023) have oriented their study on new mobility services in the urban areas (car sharing, urban bikes) in comparison with the traditional modes of transport, and investigates the changes implied by new mobility services for the enterprise architecture of public transport operators. This paper also includes a case study for illustrating the challenges and requirements of this integration. Intermodal transport service optimisation based on passenger demand on the example from metro and urban cableways network was topic of the study by Martinod et al. (2022). With the issue of performance control in the governance of local transport companies dealt Tampieri and

Canonico (2018). This was achieved based on the network-analysis approach to the performance control of integrated built-environment systems considering the efficiency and adequacy, applied to the governance of systems of local transport companies in built environments.

A non-parametric efficiency analysis of public transport companies in Germany was performed by von Hirschhausen and Cullmann (2010) on the sample of 179 communal bus operators. Authors applied data envelopment analysis (DEA) method and bootstrapping to test the robustness of the estimates. Main result of their study is that the average technical efficiency of German bus companies is relatively low. Evaluation of efficiency of a transport company was also a main aim of the paper by Miskic et al. (2022), where authors suggested an objective-subjective model based on a PCA, DEA and MCDM approach. Another paper from the field of bus transport was published by Barabino et al. (2023), focusing mainly on the fare evasion risk evaluation. Cambini et al. (2007) viewed on the evidence on cost properties from medium and large-sized companies, which was performed on the sample of local public transport companies in Italy. The results show the presence of short-run and long-run economies of scale, as well as of economies of network density. Various measures to increase the extra-transport effectiveness have been reviewed by Vakulenko et al. (2022), with the focus on railway transport segment in Russia. With the determination of operating costs and their impact on the economic profitability of urban passenger transport companies in Peru dealt Flores and Blanco (2021), using the descriptive approach. Rykala and Rykala (2021) performed an economic analysis of transport company in the aspect of car vehicle operation, considering the balance between costs and quality of services. Taran et al. (2023) used for the efficiency evaluation a Fuzzy-logic approach. Authors estimated the fleet efficiency of a road transport company on the case study of the delivery of agricultural products. The impact of the organisation of transport processes on the efficiency of vehicle usability was analysed by Lukasik et al. (2021). Bueno-Pascual et al. (2021) determined in their paper main factors influencing the transport productivity of freight transport company using advanced methods of statistics. With the freight transport sector in terms of price competitiveness dealt Poliak et al. (2021), focusing on the international road freight transport.

Another important and current topic is related to the term of sustainability and sustainable transport systems. Several authors dealt with the question of how to find the balance between the sustainability and economic efficiency of the system. Daimi and Rebai (2023) focused on the sustainability performance assessment of Tunisian public transport companies, using the AHP and ANP approaches. Authors created a 29-indicator based transport sustainability governance index of eight regional operators in Tunisia. Another paper by Daimi and Rebai (2022) dealt with the sustainability governance indicator-based framework for public transport companies, considering the developing countries. Authors suggested four key performance indicators areas, which are economic, environmental, institutional and social. Assessment of performance and operational criteria in urban transport companies on the example of Czech Republic was also a topic for Konecna and Lenert (2021a) and for Konecna and Lenert (2021b). Voznakova and Janovska (2019) focused their study on the “greening” of the public transport as an important part of the public economy. The aim was to carry out an environmental analysis of the possibilities of using alternative propulsion in urban transport. Fabianova and Janekova (2022) compared in their study the economic assessment of investment in electric and CNG buses. The result is that with a higher level of financial support, investments in electric buses are more profitable, due to lower operating costs. Another view on the sustainability issue, taking into account the previous and possible future pandemics (as COVID-19) brought Naveen and Gurtoo (2022), focusing on the strategy and epidemic prevention framework in public

transport. Their frameworks use three tenets of mobility - agility, integrated movement, and public based partnership.

3. Methodology

Considering the main aim of this paper, the quantitative methods for evaluating the economic efficiency of decision-making units (DMU's) will be used. Economic efficiency can be in general defined as an economic state, in which every resource is optimally allocated to serve each individual or entity in the best way. The term "Productive efficiency", which is for us the most important, based on the assumption that no additional output of one good or service can be obtained without decreasing the output of another good or service, and the production proceeds at the lowest possible costs. According to Cherchye et al. (2023), in the simplest case represented by one input and one output, the efficiency of DMU can be measured by the proportional indicator (1):

$$Efficiency = \frac{output}{input} \quad (1)$$

In the real conditions, it is necessary to consider several inputs and outputs, which requires different approaches for the efficiency evaluation. This can be solved by using weighted sum of individual inputs and outputs, and one of the ways how to determine the optimal weights is by using the linear programming method. For this purpose, a non-parametric Data envelopment analysis (DEA) method has been developed in the late 90s. In this paper, we focus mainly on the additive model of DEA, which benefit lies in the ability to account for all sources of the inefficiency.

3.1. Basic and additive DEA models

The basic radial models of DEA include CCR and BCC models, the difference of which lies in the nature of the returns to scale. Basic input oriented CCR model for the constant returns to scale is expressed by following linear programming task:

$$\begin{aligned} \max v^T y_0 \\ u^T x_0 &= 1 \\ v^T y_i &\leq u^T x_i \\ u, v &\geq 0 \end{aligned} \quad (2)$$

where x_i, y_i are the vectors of inputs/outputs of DMU_i

u, v are the vectors of weights (Wu and Lin, 2022).

The frontier set is subsequently created by the best DMUs from the comparison group. The dual task of CCR model can be expressed as follow:

$$\begin{aligned} \min \theta \\ \sum_{i=1}^n \lambda_i y_i &\geq y_0 \end{aligned} \quad (3)$$

$$\sum_{i=1}^n \lambda_i x_i \geq \theta x_0$$

$$\lambda \geq 0$$

where λ is n-dimensional vector
 θ is a real number (Wu and Lin, 2022).

In the BCC model for variable returns to scale, the condition of $\sum_{i=1}^n \lambda_i = 1$ need to be added to the limiting conditions of the model represented by formula (3). In this paper, we will focus in detail on another type of DEA, which are the additive models. Additive model is in general a combination of input-oriented and output-oriented models. We divide between two basic additive DEA models, which are the weighted model and Slacks-based Measure model (SBM). The objective function in the additive model maximizes the difference of weighted inputs and weighted outputs. The linear programming task for the weighted additive model can be formulated as follow:

$$\begin{aligned} \max v^T y_0 - u^T x_0 \\ v^T y_i &\leq u^T x_i \\ u &\geq w^x \\ v &\geq w^y \end{aligned} \tag{4}$$

where w^x, w^y are given vectors representing the minimal positive weights of inputs/outputs (Wu and Lin, 2022).

The unoriented SBM model is using the additional variables, so-called slacks. We assume that all input and output values for each DMU are positive. To determine the efficiency of DMU_o for $o = \{1, \dots, n\}$ using the SBM model, we need to solve the following mathematical programming task:

$$\begin{aligned} \min \rho &= \frac{1 - \frac{1}{m} x_0^{-T} s^x}{1 + \frac{1}{s} y_0^{-T} s^y} \\ x_0 &= \sum_{i=1}^n \lambda_i x_i + s^x \\ y_0 &= \sum_{i=1}^n \lambda_i y_i - s^y \\ \lambda &\geq 0, s^x \geq 0, s^y \geq 0 \end{aligned} \tag{5}$$

The DMU_o is SBM efficient if the above task has an optimal solution $\rho = 1$, i.e. if the values $s^x = 0$ and $s^y = 0$. If the value $\rho < 1$, then the DMU is inefficient, and this value expresses the degree of efficiency. When using the SBM model, we distinguish between constant and

variable returns to scale. The above task represents the constant returns to scale. When using variable returns to scale, it is necessary to add the condition $\sum_{i=1}^n \lambda_i = 1$ (Zhou et al., 2021).

The calculation of SBM DEA models for our conditions will be performed in the R language environment, using the *additiveDEA* library. The particular function for calculation of the efficiency rate is as follows:

$$\text{dea.sbm}(\text{base}, \text{noutput}, \text{fixed} = \text{NULL}, \text{rts} = 2, \text{bound} = \text{NULL}, \text{whichDMUs} = \text{NULL}, \text{print.status} = \text{FALSE}) \quad (6)$$

where *base* is the data frame of DMU's with inputs and outputs
noutput represents the number of outputs
rts is the returns to scale specification (constant or variable)
other variables are defaults to NULL (RDocumentation, n.d.).

3.2. Data collection and adjustment

Our dataset consists of the performance and financial indicators of groups of public suburban bus transport companies operating within the territory of one regional authority, which are currently operating their services based on the Public Service Obligation (PSO) contract concluded with the state (or regional) authority. Data has been collected for years 2021 and 2022. For the purpose of this paper, we consider following business indicators:

- operational performance resulting from the PSO contract, expressed in the appropriate units (vehicle-kilometres),
- total operational costs spent on the provision of PSO services,
- total revenues from passenger fare,
- compensation of provable loss received from the public authority.

These indicators have been set so that they also consider the size of vehicle fleet and human resources, which is included in the total operational costs. At the same time, these are the main indicators determined and monitored in the PSO contracts, and therefore are compulsorily published and accessible to the general public. In this case, we created groups of bus transport companies (in general private-owned) operating within the territory of each authority responsible for PSO contracting. It is based on the assumption that the production of transport services in the given territory is formed by the sum of services from individual PSO contracts, with a common ordering authority on the regional level.

Table 1 presents an example of how the raw data for our model have been collected. In Czech Republic we divide between 14 regional groups of bus transport companies operating under different currently valid PSO contracts, for Slovakia there are 8 regional groups corresponding to the administrative division of the country. For each group, one performance and three financial indicators are considered. All the financial data are expressed in thousands of the national currency (NC). Considering the character of DEA approach, it is not necessary to convert them to common units.

3.3. Research questions and hypotheses

Based on the aim of this study, the resulting research questions are how the average rate of productive efficiency within the sector of public transport services operated under public interest is, and how significant is the difference in the efficiency rate between individual countries. We can also consider other factors by comparing the results, as size of the companies or their ownership (public or private). Based on the resulting efficiency rates, there is also

Table 1: Raw data for Czech Republic (year 2021)

Regional group of carriers	2021			
	Operational performance (thous. km)	Operational costs (thous. NC)	Revenues from fares (thous. NC)	Compensation (thous. NC)
Karlovarsky	6,745	317,748	101,968	214,055
Stredocesky	77,431	3,144,384	947,309	2,197,074
Ustecky	23,518	1,077,969	398,036	679,933
Plzensky	17,374	836,409	208,573	634,400
Jihocesky	22,070	1,011,599	284,700	726,899
Olomoucky	22,100	931,879	205,475	726,404
Moravskoslezsky	36,212	1,573,500	627,605	921,671
Zlinsky	24,270	1,044,483	437,944	606,539
Jihomoravsky	43,906	1,782,972	672,372	1,110,600
Vysocina	21,733	928,969	242,098	686,871
Pardubicky	16,550	660,652	234,086	426,566
Liberecky	16,889	751,537	296,926	454,608
Kralovehradecky	19,604	838,675	314,358	512,892
Praha	12,547	756,682	154,887	601,795

Source: author by Ministry of Transport of Czech Republic (2023)

possibility to examine the influence of individual inputs and outputs, and how to change them to achieve better efficiency of the individual DMU. According to the research questions, following hypotheses have been set:

Hypothesis 1:

- null hypothesis H_0 : There is no significant difference in the efficiency rate within the sample.
- alternative hypothesis H_1 : There is significant difference in the efficiency rate within the sample.

Hypothesis 2:

- null hypothesis H_0 : There is no significant difference in the average efficiency rate of bus public transport companies between Slovakia and Czech Republic.
- alternative hypothesis H_1 : The average efficiency rate of bus public transport companies significantly differs between individual states.

Based on the non-parametric character of chosen method (DEA), all the hypotheses will be tested using non-parametric tests for independent samples. For testing the location of a population based on a sample (hypothesis 1), a Wilcoxon signed rank test for one sample will be performed. For testing hypothesis 2 we use the Mann-Whitney test for independent samples. Both non-parametric tests are performed in the R language environment.

4. Results

Individual indicators related to PSO services are usually subject to correlation – e.g., the operational costs and revenues are both affecting the amount of compensation paid by the state or regional authority. Therefore, an adjustment of inputs and outputs to DEA SBM model was necessary. For this purpose, we chose a proportional indicator of revenues per compensation unit. DMU's with a greater ratio of revenues to compensation are generating bigger production efficiency, as they require lower amount of funds from the public budget. Table 2 presents the final determination of inputs and outputs to DEA SBM models, which have been used for calculating the productive efficiency for each group of DMU's.

Table 3 presents the results of SBM DEA model for Czech groups of suburban bus transport operators sorted by individual regional authorities for years 2021 and 2022, including the value of productive efficiency and slacks of individual inputs and output, which mean how

Table 2: DEA SBM model inputs and outputs determination

Inputs	Outputs
Operational performance in mil. kilometres	Revenues per compensation unit
Operational costs in thous. NC	

Source: author

they would have to be adjusted to achieve the efficiency of DMU. Looking at the results for year 2021, there are three effective DMU's with productive efficiency rate equal to 1.0 (Karlovarsky, Zlinsky and Liberecky regional groups of public bus transport operators), other DMU's can be considered as ineffective. In 2022 only two DMU's are considered as effective. The effectiveness rate of ineffective DMU's is in average 0.38 in 2021 with standard deviation 0.222, and in average 0.31 in 2022 with standard deviation 0.115. Looking at the slacks of individual inputs, in most cases of inefficient DMU's there is a space for reducing and optimizing the operating costs, especially for the group of public bus transport companies operating in Stredocesky region, which is the biggest regional unit in the Czech. Republic. Table 4 analogically presents the results of SBM DEA models for Slovak groups of public bus transport companies operating under specific contract with regional authority.

Table 3: SBM model results for Czech suburban bus transport

Regional group of bus transport operators	2021				2022			
	Efficiency rate (SBM)	Slack y_1	Slack x_1	Slack x_2	Efficiency rate (SBM)	Slack y_1	Slack x_1	Slack x_2
Karlovarsky	1.0	0	0	0	1	0	0	0
Stredocesky	0.09	0.045	70,686	2,826,635	0.11	0.020	52,263	2,119,574
Ustecky	0.55	0	10,516	492,657	0.36	0	15,092	611,890
Plzensky	0.27	0.148	10,629	518,661	0.22	0.170	9,943	450,223
Jihocesky	0.25	0.085	15,325	693,851	0.25	0.093	14,358	580,494
Olomoucky	0.19	0.193	15,355	614,130	0.27	0.061	15,220	574,222
Moravskoslezsky	0.55	0	16,345	703,769	0.58	0	24,517	85,298
Zlinsky	1.0	0	0	0	0.32	0	15,247	690,111
Jihomoravsky	0.34	0	29,756	1,148,565	0.34	0	28,984	994,046
Vysocina	0.24	0.124	14,988	611,221	0.23	0.129	13,468	533,386
Pardubicky	0.70	0	5,650	165,238	0.37	0.055	9,308	369,757
Liberecky	1.0	0	0	0	1.0	0	0	0
Kralovehradecky	0.76	0	5,024	185,866	0.36	0.008	12,277	459,535
Praha	0.26	0.219	5,802	438,934	0.35	0.169	2,263	271,419

Source: author

We can see from the results that in case of SBM model for Slovak public bus transport there are two effective DMU's (groups of bus transport operators in Bratislavsky and Trnavsky region), while their effectiveness has not changed between the years. The effectiveness rate of ineffective DMU's is in average 0.23 in 2021 with standard deviation 0.047, and in average 0.42 in 2022 with standard deviation 0.112. In general, year 2022 has brought higher results in the effectiveness rate, in average even double the values from year 2021. This may be caused by the influence of the COVID-19 crisis the effects of which were still felt at the time. Slacks of individual inputs and output are showing us that there is space for reducing the operating costs, excluding the groups of bus public transport operators in Nitriansky region, where in 2022 the productive effectiveness could be achieved only by increasing the operational performance, which will on the other hand cause an increase in the compensation of provable loss, and therefore this effect may not be manifested.

The graphical representation of the variability of resulted efficiency rates within individual groups of DMU's reflects Figure 1, using the box-plot figure including basic descriptive statistics. On this figure, a significant difference in the variability between years is visible in case of Czech bus transport operators, when the effective DMU's are even considered

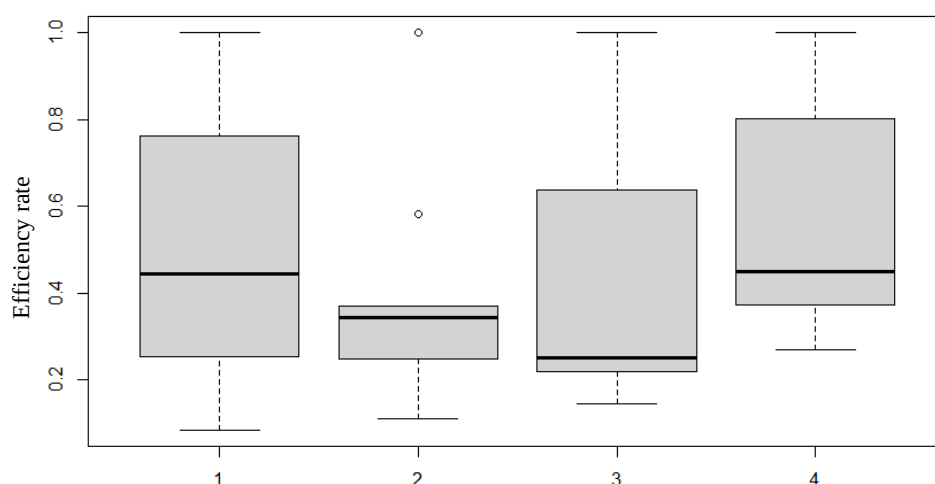
Table 4: SBM model results for Slovak suburban bus transport

Regional group of bus transport operators	2021	Slack y_1	Slack x_1	Slack x_2	2022	Slack y_1	Slack x_1	Slack x_2
	Efficiency rate (SBM)				Efficiency rate (SBM)			
Bratislavsky	1.0	0	0	0	1.0	0	0	0
Trnavsky	1.0	0	0	0	1.0	0	0	0
Nitriansky	0.25	0	17,947	31,999	0.60	0.19	5,364	0
Trenciansky	0.25	0	17,194	36,006	0.46	0.29	4,249	13,927
Banskobystricky	0.14	0	24,911	48,605	0.27	0.40	10,184	26,400
Zilinsky	0.20	0	21,073	39,112	0.38	0.35	7,335	9,898
Presovsky	0.23	0	23,363	31,737	0.36	0.36	10,188	7,487
Kosicky	0.27	0	21,164	26,970	0.44	0.32	8,443	2,826

Source: author

as outliers. Most of the results for year 2022 lies in the first two quartiles and do not reach the median of efficiency rate within the group of DMU's. This is not the case of Slovakia, where the difference between individual years is much less expressive and without presence of the outliers. The median value of effectiveness in all four groups of DMU's can be considered as not too different and ranges in the interval from 0.3 to 0.42, which is in general an insufficient value in terms of economic performance of the sector.

Figure 1: Box-plot of resulting effectiveness of DMU's



Notes: 1 – Czech Rep. 2021, 2 – Czech Rep. 2022, 3 – Slovakia 2021, 4 – Slovakia 2022

Source: author

Based on the resulting effectiveness rates from the SBM model, our two specific hypotheses have been tested using non-parametric tests. Hypothesis 1 about the significance of results within the sample is performed individually for both groups of DMU's (Slovakia and Czech Republic). In the hypothesis 2, individual countries are considered as two independent samples and the significance of the difference in average value of efficiency rate is tested. Table 5 shows the results of Wilcoxon test for individual countries and year, with the value of test statistics and p-value.

Looking at the results of non-parametric testing, in all cases we can reject the null hypothesis about non-significance of the difference of median value within the sample, as the p-value is lower than 0.05. Table 6 presents results of Mann-Whitney test, which were used for testing the hypothesis 2.

Table 5: Testing the hypothesis 1 using Wilcoxon test for one sample

Sample	W	p-value	Result
Czech Republic – 2021	105	0.001	reject H_0
Czech Republic - 2022	105	0.001	reject H_0
Slovakia – 2021	36	0.008	reject H_0
Slovakia - 2022	36	0.008	reject H_0

Source: author

Table 6: Testing the hypothesis 2 using Mann-Whitney test for independent samples

Sample 1 vs. Sample 2	U	p-value	Result
Czech Republic 2021 vs. Slovakia 2021	72	0.2896	cannot reject H_0
Czech Republic 2022 vs. Slovakia 2022	29	0.0704	cannot reject H_0

Source: author

Based on the test statistics and p-value for both time periods, we cannot reject the null hypothesis about non-significance of the difference in the efficiency rate of DMU's between individual countries. Looking at the data from 2022, the p-value is much closer to the critical limit and therefore there is a probability that with a larger sample size, the null hypothesis may be a subject for rejection. From our results it looks like Slovak and Czech groups of bus transport companies are not characterized by a significant difference in the productive effectiveness, when using the SBM DEA approach.

5. Discussion

The topic of economic or productive efficiency was usually a subject for the research in the field of “standard” sectors of the economy. This paper brings a new view on the specific sector which, however, is important for the national economy and affects the living standards of each country. It requires a different approach in determining the inputs and outputs to the model, where the condition of creating a minimum subsidy from the public budget must be considered, as opposed to creating a maximum profit. The majority of published studies have evaluated the transport sector as a whole, or paid more attention to the freight transport, the nature of which is slightly different in terms of costs and revenues. We have focused our paper on the passenger public transport services provided under public interest, and thus helped to fill the research gap in this area.

This study has been limited by the public availability of the data related to the performance and financial indicators of public transport companies, and by the COVID-19 crisis which caused that data before year 2021 were not used as they could distort the results. According to the used methodology, there are limitation in the number of outputs and inputs in the model, which had to adjust to the sample size. DEA approach is also specific, because by adding another DMU to the model we can achieve radically different results of their relative effectiveness. For the future research, it would be appropriate to extend the sample of public transport companies to other countries and other modes of transport, especially rail passenger and urban transport, and then compare the efficiency rate between individual transport modes. Suggested model can be improved by using another approach in addition to non-parametric DEA model, and by including the qualitative research in the process of the determination of appropriate inputs and outputs to the model.

6. Conclusions

The main aim of this paper was to evaluate the productive efficiency in public transport sector using additive approach, which have been performed on the example of Czech and

Slovak suburban bus transport companies represented by the groups of regional operators in time period of 2021-2022. For this evaluation, a DEA SBM weighted model was used, with determination of specific inputs and outputs applicable for this sector of public economy. The results of SBM model show us that the productive efficiency in this sector is relatively low within the selected countries, and there is no significant difference in the average efficiency rate of bus public transport companies between individual countries. Looking at the slacks of individual inputs and output, the higher level of effectiveness can be mainly reached by reducing or optimizing of operating costs, and in some cases also by increasing the operational performance, which, however, will cause higher demands on the public budget and the desired effect may not be achieved. The suggested model could be useful for the monitoring of the efficiency of public transport by individual state or regional authorities responsible for ordering these services, and with slight adjustments of inputs and outputs it can be also implemented for another modes of passenger public transport, mainly regional railway and urban transport.

Author contributions: All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding: The paper receives no external funding.

Data Availability Statement: Data available in a publicly accessible repository that does not issue DOIs. Publicly available datasets were analysed in this study. This data can be found here: <https://www.registeruz.sk/cruz-public/domain/accountingentity/simplesearch>
<https://or.justice.cz/ias/ui/rejstrik>

Conflicts of Interest: The authors declare no conflict of interest.

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COMBINED EFFECTS OF CAPITAL STRUCTURE AND CORPORATE GOVERNANCE ON FINANCIAL STABILITY OF DEPOSIT MONEY BANKS

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Cite as: Jegede, Ch. A., Fakunmoju, S. K., Ajuzie, O. (2024). *Combined Effects of Capital Structure and Corporate Governance on Financial Stability of Deposit Money Banks*, *Ekonomicko-manazerske spektrum*, 18(1), 28-40.

Available at: dx.doi.org/10.26552/ems.2024.1.28-40

Received: 24 October 2023; Received in revised form: 16 February 2024; Accepted: 30 March 2024; Available online: 30 June 2024

Abstract:

Research background: Liquidity crisis and liquidation of deposit money bank over the past years has been connected to poor corporate governance and in appropriate blend of capital structure.

Purpose of the article: By using different sample data, extensive research has investigated how corporate governance and capital structure independently influences bank's profitability, but studies investigating the joint impact of corporate governance and capital structure on the stability of deposit money bank in Nigeria is close to non-existence. This research work seeks to analyse the joint impacts of corporate governance (CG) and capital structure (CS) on stability of deposit money bank in Nigerian from 2010 to 2021.

Methods: A panel regression approach was used and ex post facto research design was employed in this study to examined the impacts of corporate governance and capital structure on Bank stability.

Findings & Value added: Result showed a positive and substantial influence of capital structure proxied by Total Debt to Total Asset ratio and Long-Term Debt to equity ratio and corporate governance variables (Board independence, Credit Committee) on financial stability proxied with Liquidity ratio among carefully chosen deposit money banks in Nigeria. The research work affords scholars, academicians, banks administration, and deposit money banks supervisory bodies a fresh understanding of how capital structure and corporate governance enhanced banks' financial stability via bank liquidity by designing sound governance and capital mixture policies.

Keywords: board independence; credit risk committee; liquidity ratio; total debt to total asset ratio; long term debt to equity ratio

JEL Classification: G21; G32; G33; G34

1. Introduction

Financial stability has become an appropriate and germane subject which has garnered important attention from intellectuals and experts. In the previous years, the confidence of depositors worldwide has been shaken by multiple instances and examples of financial fraud in the banking industry. Scholars such as Ajibade et al. (2020) and Aliu et al. (2020) have observed that fraud is intricately connected to the majority of financial crises in banks, which eventually culminate in instances of bank failure. The rise in bank failures and the growing prevalence of corrupt practices have prompted the necessity to enhance corporate governance and formulate an alternative framework for bank performance improvement (Koskei, 2020). An essential element within this process is the emergence of strong corporate governance through a well-constituted board of directors. This board is anticipated to provide a strategic direction and a suitable combination of capital structure to mitigate issues related to illiquidity. A steady and irrepressible banking industry plays a pivotal role in improving economic growth and minimizing vulnerability to crises within the banking sector (Ajibade et al., 2020). Financial stability removes financial inequities occasioning from market tremors which are revealed by bank runs or illiquidity which leads to insolvency in the banking system. A liquid banking sector is a vital requirement for firmness and the growth of the banking sector; subsequently, the resolution concerning the management of liquid assets stands as a fundamental decision that managers must make, irrespective of the scope of their enterprises. This holds particular significance for banks whose primary holdings consist of cash, and whose ongoing viability and stability are significantly reliant on maintaining consistent liquidity (Sanyaolu et al., 2021). The financial stability of banks has emerged as a crucial global discourse among regulators and policymakers after the worldwide credit crunch of 2007 to 2009. On a global scale, central banks and policymakers from various countries have progressively emphasized the maintenance of economic stability in the banking industry and the broader economic sphere (Koskei, 2020).

The developed and emerging economies had their own fair share of the liquidity problems as global commercial scandals and credit crunch like those involving Enron, Tyco, WorldCom, and other U.S. banks were connected to weak corporate governance, which served as a contributing factor to fraudulent financial reporting and an unethical corporate culture (Ajibade et al., 2020). Furthermore, the abrupt failures of Silicon Valley Bank and Signature in the United States, and the erosion of investor trust in Credit Suisse, a systematically significant global bank based in Europe have remained a dominant indicator of the challenge weak liquidity ratio which has exposed the commercial banks to vulnerabilities (Adu, 2023). Asian economies are susceptible to significant and unpredictable cross-border movements of international capital. Nevertheless, sizeable capital influxes, unless effectively controlled, can render countries that receive these capital flows vulnerable to the potential of financial instability (China Financial Stability Report 2020). The financial crunch in Asia, and other developing countries, underscored the systemic threats connected with purported “double-mismatches”. These mismatches involve short-term borrowing in foreign currencies and long-term lending in local currencies (Zhang et al., 2022).

In Nigeria, banks liquidity supervision was discovered to be in jeopardy and consequently caused the failure of the Nigerian banking system. According to Bencharles and Nwankwo (2021) loans were given out by members of the board without sufficient surety; this claim was established by Central Bank of Nigeria report that most banks gave out loan with minimal collateral. The lack of liquidity within banks contributed to the downfall, consolidation, and acquisition of numerous deposit money banks in Nigeria. Financial institutions were impacted by illiquid trend (Bencharles and Nwankwo, 2021). In addition, Salihu et al. (2020)

acknowledged weak corporate governance and inappropriate blend of capital mix to be key elements in bank liquidity crisis. Given the recognized underlying concerned, this research aims to determine the joint effects of corporate governance and capital structure on Nigerian bank stability.

One of the key challenges encumbering the stability of banks in Nigeria in recent years has been problem of liquidity; this is owing to their over dependence on government central bank funds as their main source of constant financing (Sanyaolu et al., 2021). Therefore, efforts made by banking supervisory body to guarantee the liquidity and viability of the banking sector have not accomplished its aims (Salihu et al., 2020). Also, whenever there is high influx of liquidity, commercial banks in Nigeria engage in an extremely risky trading like forex, oil gas business, stock market margin finance as their main source of revenues, especially. This abundant bank liquidity has led to extreme loaning by the deposit money banks in Nigerian which consequently led to increase in loan and loan concentration in the oil and gas business and margin finance (Koskei, 2020). Consequently, the elevated inclination towards high-risk behaviors led to the Central Bank of Nigeria assuming control of Afribank, Finbank, Intercontinental bank, Oceanic bank, and Union bank due to insolvency. Similarly, Polaris bank took over Sky bank, and Access bank acquired Diamond bank (Ajibade et al., 2020).

Researchers like Wuave et al. (2020), Sanyaolu et al. (2021), and Koskei (2020) asserted that an influx of liquidity safeguards banks against funding liquidity risk. This can, however, encourage them to adopt a more carefree approach by taking on higher risks in an effort to achieve immediate gains, which ultimately contributes to the emergence of financial crises. Consequently, board directors were deemed responsible for their failure to fulfill their primary obligations and for their neglect in carrying out their duties, primarily in terms of overseeing non-performing loan exposures. Moreover, some of the instituted committees that have the responsibility of risk management on behalf of the main board members lack the necessary expertise and dedication. Similarly, numerous independent directors encounter challenges when attempting to exert significant influence within board committees due to the distinctive intricacies of the banking industry (Karaye et al., 2022). This consequently stresses the necessity of a good code of corporate governance to checkmate financial misconducts among board of directors. The interrelation among capital structure, corporate governance, and liquidity administration is inherently interconnected. The efficiency of liquidity administration is contingent upon the adherence to sound corporate governance principles and a well-balanced capital structure. These factors collectively contribute to the reinforcement of bank stability (Salihu et al., 2020).

In light of the previously mentioned challenges, problem and gap identified, the study investigated the interaction influence of capital structure measured with (ratio of total liability to total assets and ratio of long-term debt to the sum of total debt and equity) and corporate governance measured with (board independence and credit risk committee) on bank stability proxied with bank liquidity among banks in Nigeria. Thus, this problem and gap identified motivated this study.

Financial stability according to Joseph et al. (2021), can be defined as a situation where the Deposit Money Banks (DMBs) intermediation process functions efficiently, thus, imparting confidence amongst persons that use it. Mohamed et al. (2021) stated that a bank can be financially stable when it fulfills its obligations with respect to investment funding, the formation of a deposit security fund, and the establishment of solid corporate governance mechanisms.

Similarly, the viewpoint presented by Bilal et al. (2021) suggests that bank stability signifies a state in which a bank operates seamlessly and competently, even in the face of the turbulence

experienced by the banking sector due to both systematic and unsystematic risks. Nguyen and Du (2022) view bank stability as an absence of insolvency problem, bank run or non-performing loan. In the same way Hassan (2022) defined bank financial stability as the broad structure that oversees the running of banks which enables the smooth performance of the banking sector. Thus, this study defined bank financial stability as the absence of financial instability which is a condition in which a financially viable deposit money bank performs its contractual obligations as they become due.

Liquidity ratio according to Dhanuskodi et al. (2022), was describe as a financial ratio that measures a company's ability to fulfill its short-term debt obligations. It assists in evaluating how effectively a company employs its current assets to meet its current liabilities. According to Appah et al. (2021) three liquidity ratios are frequently used: current ratio, quick ratio and cash ratio and in each case, the current liabilities figure is located in the denominator of the equation and current assets figure is located in the numerator. Ratios greater than 1.0 are preferred. A ratio of one means that a firm can precisely offset all its short term obligation with its liquid assets; a value below one indicates that a company would struggle to settle its short-term liabilities. Furthermore, a ratio exceeding one would indicate that a company possesses sufficient resources to fulfill its current obligations adequately. This metric is employed to gauge a bank's liquidity level and its ability to cover short-term obligations as they come due (Hamid, 2023).

The ratio can be computed using data found in the working capital, which comprises current assets and current liabilities. Therefore, in this study, the Liquidity ratio is characterized as the measure that evaluates a bank's capability to settle its near-term financial responsibilities using its liquid assets (Dhanuskodi et al., 2022; Hamid, 2023; Wuave et al., 2020; Karim et al., 2021).

Capital structure is the combination of a bank's equity and debt is what ensures financial stability, income generation, and growth (Usman, 2019). The composition of funding for a financial institution, such as a bank, encompasses various channels of financial support. Determining the capital structure is an initial and crucial choice for a bank, as it intertwines with both risk and potential gains (Ullah et al., 2020). Adeoye and Olojede (2019) define capital structure as the amalgamation of diverse funding sources accessible to the bank, employed to finance its feasible projects exhibiting positive net present value (NPV). It shows how a bank funds its overall activities and maintains its expansion through the utilization of diverse funding sources.

The ratio of total liabilities to total assets as one of the indicators of capital structure indicates the percentage of a bank's assets financed by leverage (Kong et al., 2023). The total-debt-to-total-assets ratio, another debt metric, portrays the overall leverage compared to a bank's assets, as explained by Adeniyi et al. (2020) and Mazanec (2023), which shows how financially sound a bank is (Nwannunu, 2022). This ratio reveals the extent to which a bank uses leverage to fund its assets (Adeniyi et al., 2020). This ratio is determined by dividing the aggregate value of a bank's total liabilities by the aggregate value of its total assets. If the ratio is 0.4 (40%), it signifies that 40% of the bank's total assets are funded through debt, while the remaining 60% are funded by owners' equity. According to Olaniy et al. (2022) a ratio above one (1) reveals that a significant percentage of the assets is financed by creditors, which means the bank has more debts than assets. Also, a ratio less than 0.5 reveals that a bigger percentage of a bank's assets is financed by shareholders' fund.

The long-term debt to equity ratio reveals the proportion of a bank's assets that are financed through long-term debt, as discussed in a study by Usman (2019). This ratio is measured through the division of long term debt by owners' equity. The owners' equity is ascertained by deducting total debt from total assets (Bala and Babangida, 2022).

Adegboyegun and Igbekoyi (2022) viewed corporate governance as a mechanism that aids management of banks. It shows the interconnection that subsists among a bank's proprietors, management, and key stakeholders, influencing the establishment of its goals and the estimation of its output. In addition, it generally shows the procedures employed by bank owners in monitoring the agents in order to protect their interest and also maintain financial stability. Mohamed et al. (2021) also defined corporate governance as a mechanism that sets out a structure that aids the management and the directors in providing clear, just and well-organized setting that enhances the satisfaction of the interest of the relevant stakeholders in the banking sector.

Furthermore, Adedeji and Ajulo (2021) described corporate governance as a structure overseeing the management and the administration of banks, this stipulates the dispersal of privileges and duties amongst various members in the industry. According to Inim (2021) corporate governance is concerned with the way in which deposits money banks are directed and controlled. It entails the process or structure that is used for directing and managing banks' affairs in order to enhance banks prosperity and financial stability and ultimately achieve the set objectives of the organization. In addition, Inyang et al. (2020), Bencharles and Nwankwo, (2021), Abdulai et al. (2020), and Okoye et al. (2020), observed that corporate governance consists of body of rules and structure that strive to provide procedures and codes to the members of the board to efficiently accomplish their duties and the maximization of the shareholders' interest by reducing corporate vices.

Board independence refers to a situation where most members of the board are outside directors. It is assumed that board with greater number of external director will be very cautious in checking the conducts and resolution of the deposit money bank; hence the owners interest been well secure by external directors than the internal directors (Ajala and Adesanya, 2019). Independent board brings in additional expertise to the bank which increases proficiency needed for policy execution which aids efficient monitoring thereby reducing agency cost and increasing firm's performance (Mohamed et al., 2021).

According to Peizhi and Ramzan (2020), independent directors are those who are not employed by the bank and lacking any substantial affiliations with the institution. Broad literature proposes that the inclusion of independent director increases the worth of banks with their independent analysis of strategies. Furthermore, El-Chaarani et al. (2022) stated that independent directors refer to those with no substantial interest in the company, apart from sitting allowance. Agency theory supports the use of independent executives as a crucial corporate governance tool for mitigating executive mismanagement. The supporters of agency theory, sees managers as persons with proud dispositions, who must be given close monitoring by an independent board member (Althubaiti and Rasid, 2020). This is obtained by taking the ratio of non-executive directors to the overall board membership. As used by the following past scholars such as (Akamiokhor and Okologume, 2022; Sanyaolu et al., 2021; Li et al., 2020).

The credit committee is a group of persons who are given the duty of evaluating the credit position of a potential borrowers as well as their capability to pay back the loan given to the borrowers by credit establishments (Egungwu and Egungwu, 2018). The credit committee evaluates the bank's financing undertakings and gives its view on credit categories (Karaye et al., 2022). The credit committee also identifies the likely risks the bank undertakes for various kinds of transactions. Credit committees on banking authorization regularly decide the basis on which funding is made accessible, as well as any collateral from borrower. The committee's responsibility is to offer oversight of credit risk in a rational and reliable way within the bank's lending and financing activities (Karaye et al., 2022).

The study anchored on agency theory since its explained objectives of the study. The origin of the Agency theory can be traced back to economic theory posited by Alchian and Demsetz (1972) and subsequently developed by Jensen and Meckling (1976). It is the foremost theoretical effort on the study of corporate governance (Adediji and Ajulo, 2021). According to the Agency theory, governance is perceived as an agreement between the board and shareholders; these executives and management, most times take resolutions that are advantageous to them but may detrimental to shareholders. Instances of such actions include forging of financial reports and extreme payment structure for management (Sarpong-Danquah et al., 2022).

Agency cost is the price that is paid by shareholders, to make sure that the executives discharge their duty in the utmost interest of the shareholders (Jensen and Meckling, 1976). These costs include all incentives and control mechanism established by the principal to ensure that agents work in their best interest (Inyang et al., 2020). Agency supporter perceives agents as selfish individuals, logically maximizing their interest, to the detriment of principal's interest. To safeguard their assets, the principal trades off three diverse costs: monitoring expenses, bonding expenses, and residual losses (Jensen and Meckling, 1976). Critics of this theory contend that it is overly simplistic and heavily biased. It encompasses solely economic elements, while disregarding the roles of other interested parties, political influences, and the internal intricacies inherent in governance (Adegbie et al., 2019). Agency theory claims that executives responsible for the running of the organization will require close monitoring from the shareholders. It postulates that shareholders will need to safeguard their asset and liability from misuse so as to gain financial stability (Adegboyegun and Igbekoyi, 2022; Olokoyo et al., 2019).

Houshang et al. (2022), Pham et al. (2022) and Dinh and Pham (2020) found that capital structure significantly affect performance proxied with profitability of companies. Shahriar et al. (2022) and Bilal et al. (2021) found that capital structure had substantial favourable influence on the profitability of banks in Pakistan in particular and Asia as a whole. Both Alam et al. (2020) and Hafiz et al. (2020) discovered a bidirectional (positive-negative) correlation amid corporate governance and conventional banks' profitability in Pakistan. Kong et al. (2023) and Kanu (2022) examined the relationship between capital structure and financial performance in Ghana, as well as the impact of capital structure on the financial performance of banks in Sierra Leone. They discovered that the capital structure variables have a favourable and substantial correlation with probability in Ghanaian and Sierra Leone banks.

Equivalently, Akhsanul (2020), Rashid et al. (2020), Alam et al. (2020) and Hafiz et al. (2020) found the significant relevance of corporate governance and the connection on banks' efficiency in Bangladesh and Pakistan. Likewise, Addo et al. (2021) and Bekiaris (2021) established significant connection between corporate governance and banks' profitability. Also, El-Chaarani, et al. (2022), Sarpong-Danquah et al. (2022) and Musah and Adutwumwaa (2021) found that there exists sound interconnection between corporate governance and profitability of Ghanaian manufacturing companies and Ghanaian rural banks. Bala and Babangida (2022), Olaniyi et al. (2022) and Adeniyi et al. (2020) discovered that capital structure measures had favourable substantial impacts on the profitability of banks and registered manufacturing companies in Nigeria. Furthermore, Adegboyegun and Igbekoyi (2022), Eni-Egwu et al. (2022) and Akinola (2021) found that corporate governance measures exert an immaterial and negative influence on bank and firm performance. From review of past empirical related studies, no known studies examined interaction effect of ratio of total liability to total assets, the ratio of long-term debt to the sum of total debt and equity, board independence, and credit committee on liquidity of DMBs in Nigeria, thus there exist empirical gap this study intends to investigate.

Several studies within and outside Nigeria contexts such as Kong et al. (2023), Kanu (2022), Houshang et al. (2022), Pham et al. (2022), Dinh and Pham (2020), Nguyen and Du (2022), Zhang et al. (2022), Addo et al. (2021), Bekiaris (2021), Peizhi and Ramzan (2020), Shahriar et al. (2022), Ullah et al. (2020), Rishi and Boopendra (2022), Mohamed et al. (2021), Akhsanul (2020), Rashid et al. (2020), Alam et al. (2020), Hafiz et al. (2020), Sarpong-Danquah et al. (2022), Bala and Babangida (2022), Olaniyi et al. (2022), Adeniyi et al. (2020), Adegboyegun and Igbekoyi (2022), Eni-Egwu et al. (2022), Akinola (2021), Okoye et al. (2020), Inim (2021) and Kafidipe et al. (2021) among others have examined the individual effect of corporate governance on performance of bank as well as effect of capital structure on bank profitability, however, most of these past related empirical works on how both corporate governance (board independence, and credit committee) and capital structure (ratio of total liability to total assets, the ratio of long-term debt to the sum of total debt and equity) influence financial stability measured with bank liquidity in Nigeria was closed to non-existence. Therefore, there exist a lacuna in the existing literature that this study intended to address.

2. Methodology

The study utilized ex-post facto research design from 2010 to 2021. The research encompassed a study population of 12 deposit money banks, which were chosen based on the accessibility and they were leading banks among international and national categorized banks in Nigeria as well as listed in the Nigerian stock market, Central Bank of Nigeria Report (2022) and NSE Reports (2022). The sampled population was taken from the total population of 19 Nigerian deposit money banks. The sample size was achieved through the use of purposive sampling technique; where international categorized banks were; First Bank Limited, UBA Plc, GTBank Plc, Zenith Bank Plc, FCMB Bank Limited and Access Bank Plc while national categorized banks were; Ecobank Nigeria, Stanbic IBTC Bank Plc, Sterling Bank Plc, Wema Bank Plc, Polaris Bank.

The study employed the panel regression analysis method, and the selection between fixed, random, and pooled panel regression models was determined through the application of the Hausman test. Secondary data of the selected 12 deposit money banks enlisted on the Nigerian stock market within the period of 2010 to 2021 was obtained. Time series - cross-section data was used to examine the data. They were combined and pooled for regression analysis. Data relating to bank capital structure (ratio of total liability to total assets, sum total of equity and ratio of long term liabilities to total liability), corporate governance (Board independence) and bank stability proxied with Liquidity ratio were extracted from yearly published financial statement of banks in Nigeria.

The econometric model employed in this research is specified thus:

$$Y = \beta_0 + \beta_1 x_{it} + \beta_2 x_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

The equation pertains to a regression model where Y represents the dependent variable. The parameter β_0 denotes the constant, Y is dependent variable represented by Bank Stability, while $\beta_1 x_{it}$ and $\beta_2 x_{it}$ were independent variable (capital structure and corporate governance) with their coefficients. In the context of the study, x_{it} stands for the explanatory variable, while ε_{it} signifies the error term. Mathematically, transmuting eq. (1) into a testable form based on agency theory, the study obtained the following regression equations:

$$LQR_{it} = \beta_0 + \beta_1 TLTA_{it} + \beta_2 LDTL_{it} + \beta_3 BI_{it} + \beta_4 CRC_{it} + \mu_i + \varepsilon_{it} \quad (2)$$

Table 1: Measurement of Variable

Variables	Proxied	Computation	Apriori Expectation	Dependent/Independent
Capital Structure	Debt to equity	Total liability to total assets ratio	+/-	Independent Variable
	Debt to equity	Long term liability to total liability plus equity ratio	+/-	Independent Variable
Corporate governance	Board independence (BI)		+	Independent Variable
	Credit committee (CRC)		+	Independent Variable
Bank Stability	Bank Liquidity	Ratio of current assets and current liabilities		Dependent Variable

Source: authors' computation

3. Results

Table 2 below depicted the descriptive trend among the study variables.

Table 2: Descriptive Statistics

	LQR	TD_TA	LTD_E	BI	CRC
Mean	13.4716	1.194571	7.528227	0.513646	0.423689
Median	1.169914	0.715332	5.747714	0.500000	0.300452
Maximum	4,686.551	17.72317	136.9585	0.928571	0.822591
Minimum	0.011153	0.001222	-4.642964	0.000000	0.000000
Std. Dev.	542.1579	2.590552	12.97798	0.115053	0.112521
Skewness	5.815883	4.577263	7.494762	0.004611	0.042692
Kurtosis	41.82311	23.79005	71.57247	5.952120	4.833899
Jarque-Bera	9,855.190	3,096.188	29,561.22	52.29059	48.346708
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	19,795.91	172.0182	1,084.065	73.96509	69.753845
Sum Sq. Dev.	42,032,732	959.6674	24,085.21	1.892902	1.7529851
Observations	144	144	144	144	144

Source: authors' computation

The table provided below presents a description of the data utilized for the analysis, outlining its key attributes. The range of the total liability to total assets ratio is 0.001 to 17.72317, with an average of 1.194571. The long term liability to equity ratio ranges from -4.642964 to 136.9585, with an average value of 7.528227. Board independence ranges from 0.000 to 0.928579, with a mean value of 0.513646. The range of the credit committee is from 0.000000 to 0.822591, with a mean value of 0.423689. Finally, LQR, the explained variable, had an average value of 13.4716 with a range of 0.01115 to 4686.551. The variables also demonstrated a strong level of uniformity, as evidenced by the close proximity of the mean and median values to the highest and lowest values. All the variables are leptokurtic (the values are more than 3) in terms of kurtosis. Positive skewness permeates every variable. Since the probability value for the Jarque-Bera is less than 5%, it inferred that the data for the research variables LQR, TDTA, LTDE, CRC, and BI were normally distributed. The Jarque-Bera probability indicates that the data distribution of the study variables, including LQR, TDTA, LTDE, CRC, and BI, were normally distributed. This conclusion is drawn from the fact that the Jarque-Bera probability value is below 5%.

The explanatory power Adj.R² of capital structure and corporate governance measures (TDTA, LTDE, BI and CRC) combined effect on LQR proxied for bank financial stability using Fixed OLS is 0.36. This means that just 36% deviation in the LQR is expounded through the joint impact of the dependent proxies of capital structure and corporate governance (TDTA, LTDE, BI and CRC) while the remaining 64 percent is affected by external causal variables that fall beyond the scope of this study. Looking at the F-statistics results with a p-value of 0.00 (0 percent), it indicated that the combined impact of the explanatory variables (TDTA, LTDE,

Table 3: Panel Regression

Method	Pooled OLS			Fixed effects			Random effects		
Variables	Coeff	t-Stat	Prob	Coeff	t-stat	Prob	Coeff	t-stat	Prob
TDTA	-26.35	-1.50	0.14	12.70	3.69	0.09	-15.72	-0.88	0.37
LTDE	-2.96	-0.85	0.39	-0.51	-0.16	0.87	-0.91	-0.29	0.76
BI	12.194	3.082	0.00	62.15	1.71	0.04	72.87	2.02	0.08
CRC	11.186	2.068	0.06	56.07	1.67	0.02	67.78	1.08	0.06
Constant	-427.78	-2.06	0.04	165.59	-0.87	0.39	-20.70	-1.00	0.31
	Adj. R-squared = 0.06			Adj. R-squared = 0.36			Adj. R-squared = 0.11		
	F-Stat = 4.27			F-Stat = 6.67			F-Stat = 3.54		
	Prob > F = 0.00*			Prob > F = 0.00*			Prob > F = 0.00*		
Hausman Test: Chi ² ₍₅₎ = 2.37, Prob > chi ² = 0.04									
Breusch-Pagan LM Test: Chi ² ₍₁₎ = 1.55, Prob> chi ² = 0.21									
Breusch-Pagan/ Cook-Weisberg Test: Chi ² ₍₁₎ = 1.23, Prob > chi ² = 0.24									
Pesaran Cross-sectional Dependence (CD) = 1.368 (p>5% = 0.735)									
Wooldridge Test: F = 7.85, Prob > F = 0.13									
Dependent Variable: Liquidity ratio *Significance @ 5% and 10%									

Source: authors' computation

BI, and CRC) significantly influences the dependent variable (LQR), which serves as a proxy for bank financial stability. The t-statistics as shown in Table 3 indicated that Total Debt to Total Asset (TDTA) (t-stat = 3.69, p-value = 0.09 > 0.05); Long Term Debt to Equity ratio (LTDE) with (t-stat = -0.16, p-value = 0.87 > 0.05) have favorable influence on the ratio of Liquidity (LQR) of the selected Nigerian, deposit money banks, Board Independence (BI) (t-stat = 2.02, p-value = 0.04 < 0.05); Credit Risk Committee (CRC) with (t-stat = 1.67, p-value = 0.02) have positive and substantial impact on the Liquidity ratio (LQR) of selected Nigerian deposit money banks. Looking at the regression model, the F-statistics is 6.67, while the p-value of the F-statistics is 0.00, which is less than the level of significance of 0.05 used in this study. Thus, the regression model was well fitted.

4. Discussion

The study dwelled on combined effect of capital structure and corporate governance mechanism on bank financial stability proxied with bank liquidity. Findings of this study established that both capital structure and corporate governance mechanism determine bank liquidity. This indicated that both capital structure and corporate governance significantly improved bank liquidity among selected deposit money banks in Nigeria. The results of the study are consistent with the findings of Alam et al. (2020), Hafiz et al. (2020), Sarpong-Danquah et al. (2022), Bala and Babangida (2022), Olaniyi et al. (2022), Adeniyi et al. (2020), Otekunrin et al. (2020), Adegboyegun and Igbekoyi (2022) and Eni-Egwu et al. (2022), that both corporate governance and capital structure proxied (TDTA, LTDE and BI) enhanced bank stability of selected deposit money banks in Nigeria. Thus, this study rejected the null hypotheses stated.

5. Conclusions

The focused of this study examined how the stability of banks in Nigeria is affected by both capital structure and corporate governance; it concludes that Board Independence (BI) and Credit Committee (CRC) have positive and significant influence on the Liquidity ratio (bank stability) of selected banks in Nigeria. While, Long Term Debt to Equity Ratio (LTDE) and Total Debt to Total Assets ratio (TDTA) have positive but insignificant influence on the Liquidity ratio (bank stability) of deposit money banks in Nigeria. The study recommends that;

The study's conclusions revealed that viable DMBs do not only finance their assets with TDTA or LTDE. Therefore, anytime a bank chooses to borrow money for investment, due diligence must be performed. This will ensure that the performance-enhancing managerial restraint imposed by debt is not offset by the potential financial distress brought in by excessive leverage. This will increase the bank's liquidity, which will in turn strengthen the deposit money banks' financial stability. The study also suggests that management should increase incentives for debt suppliers, particularly depositors, as this will inspire the depositors to preserve their savings with DMBs for a lengthier period. The modification to the maturity structure will give DMBs access to more liquid assets, which might improve their capacity to maintain their financial stability. Also, the government must adopt laws that will hasten the growth of a more active capital market, where DMBs and other businesses will have access to shares and bonds at prices that are competitive globally. This will significantly reduce the likelihood of Nigerian businesses looking for financing opportunities outside while also luring foreign investors to the Nigerian capital market. Finding also shows that corporate governance significantly improved liquidity ratio of deposit money bank.

The study thus suggests that outside directors should be truly independent in order to continuously improve financial stability; priority should be on enhancing their financial literacy, and notably, possessing prior experience in banking operations is crucial to facilitate the effective management of liquidity. Lastly, policymakers and bank executives in Nigeria should make sure that the credit committee is properly composed with finance managers, and external directors with the right financial expertise so as to ensure quality loan policy formulation, lending guideline and credit risk management in a fair and consistent manner within the bank's lending and credit-related activities. This will in turn enhance the liquidity ratio and increase the financial stability of the deposit money banks in Nigeria.

Author contributions: All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding: This research received no external funding.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: I appreciate the sound contribution of Mrs Ajuzie Oluchi as my PhD student in the Department of Finance, Lagos State University who I Fakunmoju, S. K (PhD) co-supervised during her thesis writing.

Conflicts of Interest: The authors declare no conflict of interest.

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DECIPHERING THE ARCHITECTURE OF B2B RELATIONSHIPS IN SMES INTERNATIONALIZATION: A QUALITATIVE OVERVIEW

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Cite as: Alexandru, V.-A., Mititean, P., Jerdea, L., Vintila, F. (2024). *Deciphering the architecture of B2B relationships in SMEs internationalization: A qualitative overview*, *Ekonomicko-manazerske spektrum*, 18(1), 41-53.

Available at: [dx.doi.org/10.26552/ems.2024.1.41-53](https://doi.org/10.26552/ems.2024.1.41-53)

Received: 16 January 2024; Received in revised form: 18 March 2024; Accepted: 9 April 2024; Available online: 30 June 2024

Abstract:

Research background: Cross-border cooperation promotes multifield relations in the global economy with small and medium-sized enterprises (SMEs) aiming to find new markets and business networks and achieve any higher economic performance. In addition, it is more than healthy for businesspeople to use their experience to address the challenges of multi-cultural interactions and to form, develop, adjust and strengthen relationships within dynamic environments. Current studies on business-to-business (B2B) relationships and internationalization provide evidence that there is no single theoretical framework, and the analysis of the correlation between the two processes is an area of interest for future research. Thus, international relationships which take into account the general challenges of global intricacies, the cultural differences between target markets, emerge as relevant.

Purpose of the article: The paper seeks to examine managers' perception and attitude towards different facets of B2B relationships availed by SMEs in international contexts.

Methods: The research method used is the interview-based survey, a qualitative, eminently exploratory method which facilitates an investigation of presumed relationships between different constructs and, implicitly, a pertinent description of socio-human processes and phenomena.

Findings & Value added: The qualitative analysis of the collected data pointed to several main conclusions. Firstly, most of the interviewed subjects rated the dimensions related to B2B relationships as important in the internationalisation process of their SMEs. Secondly, managers consider that economic interests and overall business details prevail over socio-cultural differences between business partners and over the characteristics of the country of origin.

Keywords: business-to-business (B2B) relationships; small and medium-sized enterprises (SMEs); internationalization; competitiveness

JEL Classification: O32; O33

1. Introduction

The global economy has been actively promoting economic relations through cross-border cooperation by doing things like reducing customs duties, increasing operational and financial flows, decreasing transport costs, multiplying communication channels, encouraging citizens to pursue careers that take them around the world, etc. Small and medium-sized enterprises (SMEs) often need to find new markets, new stakes, and especially new business networks in order to achieve superior economic performance, become more competitive, adapt intelligently to market conditions, be proactive, and dynamic in a highly competitive environment (Hilmersson, 2014; Sandberg, 2014; Koveshnikov et al., 2022). As a result, businesspeople must effectively manage the challenges of intercultural interactions, of forming, developing, adjusting, and strengthening relationships beyond the dot-com bubble (Cannone and Ughetto, 2014; Villar et al., 2014; Andrei et al., 2021).

Recent studies on relationship management and business internationalization have found that "there is no unified theoretical framework" and that the correlative analysis of the two processes needs to be a priority for future research (Vatamanescu et al., 2019, 2020, 2022a, 2022b). Despite being treated sporadically in the literature and from the perspective of culture and country of origin effect, relationship management in its various forms has been treated in a variety of contexts (Khojastehpour and Johns, 2014; Paduraru et al., 2016; Vatamanescu et al., 2022a). At this stage, internationalization is viewed as an exploratory approach to new markets with the goal of increasing the company's value through the acquisition of new capabilities, the formation of strategic partnerships with other businesses and the seizing of previously unrealized opportunities (Lin and Chaney, 2007; Khojastehpour and Jones, 2014; Alexandru et al., 2020). International relationships which take into account the difficulties of a changing global setting and the cultural differences among target audiences, is the key to success in all these endeavors (Leonidou et al., 2011; Koveshnikov et al., 2022).

Assuming these issues, the paper seeks to examine managers' perception and attitude towards different facets of business-to-business (B2B) relationships availed by small and medium-sized enterprises (SMEs) in international contexts. The research method used is the interview survey, a qualitative, eminently exploratory method which facilitates an investigation of presumed relationships between different constructs and, implicitly, a pertinent description of socio-human processes and phenomena. The main research question to be answered is: Which are the main dimensions of B2B relationships conducive to the success of SMEs internationalization?

By answering this inquiry, the paper makes significant contributions to specialized literature, providing valuable insight into how contemporary companies view and manage international relations. On the one hand, the importance of international collaborations for the success of a company is emphasized. On the other hand, different perspectives on how international collaborations can influence profitability are discussed, from the importance of knowing the policies of foreign markets to the need to focus on certain categories of products in specific areas. Moreover, the paper highlights the criteria that companies use to select foreign partners, such as competitiveness, profitability and opportunity for organizational development. Therefore, the contribution to the specialized literature is enriched, the paper offering a deeper

understanding of the importance and impact of international collaborations in the context of contemporary business.

The remainder of the paper will look into the specialized literature, the research methodology and will present the main results as derived from the interviews followed by discussion and conclusions.

2. Literature Review

Interactionists believe that relationships develop throughout time as a result of a continuous chain of acts and reactions. Specifically, the relational strand is explained in the following ways (Anderson and Narus, 1999; Walter et al., 2000; Brennan et al., 2011; Vatamanescu and Mitan, 2023): the interaction encompasses all forms of exchange between the parties, including monetary, product-related, informational, and social ones, the benefits of the exchange extend beyond monetary ones, the exchange revolves around a dyad in the sense that both parties involved in an exchange can act convergently or divergently toward the other entity and the exchange implies an ambivalent perspective.

Many authors (Turnbull and Valla, 1986; Sin et al., 2005a; Sweeney and Webb, 2007) have focused solely on interaction rather than action and reaction in B2B markets because the buyer may be even more active than the seller. In this kind of market, clients come in all shapes and sizes and have a wide range of preferences when it comes to the products and services they use, therefore it's important that the interactive process adhere to the principles of customizing the offers made and taking a relational perspective.

Complexity is added to the IMP Group's perspective by the fact that it distinguishes between economic and financial transactions that occur on a whim and those that are sustained via repeated encounters. One-off contacts are called episodes or occurrences and are considered as "engines that generate the energy of the relationship" (Schurr, 2007, p. 161), but not as a reliable pattern of communication between partners. During this stage, the dynamics of interaction are shaped by factors that also affect the quality of relationships: There are monetary relationships that are contingent on the amount of money exchanged and thus directly affect the relationship's coherence; there are informational relationships, such as making technical and/or commercial connections; and there are product/service-based relationships, with the links between the parties built around these elements and directly determined by the intrinsic specifications and advantages of the goods and services themselves (Brennan et al., 2011). Partners become closer through communication, clarifying their understanding of one another and their respective roles. At this juncture, B2B relationships necessitate the participation of at least two businesses, and hence, at least two interacting people (Tidstrom and Hagberg-Andersson, 2012; Vatamanescu and Mitan, 2023).

Nonetheless, the physical properties of organizations, such as their size, structure, and technological resources, are not ignored by the IMP Group's interaction model (Mandjak and Durrieu, 2000; Payne and Frow, 2005; Gupta and Sahu, 2012). The size of an organization has a direct bearing on its position of dominance or subordination within any given relationship. It's a social structure where the bigger, stronger party has more say in how things go between the two of them. The configuration of ties between companies has repercussions on the extent to which authority is centralized, procedures are standardized, and roles are divided among different departments within the various companies involved. The ways in which people at various levels of an organization's hierarchy are able to communicate with one another reflects these traits (Vatamanescu et al., 2019).

By shifting the focus to technology resources, B2B relationships and inter-organizational partnerships can be performed in light of what each party brings to the table and how they plan to use it within the context of the commercial relationship. The scope of technology goes beyond the physical components and underlying networks upon which they rely. Intangibles like organizational strategy and firms' prior experience are also included (Payne and Frow, 2005; Gupta and Sahu, 2012; Al-Hawari et al., 2013; Vatamanescu et al., 2020a, 2020b, 2022a). According to the methodology of the IMP Group, this resource also incorporates objectified intellectual capital in the form of the knowledge, personality traits, experiences, and motivations of the organization's members, all of which have an effect on the business-to-business (B2B) relationship.

For instance, the partnership as a whole reflects - through various indicators - what each party hopes to accomplish through the commercial connection. Furthermore, companies' levels of involvement with their partners differ according to their previous relational experiences. The members of the organization interact to establish, develop, and maintain the business relationship, thus bestowing onto it the relational substance. The coordinates of the interaction and the actors' motivation to interact are mapped by the personalities and life experiences of the individuals involved (Brennan et al., 2011; Vatamanescu and Dinu, 2023).

It is also important to highlight that the external environment that frames dyadic relationships emerges as a significant determinant of organizations' relational behavior. To what extent the international market structure affects the business relationship in terms of the availability and attractiveness of collaboration alternatives with other partners, and how the location of the relationship within the collaboration chain is affected by and influences the characteristics of the wider social system, with strategies and changes in a particular area of the network also affecting the relational behavior, are examples of where the external environment can be seen to have an impact.

A connection is more than the sum of its parts, and that's why it takes time for interactions to develop. This is a dynamic partnership, with the connection evolving according to the specifics of each new episode. As time goes on, the bond grows stronger, creating an environment that is ideal for continuing to work together (Lambert et al., 1998; Sin et al., 2005b; Sweeney and Webb, 2007; Andrei et al., 2021). According to the IMP Group's concept, the climate of relationships can be characterized by bipolar characteristics including power and reliance, cooperation and conflict, intimacy and departure, with the partners' shared expectations serving as the relationship's spark.

There are a number of important details to bring up while discussing good managerial connections (especially those that take place between international partners). To begin, managers must always view interactions as mutually beneficial, which necessitates taking into account the goals, potential, and expectations of all parties participating in the exchange. Second, managers must take into account the cultural variation in the effects and possibilities for updating a given set of variables describing a set of relationships. Due to the wide variety of international contexts and variables that could explain each given relationship, no single set of guidelines can be said to guarantee success in any given connection (Vatamanescu et al., 2019; Koveshnikov et al., 2022). Finally, at any given period in every connection, long or short, the fundamental qualities of the interaction up to that point may be tracked. The relationship's past reveals its essential essence and also establishes the groundwork for its potential development in the future. Prescription of the indefinite business relationship requires a thorough familiarity with the interaction's background.

3. Methodology

The research objective was to examine managers' perception and attitude towards different facets of B2B relationships in an international context. The research method used is the interview survey, a qualitative, eminently exploratory method which, according to Chelcea (2004, p. 297), facilitates an investigation of presumed relationships between different constructs and, implicitly, a pertinent description of socio-human processes and phenomena. In this context, as a research technique, the interview allows for obtaining relevant data from specific individuals and interest groups as a basis for future quantitative studies.

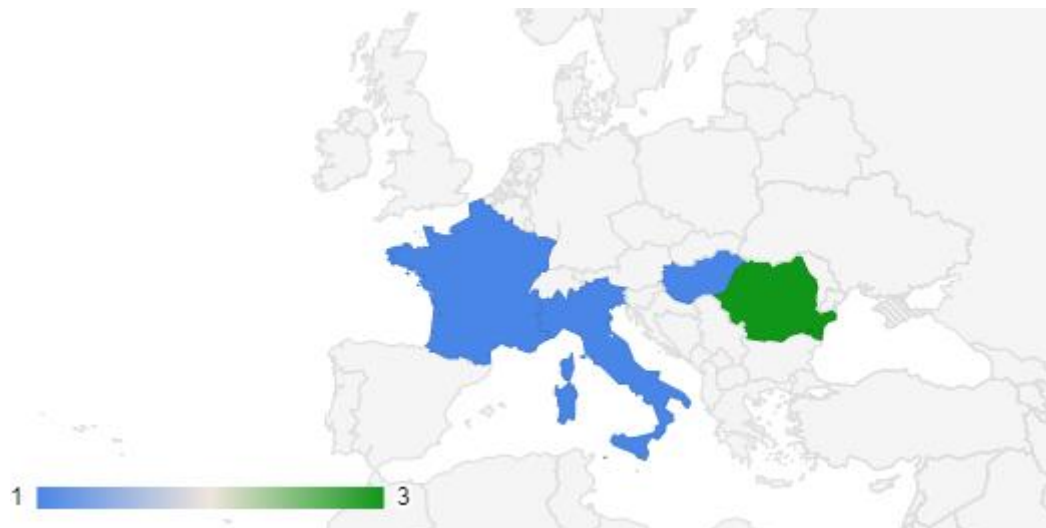
Seven subjects - managers in European SMEs in the industrial sector - were interviewed, with six out of seven stating that they have more than 100 international collaborators. As can be seen in Table 1 and Figure 1, three of the respondents are of Romanian nationality and the other four are of Italian, Hungarian, Bulgarian, and French nationality, as follows.

Table 1: Data sample

Respondent	Age	Position
Coca	47	Sales Manager
Adrian	52	General Manager
Andrei	28	Sales Manager
Umberto	25	Sales Manager
Maia	29	Regional Sales Manager
Ivelina	27	Purchasing Manager
Alan	37	Sales Manger

Source: own processing

Figure 1: Population distribution of the population



Source: own processing

The use of the interview in this research responds to substantive requirements. Thus, the information resulting from the interview supports the exploration of the variables and the links between variables, guiding the subsequent examination of the dimensions under analysis and, subsequently, the in-depth processes. Through open-ended questions, the perceptions and attitudes of the subjects in the field under investigation about the major constructs under discussion.

The survey was based on an intensive, semi-directive interview (Ghiglione and Matalon, 1991, cited in Chelcea, 2004, p. 306), focusing on in-depth structures, with each item in the interview guide targeting one of the main dimensions of the conceptual model. At this level, it

should be noted that the interview focused on clearly predefined aspects and not on the person in the exhaustiveness of his/her professional, organisational activity.

The subjects were presented with the topic of the conversation and the ideological outlines. An indicative interview guide was drawn up, based on the pre-established themes and hypotheses, but the order of the questions was flexible in order to allow significant informational structures to emerge. Thus, the interview was semi-structured and focused on the subjective experience of the respondents, operationalised through both factual and opinion questions. The questions were designed so that the entire interview lasted between 25 and 35 minutes, given that the subjects were European managers in the industrial sector, and the respondents' willingness to answer the questions also depended on the prior assumption of a pre-determined interview time. The interviews were conducted via Skype, given the geographical dispersion of the subjects (Bulgaria, Italy, France, Hungary, Romania).

Following the first seven interviews, similar positions were reiterated by the interviewees, a phenomenon called representativeness or empirical saturation. The phenomenon describes "that situation in which, after a relatively small number of interviews, or observations, the amount of new information that is still obtained from subsequent interviews (or observations) is so low that it is no longer worth the effort of continuing with further interviews" (Iliescu, 2011, p. 18). As a consequence, the information resulting from the conversations with the seven respondents was centralized and conceptually systematized.

4. Results and Discussion

The first question in the instrument focused on the interdependence between the internationalisation approach and the profitability resulting from collaborations with foreign partners (*"In your field of activity, do you think it is important for your company to collaborate with foreign organisations? Do you think that your firm's profitability depends significantly on international collaborations (import, export, purchasing, sales, distribution)?"*).

The subjects' answers on this level were unanimously confirmatory, with respondents stating that the profitability of the business is substantially dependent on the company's international activities. In this respect, Andrei (Sales Director, 28 years old, Romania) points out that *"Without these collaborations, I believe that the profitability of our company would have been very low, if not non-existent. In our company, one of the basic mottos is 'No contract without a whiff of abroad'"*. While Ivelina (Purchasing Manager, 27 years old, Bulgaria) says that *"export and distribution to foreign markets are the biggest revenue earners for the company"*. Similarly, Umberto (Sales Manager, 25, Italy) confirms the considerable influence of foreign collaborations on profitability, arguing that *"today, you have to be as fast as possible, more competitive in terms of price and quality and faster in terms of delivery"*, and all these opportunities should be sought abroad. The manager also mentions the importance of knowing the policies of different foreign markets in managing costs efficiently, for example transport costs: *"we often resort to contracting transport companies from Poland because they have better prices than domestic companies thanks to government subsidies"*. A related perspective is brought to the fore by Adrian (General Manager, 52, Romania) - *"Profitability is also influenced by the number of customers and the countries they come from. Profitability margins can be improved by concentrating on certain product categories in specific areas where that category of goods is not produced"*.

Taking a more radical approach, Maia (Regional Sales Manager, 29, Hungary) says that *"if we limit ourselves to internal collaborations, we should close the business"*, while Coca (Sales Director, 47, Romania) believes that: *"In the current period, refusing to work with foreign*

companies is a first step towards bankruptcy. We all like to believe in the 'made in Romania' product, but the movements in the market for industrial goods and, by extension, metallurgical products no longer allow us the luxury of staying put. We need to identify manufacturers with quality goods and services but with good prices, we need to expand our distribution beyond our borders to increase our profits. I would say that at the moment more than 70% of the company's profit comes from international collaborations, import, export, distribution, etc."

Focusing on the main criteria for selecting a foreign collaborator, respondents mentioned several common aspects: competitiveness, profitability and the opportunity for organisational development as a result of establishing the partnership. These components are considered by the majority of subjects as a prerequisite for the business relationship. In addition, credibility, reliability, honesty, flexibility and compatibility of the parties and good cooperation between the partners were highlighted.

"The main criterion is to be competitive and therefore profitable. The desire to grow, to develop as a business, but also financially, leads us to opt for one collaboration over another. If we agree in terms of price, quality, payment terms, delivery, transport, what matters is professionalism and respect for the commitment of the other party" (Coca, Sales Director, 47, Romania).

The idea of organizational development is recurrent in the respondents' statements, with Andrei (Sales Director, 28 years old, Romania) stressing that *"if establishing a link with a foreign company propels us and helps us to develop as an organisation, we don't miss the opportunity to explore a possible collaboration and, if things go well from the beginning, we invest in that business relationship as much as we can"*. Competitiveness and profitability of collaboration take many interlinked forms *"a collaboration has details such as delivery time, payment method, product quality, which are strictly related to trust (...) Two other very important criteria are price and quality. Without a competitive price or without fulfilling the minimum quality conditions set by the standards in force, there is no reason to establish a collaborative relationship"* (Adrian, General Manager, 52 years old, Romania). Similarly, Maia (Regional Sales Manager, 29 years old, Hungary) credits the credibility of the parties, the growth potential of the organisation and making payments on time with a major importance, but *"all this matters only when we have common interests and collaboration helps each other to be competitive"*. References to loyalty and credibility are also found in the responses of Alan (Regional Sales Manager, 37, France) and Ivelina (Purchasing Manager, 27, Bulgaria), the latter highlighting a focus on *"both product specifications and relational exchanges"*.

A more nuanced perspective is offered by Umberto (Sales Manager, 25, Italy) who differentiates the selection criteria according to the type of international collaboration (buying versus selling) and according to the cultural and national dimensions of the potential partners: *"If you sell in Germany or Western Europe in general, you tend to trust the buyer from the start because of their approach and high professionalism. On the other hand, if you are selling in Turkey or South-East Europe, you wonder from the start about the honesty of the customer, you wonder if it would be better to ask for payment in advance. If you're the one buying, it's easier because the risks are more with the seller, especially when it's not a niche supplier unilaterally setting the terms of the collaboration."*

Corroborating the information resulting from the subjects' answers, the basic criterion supporting the establishment of a business relationship at international level is subsumed by the competitiveness of the organisation in terms of quality, price of products and services, quality-price ratio, payment and delivery terms. Following on from these, the quality and consistency of relational exchanges between managers stand out as defining factors, influenced in turn by the effect of the country of origin and intercultural differences.

The third item in the interview guide aimed to investigate the importance of direct face-to-face contact between managers in different countries in order to initiate or develop international partnerships. The focus was on trade fairs, international exhibitions of reference for the metallurgical sector. Respondents unanimously confirmed the importance of face-to-face meetings between collaborators, each of them nuancing, according to their experience, the contexts and situations in which this type of interaction is most useful. In this respect, Andrei (Sales Director, 28 years old, Romania), considers that: *"For the development of the collaborative relationship between companies and meeting new potential collaborators, it is necessary to meet face to face through reciprocal visits or by taking advantage of opportunities when fairs and exhibitions are organised. Many technical things can be discussed by e-mail, but a strong collaboration is also strengthened by direct contacts between the managers of the two companies."*

Similarly, Coca (Sales Director, 47, Romania) says that: *"There are some moments when it is very important to meet potential and even existing collaborators face to face. First of all, initiating a contract is more solid when the deal is validated by shaking hands. When you see a new partner face-to-face, you're sharing both your way of being and the benefits of the organisation you come from. If you get along well on personal terms, possibly if we both have the same sense of humor, things are promising. Secondly, I think there are certain events that should not be missed in order to be visible to both existing partners and to establish new alliances. The Dusseldorf Fair is recognised in the field of metal products - if you don't go to Dusseldorf once every two years, you don't really exist."*

The example given by Coca is echoed in the arguments given by Maia (Regional Sales Manager, 29, Hungary): *"In my opinion, giving a face and a voice to a company through direct meetings is very important for gaining trust and credibility (...) For example, there is a big fair in Dusseldorf once every two years and we cannot afford to miss this event because we would miss a good opportunity to meet most of our partners - suppliers and customers, renew relationships, create new contacts, etc."*

The relevance of direct social exchanges is also supported by Adrian (General Manager, 52 years old, Romania) who mentions that: *"This kind of meeting is very important because in the competitive environment in which we operate we need to differentiate ourselves and establish a personal connection with potential collaborators. Also, this kind of personal acquaintance provides trust to both parties and facilitates further communication. Trade fairs are the best opportunity to meet potential clients because of the large number of participants and the fact that you can meet a lot of companies in a short time and at a low cost compared to the traditional method of visiting each one individually."*

The responses to item three again brought to the fore the influence of the country of origin on subjects' reporting. Thus, Umberto (Sales Manager, 25 years old, Italy) states that *"face-to-face meetings are the key to good collaboration, especially when potential partners are from Eastern countries. Before we can do business or increase the volume of transactions, we have to make sure that the client is credible"*. In addition, Alan (Regional Sales Manager, 37 years old, France) sees personal contact as a form of interpersonal learning and adaptation to the extent that *"I can manage my attitude and projects better to create a pleasant business environment"*. Even if she does not consider face-to-face meetings with business partners as compulsory, Ivelina (Purchasing Manager, 27, Bulgaria) stresses, however, that they are *"useful for establishing new solid collaborations and fairs and exhibitions are a good opportunity to create new contacts. There are situations where we meet our main partners directly once a year, but we keep in touch by e-mail or phone"*.

Related to the previous question, the fourth item in the interview guide focused on the respondents' comfort with working with geographically closer foreign partners. The initial inclusion of the item in the instrument aimed at highlighting issues related to the psychological (socio-cultural) distance between managers with distinct cultural dimensions. However, centralising the responses revealed a different perspective on the empirical reality. On this level, Andrei (Sales Director, 28 years old, Romania) mentions that: *"It doesn't matter so much the geographical position of the country with which you have a collaboration or in which you can be a potential collaborator. As long as the laws on trade with those countries are respected, and both companies are interested in each other's services, I don't see any real obstacles in working with a foreign partner. The only drawbacks that could affect collaboration with a company further away are higher transport costs or longer delivery times."*

Coca (Sales Director, 47, Romania) adds that *"comfort is given by the profitability of the business very often. And it is also more profitable to work with partners who are geographically closer because there are several advantages: lower transport or delivery costs, shorter delivery times, the possibility to visit us more often when small inconveniences arise"*. The imperative of lower transport or delivery costs and the possibility to intervene more quickly in the event of a crisis (rejection of products due to poor quality and the need to send other products quickly) is a recurring theme in the responses of all subjects, with the comment that when *"the company is in a remote corner of the world, transport costs may be too high to make collaboration meaningful. Special cases are when a customer needs a good product in a certain country or region and transport costs are no longer restrictive, but these cases are quite rare"* (Adrian, General Manager, 52 years old, Romania).

When international collaborations with long-distance partners have a direct impact on the competitiveness and profitability of the business, geographical positioning and therefore cultural differences take second place, a point confirmed by both Alan (Regional Sales Manager, 37, France) and Maia (Regional Sales Manager, 29, Hungary), the latter stating that *"nowadays, it is no longer relevant from which part of the world a partner comes from as long as there are multiple communication channels to keep in touch effectively"*. Even in this context, there is one respondent who states that *"interacting with partners in closer locations creates the conditions for better collaboration"* (Ivelina, Purchasing Manager, 27, Bulgaria), as geographical proximity brings with it cultural proximity.

When asked if they had ever stopped developing a business relationship simply because they were not personally compatible with the other organisation's manager, respondents took similar approaches. Subjects consider compatibility a relevant relational aspect, but for them, business interests take precedence. For example, Adrian (General Manager, 52 years old, Romania) states that: *"Incompatibility, even on a personal level, causes barriers in communication and a business relationship cannot develop without genuine communication, with a short response time (...) Even though business should be based only on figures and rational decisions, we are often put in borderline situations where the decision can no longer be taken only by paper calculations. At such times, personal relations with the manager of the collaborating company will be decisive"*.

Similarly, Umberto (Sales Manager, 25 years old, Italy) confirms that in case of incompatibility, the business relationship *"dissolves itself (...) If one of the parties has no other solution, they will still make great efforts to continue the collaboration"*, a point shared by Alan (Regional Sales Manager, 37 years old, France) - *"it is important for me to see a positive attitude from the other manager (...) If my business depends on that collaboration, I will try to get over the personal aspects"*. Andrei (Sales Director, 28, Romania) points out that *"so far, I have not encountered such problems. Where there is a great interest on both sides to collaborate, some*

form of agreement is found. We just need to speak the same language - the 'language of profit'". On the same level, Maia (Regional Sales Manager, 29 years old, Hungary) highlights that in the metallurgical sector, "terminating a business relationship due to lack of compatibility between managers is a threat to the business in general as most foreign partners are very different from us. What matters are common interests - profit, growth and development of the business, more markets - and limiting personal ego".

The example given by Coca (Sales Director, 47, Romania) in this regard is eloquent: "We didn't stop working together, but we were very close. It happened that the manager of an organisation with which we worked very well left for another company and the person who took his place was a very arrogant and rigid person. Although I had been working with this company for almost 7 years, there was a temptation to give up the partnership and look for another supplier. However, after several meetings with the new manager, we both came to the conclusion that we are better off together than separately. To sum up, personal and social factors are important, but the long-term benefits are essential."

The issue of differences between managers also addressed cultural differences ("Do you think intercultural differences are an important factor when establishing international business relationships? Can you give an example? How do you deal with situations of divergence?"). Six out of seven respondents consider intercultural differences to be a relevant factor in building and developing business relationships. Thus, Adrian (General Manager, 52 years old, Romania) states that: "Intercultural differences are important and can even be decisive in some situations. If you make the wrong gesture or joke at the first meeting with a potential collaborator, they may consider you rude and it will be hard to get rid of an unfavourable label, especially as we are considered inferior in many countries. To avoid such situations, it's good to find out beforehand what you should and shouldn't do, and if it's clear that you've done something wrong, it's good to clarify the situation so that the end of the discussion is still positive."

Similarly, Umberto (Sales Manager, 25 years old, Italy) explains that situations of cultural divergence need to be handled with care because there may be situations where "business partners will not understand the discussion, the request, the joke etc. correctly". In this vein, Ivelina (Purchasing Manager, 27 years old, Bulgaria) mentions the ambivalence of cultural specificity, which is "either a support or a hindrance" in establishing international business relations - however, "when partners approach differences with mutual consideration and respect, business relations are solid (...) Concessions on both sides are needed for the relationship to work".

Illustrating from personal experience, Coca (Sales Director, 47, Romania) says: "I remember once showing the 'OK' sign to a partner in Australia and he looked at me very badly. He told me later that in their culture it is a rude gesture. I apologised and explained the meaning of the gesture in Romania. We both laughed. Our good fortune was that we are both open, communicative people interested in working together. Probably, if we hadn't given each other a chance, if we hadn't clearly explained what bothers us or what we consider a problem, we wouldn't have ended up with almost 11 years of collaboration behind us."

Similarly, Andrei (Sales Director, 28, Romania) specifies "experience in different international markets helps you to accept or tolerate new situations more easily. For example, when I first worked with a German company, a manufacturer, I was annoyed by their formal, often judgmental style. Later, when I was in the situation of signing a contract with another company in Germany, my expectations were already formed, and it was easier for me to react". Only one respondent - Maia (Regional Sales Manager, 29 years old, Hungary) - does not consider this kind of differences as an important factor when doing business internationally as "it is a proof of business maturity to deal with divergent situations by being open to new cultural

prototypes and positioning. If both parties are interested in a profitable collaboration, they need to harmonize with the rest".

The next item in the interview guide focused on respondents' opinions on the main success factors for a long-term business relationship and the place of credibility of collaborators. In this respect, the subjects focused on the data inherent to the business itself, as Andrei (Sales Director, 28 years old, Romania) stated: *"Success factors are primarily related to win-win situations for both partners. Meeting payment and delivery deadlines, responding quickly to a request, finding quick solutions in exceptional cases are all basic elements. All this shows that our partners can be considered reliable and trustworthy and that it is worthwhile to continue investing in the business relationship. In my opinion, there can be no long-term relationship if we do not prove our credibility on an ongoing basis."*

Similarly, Coca (Sales Director, 47, Romania) argues that *"success factors are many - besides the classic ones - price, product, distribution, deadlines - the credibility of the other party is essential to the success of a long-term deal. If the commitments made are respected, if we treat our partners with respect and professionalism, the business relationship works for a long time."* Such a perspective is also taken by Maia (Regional Sales Manager, 29, Hungary) who credits long-term collaboration and the added value brought to partners with a defining importance - *"always trying to be a useful resource, honest all the time, meeting deadlines and relating to the customer as a person, not just as a source of money"*. In addition, Ivelina (Purchasing Manager, 27, Bulgaria) brings to the fore mutual respect, accuracy in collaboration and maintaining competitiveness, with the credibility of the parties being a potential enabler as long as there is a competitive advantage associated with the partnership. Credibility is seen as a central aspect of collaboration by Umberto (Sales Manager, 25 years old, Italy) and Adrian (General Manager, 52 years old, Romania), the latter concluding *"Credibility is the main personal factor of success in a collaboration. Without credibility, there is no possibility to develop a business, especially in the long term"*.

5. Conclusions

In a global economic environment that promotes economic relations through cross-border cooperation, SMEs are often forced to find new markets and business networks to become more competitive and to adapt intelligently to market conditions. Recent studies have highlighted the lack of a unified theoretical framework for relationships development and business internationalization. This makes the correlative analysis of the two processes a priority for further research. As emerges from the interviews, international collaborations are indispensable for the profitability of their businesses, which is a way for them to effectively expand internationally. The general criteria applied in choosing a foreign partner include competitiveness, profitability and opportunities for organizational development, along with good reputation. The qualitative analysis of the collected data pointed to several main conclusions. Firstly, most of the interviewed subjects rated the dimensions related to B2B relationships as important in the internationalization process of their SMEs. Secondly, managers consider that economic interests and overall business details prevail over socio-cultural differences between business partners and over the characteristics of the country of origin. Furthermore, the results obtained indicate that international collaborations are essential to the profitability of businesses. Managers believe that such collaborations are crucial for organizational growth and development. Aspects such as competitiveness, profitability and expansion opportunities are important selection criteria in choosing foreign partners. Also, credibility, reliability, honesty, and good cooperation are considered essential aspects for a

successful business relationship. In addition, most respondents admit that the profitability of their business is strongly influenced by international collaborations, and the refusal to work with foreign companies can lead to bankruptcy. The main criteria for selecting a foreign collaborator include competitiveness, profitability, and opportunities for organizational development. Despite the novel insights brought forward, this work has several limitations. The research involved only seven subjects, which may limit the generalizability of the results to European small business managers in the industry. In addition, as the subjects come from several European countries, there may be cultural and contextual differences in other places that were not included in the research. Since the study is based on interviews, they run the risk of being subjective and influenced by the subjects' own experiences and knowledge. Additionally, time limiting the interviews to 25-35 minutes may have restricted more detail and complexity of responses.

In conclusion, future research could involve a larger and more diverse sample of European SME managers from different industrial sectors to provide a more detailed insight into B2B relationships in the same international context. Furthermore, the cross-industry comparison of B2B perceptions and practices can reveal some important differences and provide a more accurate view of the different industrial context influencing B2B relationships at the international business level. At the same time, analyzing the impact of COVID-19 on the business context may have the potential to become an interesting direction for research.

Author contributions: All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding: This research received no external funding.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

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IMPACT OF FINTECH SECTOR DEVELOPMENT ON MONEY LAUNDERING PREVENTION

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Cite as: Geceviciene, K., Danileviciene, I., Okuneviciute-Neverauskiene, L. (2024). *Impact of FinTech sector development on money laundering prevention*, *Ekonomicko-manazerske spektrum*, 18(1), 54-66.

Available at: dx.doi.org/10.26552/ems.2024.1.54-66

Received: 20 February 2024; Received in revised form: 11 April 2024; Accepted: 12 May 2024; Available online: 30 June 2024

Abstract:

Research background: In the last decade, as the financial crisis brought the global economy to its knees, financial technology start-ups have surged forward and offered more innovative solutions to problems in the traditional areas of banking, insurance and wealth management. This new and burgeoning industry, which has come to be known as the FinTech industry, is growing. FinTech, as the name suggests, refers to using the latest technology to solve financial service problems. Technology-based innovation is radically changing the financial industry. Financial innovations are attractive and convenient products for consumers. Still, at the same time, they create new problems in the fight against money laundering and terrorist financing and pose new challenges to specialists in improving the system of combating money laundering and terrorist financing and global practice in this field. The concept of FinTech and the ecosystem structure are presented. The impact of development on money laundering prevention is discussed, the indicators leading to the development of the FinTech sector are distinguished.

Purpose of the article: The main aim of the article is to assess the impact of the development of the FinTech sector on money laundering prevention.

Methods: Literature analysis specifies information about FinTech development and money laundering, while multi-criteria assessment methods, TOPSIS, EDAS, and SAW, are used to assess the impact of FinTech sector development on money laundering prevention.

Findings & Value added: The results of country evaluations based on their Anti-Money Laundering Basel index using different multi-criteria assessment methods provide insights that the United Kingdom, Switzerland, and Sweden have performed well in terms of compliance with regulations. Bulgaria, Italy, and Turkey have demonstrated efficiency in addressing money laundering based on the criteria used in the evaluation.

Keywords: financial technologies; financial technology development; money laundering prevention; Fintech regulation; money laundering prevention index.

JEL Classification: E42; E51; G18; G21

1. Introduction

Financial innovations are attractive and convenient products for consumers, but at the same time, they create new problems in the fight against money laundering and terrorist financing and pose new challenges to specialists in improving the system of combating money laundering and terrorist financing and global practice in this field. Nowadays, the speed of execution and processing of transactions, the increase in the number of international transfers, the availability of financial services, the emergence of high-tech financial technologies, including blockchain technology and cryptocurrency based on it, as well as the vulnerability of the financial system and AML legislation to new threats, increase the use of these technologies in non-performing loans (NPL)/terrorist financing (TF) risk for purposes. Financial technologies are improving daily, and their associated risks are growing accordingly. According to Ugli (2022), based on the speed of development and global distribution of modern financial products and the low legal regulation of the management of these products, we can safely say that they will inevitably affect the area of money laundering prevention.

The research object is to identify indicators leading to the development of the FinTech sector. By analysing various factors such as technological advancements, regulatory environment, investment trends, consumer preferences, and market dynamics, the study aims to uncover the primary drivers behind the expansion of FinTech. Understanding these indicators is crucial for policymakers, investors, and industry stakeholders to make informed decisions and strategies that foster continued growth and innovation within the FinTech ecosystem. Through empirical analysis and insights, the research tries to provide valuable insights into the factors shaping the trajectory of the FinTech sector and its broader implications for the financial industry.

The research problem is that the rapidly expanding financial technology sector and the easy availability and use of its services potentially provide a convenient environment for committing criminal acts and legalizing the funds obtained in this way. So, the problem is: How do we properly assess the impact of the development of the FinTech sector on the prevention of money laundering? The research aims to determine the impact of the development of the FinTech sector on money laundering prevention. By examining the financial technology solutions, regulatory frameworks, and technological innovations within the FinTech industry, the study seeks to evaluate their effectiveness in enhancing anti-money laundering (AML) measures. It aims to identify how FinTech tools and platforms contribute to improving AML processes, detecting suspicious transactions, and mitigating risks associated with money laundering activities. To achieve this, a few methods are used: literature analysis and multi-criteria assessment methods: TOPSIS, EDAS, and SAW.

2. Literature Review

2.1. FinTech concept and risks

The financial services industry is changing in parallel with the technological capabilities of the industry's transformation. Financial technology (FinTech) is becoming a global phenomenon led by innovators, closely followed by academics, and now attracting the attention of regulators.

Although the concept of FinTech is widely analyzed in the scientific literature, the opinions of the authors differ. Mention (2021) argues that FinTech is a general term for innovative technology-based financial service business models. According to Kagan (2020), FinTech describes new technologies that aim to improve and automate the provision and use of financial services. The basis of FinTech is to help companies, business owners, and consumers better

manage their financial transactions, processes, and lives using specialized software and algorithms that are used on computers and smartphones.

Li and Xu (2021) state that financial technology is a series of new business models, new technology applications and new products and services that significantly impact the financial market and supply. It has gained much attention for the following benefits: increasing operational efficiency, effectively reducing operating costs, collapsing existing industry structures, blurring industry boundaries, facilitating strategic brokerage, providing new entrepreneurial gateways and democratizing financial services. FinTech can also be considered „any innovative ideas that improve financial service processes by offering technological solutions for different business situations or can be interpreted as information application of technology in finance, financial innovation and digital innovation“ (Suryono et al., 2020).

Ogege and Boloupremo (2020) argue that FinTech is a still-evolving industry that seeks to improve the quality of financial service operations. It is an innovative technology that challenges conventional ways of providing financial services. The financial services sector includes banks, accounting firms, credit unions, insurance companies, consumer finance companies, real estate, and services provided to individual users or companies. FinTech is the connection between the financial industry, information technology and innovation. Moreover, the term FinTech comes from the union of the words „finance“ and „technology“ and reflects what the acronym means, which includes the development of technology and innovation to support banking and financial skills using the latest technologies (Giglio, 2021). FinTech also describes the connection between technologies such as cloud computing and mobile internet with financial services businesses such as loans, payments, money transfers, and other banking.

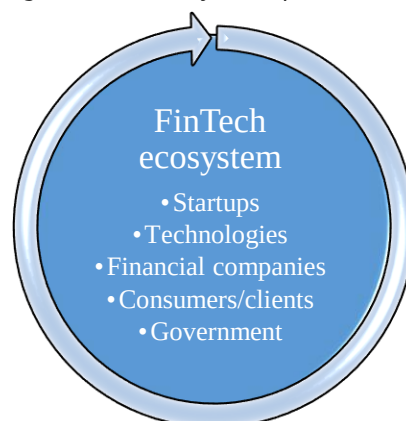
Vucinic and Luburic (2022) define FinTech as technologically enabled innovations in the field of financial services that can lead to the emergence of new business models, applications, processes or products that have a significant impact on financial markets and institutions and the provision of financial services. FinTech is a phase that changes over time as new technologies revolutionize the world (Razzaque and Hamdan, 2020). FinTech is not limited to certain distinct segments that dominate the economy, such as financing or business models such as peer-to-peer lending, but instead encompasses the full range of devices and products typically provided by the financial services industry. Organizations use the best technologies to improve their ability to gain a more significant competitive advantage by providing services. FinTech brings together finance and technology that is delivered automatically and efficiently while proving to be cost-effective.

Although FinTech can be broadly defined as any technology that enables or improves the provision of financial services, such a definition is limited to empirically identifying and classifying real-world financial technologies (Chen et al., 2019). In order to understand the meaning of FinTech, the ecosystem of FinTech is defined below (Figure 1). This ecosystem was defined by Albarrak and Alokley (2021) and consists of five categories – FinTech start-ups, technology developers, government, consumers and traditional financial institutions.

Figure 1 presents the FinTech ecosystem, the most crucial part of which is start-ups. *Startups* are innovative in specific areas, such as payments, international transfers, lending, crowdfunding, capital markets, and insurance and operate at lower costs than their traditional counterparts. Technology developers offer digital tools for social media, big data analytics, cloud computing, artificial intelligence, smartphones and mobile services.

Financial institutions also play an essential role in the FinTech ecosystem. According to Bitvinskas and Maknickiene (2021), most financial flows in countries still belong to traditional financial institutions; they account for most of this system.

Figure 1: The ecosystem of FinTech



Source: compiled by the authors, based on Albarrak and Alokley (2021)

Users are the unifying category of the ecosystem, as all services and products created are designed to meet the expectations and needs of users.

To facilitate the intermediation of financial flows with FinTech companies, *government* authorities apply incentive programs aimed at cooperation between the two parties.

The spectrum of risks in the FinTech sector is wide, and the probability of their occurrence and impact on the financial system differs. According to the research data of the Financial Stability Department of the Bank of Lithuania, several essential risks of the FinTech sector can be distinguished: compliance, operational, credit, financial, fraud and risks for the banking sector. However, the main risk of the Lithuanian FinTech sector is the dangers posed by money laundering and terrorist financing and the lack of prevention. According to various calculations, even 97 percent of financial institutions are also involved in money laundering-related crimes. Although the overall level of money laundering and terrorist financing (PMTF) prevention in Lithuania is assessed positively, in July of 2022, in the recommendations presented by the International Monetary Fund, Lithuania is further encouraged to strengthen PMTF risk supervision and monitoring.

The fact that this risk includes an extensive range of factors is also proven by the index compiled by the AML Basel Index. The Basel AML Index measures money laundering and terrorist financing (ML/TF) risk in jurisdictions worldwide. It is based on a composite methodology containing 18 indicators, grouped into five areas based on five key factors believed to contribute to high ML/TF risk. The fight against money laundering has affected the world economy for many years. Large amounts of money are laundered yearly, posing a threat to the economy. In the scientific literature, the authors similarly define money laundering.

According to Odu (2020), money laundering can be defined as a crime to make a profit so that the proceeds of this crime are concealed or used for criminal activities. Everyday money laundering activities include corruption, market manipulation, tax evasion, drug trafficking and fraud. All funds generated through these activities divert resources that could otherwise be used for economic and social welfare. These activities also adversely affect the countries' overall functioning and stability and financial operations.

According to Kemal (2014) and Kumar et al. (2021), money laundering is a type of dirty money, and the primary purpose of the crime of money laundering is to transform dirty money into clean money in order to hide assets, avoid prosecution and taxes, increase profits and become legitimate. Assessing the efficiency of anti-money laundering programs to identify criminal clients and suspicious transactions in financial institutions is becoming more critical for their reliable operation and efficiency. Money laundering is illegally obtaining an amount

from various illicit related sources and converting monetary funds from illegal to clean funds using any international investment vehicle or bank.

2.2. Analysis of the indicators leading to the development of the FinTech sector

The development of FinTech is rapidly accelerating the digital financial services sector, giving people worldwide access to faster, cheaper and more efficient tools to manage everyday transactions, protect against emergencies and invest. In the literature, authors describe and analyse FinTech development in different ways. Malciauskaite and Kvietkauskienė (2019), in their research, based on the analysis of scientific literature, assessed the possibilities, problems and challenges of FinTech development in the world. In order to determine the importance and development of FinTech, the article examines the FinTech adaptation indicator and investments received in FinTech companies.

According to Bitvinskas and Maknickienė (2021), the number of sector employees is one indicator describing development. FinTech companies with a minimal number of employees signal to consumers and supervisory authorities about possible risks due to fraudulent activities and the real purpose of the FinTech company, for example, whether the activities carried out comply with the money laundering regulations of the supervisory authorities and the like.

The Ministry of Finance of the Republic of Lithuania issued a report on the approved plan for the growth of FinTech tools, which will monitor and evaluate the following indicators: the number of FinTech companies, the number of jobs created in the FinTech sector, the positions held in the most influential rankings of international financial centres. Researchers (Kukoc, 2021; Nguyen and Dang, 2022; Tao et al., 2022; Wang, 2023) also chose the international FinTech index to measure FinTech development. Batunanggar (2019) and Goecks et al. (2022) analysed FinTech development and regulatory systems in Indonesia. FinTech development indicators were selected after evaluating the entire country's FinTech sector according to the fastest-growing areas: peer-to-peer lending (P2P) and electronic payments. In summary, it can be said that the best way to evaluate the development is the FinTech index, because it can be used to evaluate different parts of FinTech and its advantages/disadvantages.

2.3. Theoretical aspects of the influence of FinTech sector development on money laundering prevention

The rapidly expanding financial technology sector the easy availability and use of their services, potentially provide a convenient environment for committing criminal acts and legalizing the funds obtained in this way. Analysing the scientific literature, it was noticed that different authors interpret the influence of the development of financial technologies on the prevention of money laundering in different ways. According to Dzafarova (2022), the growing FinTech sector poses risks in money laundering, and the institutions responsible for preventing this area are not yet fully capable of ensuring it. The researcher analysed the money laundering problem in Lithuania's FinTech sector and claimed that the number of financial technology companies in Lithuania has proliferated over the past year. However, they do not publish and do not provide all the necessary information about their finances and situation, which makes it impossible to ensure that money laundering is avoided and prevents criminals to „launder“ money (Zemgulyte et al., 2019). There is a lack of publicly available information about FinTech companies operating in Lithuania because the average transparency assessment of financial technology companies with the most significant amount of taxes paid to the budget last year is 25 points out of 100.

Also, only about 6 % of FinTech companies operating in Lithuania publicly publish their financial statements. Faccia et al. (2020), Mogaji and Nguyen (2022) argue that one of the most

significant risks facing the financial technology sector is the risk of money laundering. The main reason is that FinTech companies can defy existing anti-money laundering legislation and regulation (Roide, 2022, Meiryani et al., 2023). FinTech companies no longer need professional intermediaries such as banks and others in the financial sector, so they may not be subject to the same financial reporting rules that would regularly promote market stability. Anti-money laundering regulators need an international solution to solve an international problem. According to Choudhary (2023), money laundering problems have arisen with the development of FinTech. Money laundering is attractive to FinTech criminals due to the proliferation of these systems for transaction initiation, unlimited cash flow and anonymous accounts for transaction purposes. In addition, electronic prevention of money laundering has begun supplanting traditional anti-money laundering (transaction laundering). This case shows that FinTech companies can be targeted by criminal groups engaged in money laundering. This data can pose a significant AML threat to the FinTech industry. According to Bytautas and Morkunas (2023), the main risk posed by Lithuanian FinTech is the dangers posed by money laundering and terrorist financing and the lack of prevention. Financial institutions, especially those growing rapidly and often have a less developed self-regulatory mechanism for risk assessment and money laundering prevention compared to traditional financial institutions, are at greater risk of falling into money laundering schemes.

In conclusion, it can be said that different authors similarly define FinTech. The FinTech sector is a sector that changes over time as new technologies revolutionize the world and enable or improve the provision of financial services. The authors also analyse the development of the FinTech sector by distinguishing different sector indicators. It can be noticed that FinTech international indices are primarily repeated in the literature. The authors also often evaluate the number of payments made, the number of FinTech companies, P2P lending indicators and the number of employees in the FinTech sector. It was also noticed that the most common evaluation methods are correlational regression analysis, multi-criteria decision evaluation, and expert evaluation. However, although this sector is described as a revolutionary new technology, the most significant risk posed by FinTech is the dangers and lack of prevention of money laundering and terrorist financing.

3. Methodology

Multi-criteria assessment methods will be used to assess the influence of FinTech sector development on money laundering prevention. The choice of the method was determined by the ease of application and the analysis of the authors (Malciauskaite and Kvietkauskiene, 2019; Bitvinskas and Maknickiene, 2021; Batunanggar, 2019; Demirguc-Kunt et al., 2020; Nguyen and Dang, 2022; Akartuna et al., 2022; Zakaria, 2023) in which the impact of FinTech development on various aspects was evaluated. After analysing the literature, it was found that different authors chose different indicators for the development of FinTech. Therefore, the evaluation criteria are chosen considering the published FinTech development reports and data availability. In order to obtain the most accurate results, the study sample was increased by evaluating the selected 24 countries (including the Baltic countries) for which all data were available in the relevant period. The countries were divided into two categories according to the AML Basel index - low-risk and higher-risk countries. All criteria were weighted using the CRITIC weighting method. The following evaluation criteria were selected:

- number of FinTech companies;
- number of FinTech employees;
- attracted investments in FinTech companies;

- global FinTech index;
- total number of FinTech users in the country.

TOPSIS is a method for determining the rationality of options close to the ideal point. The essence of this method is to determine the relative distance of each alternative to the „ideally worst“ option. The greater the determined distance to the „ideally worst“ option, the more suitable the alternative is judged to be for the decision-maker. For the application of the TOPSIS method, a decision matrix X is formed at the beginning, the elements of which are x_{ij} , $i = 1, m$; $j = 1, n$ (here x_{ij} – the value of the j -th indicator of the i -th alternative). When applying the TOPSIS method, the elements the decision matrixes normalized according to the formula:

$$\tilde{x}_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^m x_{ij}^2}} \quad (1)$$

Use the weights of the indicators ω_j , $j = \overline{1, n}$ and the normalized elements of the decision matrix, a weighted normalized matrix is formed:

$$\bar{X} = \begin{pmatrix} \omega_1 \tilde{x}_{11} & \cdots & \omega_n \tilde{x}_{1n} \\ \cdots & \cdots & \cdots \\ \omega_1 \tilde{x}_{m1} & \cdots & \omega_n \tilde{x}_{mn} \end{pmatrix} = \begin{pmatrix} a_{11} & \cdots & a_{1n} \\ \cdots & \cdots & \cdots \\ a_{m1} & \cdots & a_{mn} \end{pmatrix} \quad (2)$$

The “ideally best” alternative is formed from the elements of the weighted normalized matrix according to the formula:

$$A^+ = \left\{ \left(\max_i a_{ij} \mid j \in J \right), \left(\min_i a_{ij} \mid j \in J' \right) \mid i = \overline{1, m} \right\} = \{a_1^+, a_2^+, \dots, a_n^+\} \quad (3)$$

where J is a set of indexes of indicators, the higher values of which are better
 J' is a set of indices of indicators, with smaller values being better

The “negative ideal” alternative is formed according to the formula:

$$A^- = \left\{ \left(\min_i a_{ij} \mid j \in J \right), \left(\max_i a_{ij} \mid j \in J' \right) \mid i = \overline{1, m} \right\} = \{a_1^-, a_2^-, \dots, a_n^-\} \quad (4)$$

The distance between the compared i -th and the ”ideally best” A^+ alternatives is determined by calculating the distance in n -dimensional Euclidean space according to the formula:

$$S_i^+ = \sqrt{\sum_{j=1}^n (a_{ij} - a_j^+)^2}, (i = \overline{1, m}), \quad (5)$$

and between the i -th and “negatively ideal” A^- alternatives – according to the formula:

$$S_i^- = \sqrt{\sum_{j=1}^n (a_{ij} - a_j^-)^2}, (i = \overline{1, m}). \quad (6)$$

The final step of the TOPSIS method determines the relative distance of each i -th alternative to the “ideally worst” option:

$$P_i = \frac{S_i^-}{S_i^+ + S_i^-}, i = \overline{1, m} \text{ when } C_i \in [0,1]. \quad (7)$$

Based on the values of C_i a priority queue of alternatives is formed. The rational alternative is considered to be the one with the highest values of C_i .

The basic concept of the **SAW method** is to find a weighted sum of ratings for each alternative. Firstly, the normalized efficiency matrix of the r_{ij} value of the i -th object (alternative) of the j -th criterion is calculated according to the formula when the exponent is maximizing

$$\overline{r}_{ij} = \frac{r_{ij}}{\max_j r_{ij}} \quad (8)$$

and when the indicator is minimizing

$$\overline{r}_{ij} = \frac{\min_j r_{ij}}{r_{ij}} \quad (9)$$

where $\overline{r}_{ij}$ is normalized efficiency matrix values
 r_{ij} is the decision matrix

The final values of S_j are calculated below according to the formula:

$$S_j = \sum_{i=1}^m w_i r_{ij} \quad (10)$$

where S_j is the weighted sum of the assessment
 w_i is criterion weight
 m is number of criteria

EDAS method is a method based on the distance from the mean solution. Firstly, the value of the positive distance from the mean is calculated according to the formula when the indicator is maximizing

$$PDA_{ij} = \frac{\max(0, (x_{ij} - AV_j))}{AV_j} \quad (11)$$

and when the indicator is minimizing

$$PDA_{ij} = \frac{\max(0, (AV_j - x_{ij}))}{AV_j} \quad (12)$$

where X_{ij} is solution matrix
 AV_j is average of criteria

The longest negative distance from the mean is calculated below using the formula when indicator is maximizing

$$NDA_{ij} = \frac{\max(0, (AV_j - x_{ij}))}{AV_j} \quad (13)$$

and when indicator is minimizing

$$NDA_{ij} = \frac{\max(0, (x_{ij} - AV_j))}{AV_j} \quad (14)$$

Also, the weighted sums of the positive and negative distance from the mean values are calculated according to the following formula when the indicator is maximizing

$$SP_i = \sum_{j=1}^m w_j PDA_{ij} \quad (15)$$

and when the indicator is minimizing

$$SN_i = \sum_{j=1}^m w_j NDA_{ij} \quad (16)$$

where

w_j is criteria weights

PDA_{ij} are values of positive distance from the mean

NDA_{ij} – the longest negative distance from the mean

Further step is to calculate the weighted sums of SP_i and SN_i values when the indicator is maximizing

$$NSP_i = \frac{SP_i}{\max_i(SP_i)} \quad (17)$$

and when the indicator is minimizing

$$NSN_i = 1 - \frac{SN_i}{\max_i(SN_i)}, \quad (18)$$

where

NSP_i is weighted sum of values of positive distance from the mean

NSN_i is weighted sum of values of negative distance from the mean

4. Results

After performing the calculations using the TOPSIS, EDAS and SAW methods, the results were obtained, which are presented in Tables 1 and 2.

Based on the results of the study presented in Table 1, it can be said that each country is assigned a rank. The country with a higher P_i , AS_i , S_j , index gets a higher rank. After ranking the selected countries, the following results are obtained: according to the TOPSIS method, the United Kingdom is ranked first, according to the EDAS method, Portugal is ranked first and according to the SAW method, the United Kingdom is ranked first.

Based on the results of the analysis presented in Table 2, it can be said that each country is assigned a rank. The country with a higher P_i , AS_i , S_j , index gets a higher rank. After ranking the selected countries, the following results are obtained: by the TOPSIS method, the first-place

Table 1: Results of the multi-criteria evaluation of countries with a low AML Basel index

Low AML Basel index countries	TOPSIS assessment		EDAS assessment		SAW assessment	
	P_i	Rank	AS_i	Rank	S_j	Rank
Ireland	0.40259	4	0.92685	4	0.42937	2
Belgium	0.39016	10	0.89676	5	0.29437	11
Denmark	0.39682	6	0.92754	3	0.38842	4
Estonia	0.39276	8	0.86608	6	0.31126	9
Spain	0.31978	13	0.63808	12	0.21051	14
Italy	0.27643	14	0.66887	10	0.16272	15
United Kingdom	0.60118	1	0.00000	15	0.77684	1
Latvia	0.39186	9	0.97139	2	0.35872	6
Lithuania	0.37996	11	0.80510	7	0.26090	12
Netherlands	0.40223	5	0.64075	11	0.30228	10
Portugal	0.39348	7	1.00000	1	0.36293	5
France	0.27207	15	0.55012	13	0.23260	13
Sweden	0.40758	3	0.80441	8	0.33589	8
Switzerland	0.42764	2	0.76197	9	0.40712	3
Germany	0.35314	12	0.44865	14	0.35163	7

Source: compiled by the authors based on own calculations

according to the ranking is Bulgaria, by the EDAS method – Moldova, by the SAW method – Bulgaria. According to the evaluation methods, Serbia, Turkey and Albania took the last places.

Table 2: Results of the multi-criteria evaluation of countries with high AML Base index

High AML Basel index countries	TOPSIS assessment		EDAS assessment		SAW assessment	
	P_i	Rank	AS_i	Rank	S_j	Rank
Albania	0.46381	7	0.94893	2	0.15040	10
Armenia	0.54857	4	0.94053	3	0.46358	4
Bulgaria	0.77663	1	0.41129	7	0.49784	1
Italy	0.61580	2	0.16261	9	0.46710	2
Croatia	0.53576	5	0.42528	6	0.34166	7
Malta	0.59243	3	0.50536	5	0.43556	5
Moldova	0.52139	6	1.00000	1	0.32485	8
Serbia	0.42349	10	0.68630	4	0.15084	9
Turkey	0.46352	8	0.00000	10	0.46570	3
Hungary	0.43204	9	0.23101	8	0.35737	6

Source: compiled by the authors based on own calculations

5. Discussion

The FinTech sector represents a dynamic and rapidly evolving industry that uses new technologies to develop financial services on a global scale. The development of the FinTech sector is analysed with a particular emphasis on various indicators and international indices commonly employed to assess its growth and impact. Despite its innovative potential, the rise of FinTech also brings forth significant challenges, particularly concerning the prevention of money laundering and terrorist financing activities by its digital nature and global reach. Numerous multi-criteria assessment methods, such as TOPSIS, EDAS, and SAW, evaluate countries' efficacy in combating money laundering based on their AML Basel index scores.

In evaluating countries with low AML Basel index scores, the United Kingdom consistently emerges as a top performer across assessment methodologies, showcasing its robust anti-money laundering measures and regulatory frameworks. Portugal, Latvia, and Denmark demonstrate efforts in combating financial crime, as evidenced by their rankings in various assessments. Countries with higher AML Basel index scores display varying rankings, indicating disparities in their efficiency in addressing money laundering challenges.

Bulgaria is a leading performer across multiple assessment methods, suggesting a commitment to combating financial crime within its jurisdiction. However, countries like Italy

and Turkey show fluctuations in their rankings, highlighting potential areas for improvement in their anti-money laundering strategies. These evaluations define the critical importance of approaches to combating money laundering and terrorist financing within the dynamic FinTech landscape.

By identifying strengths and weaknesses across different jurisdictions, policymakers and stakeholders can efficiently develop targeted interventions to mitigate financial crime risks. Furthermore, fostering collaboration and innovation within the FinTech sector is essential to building a resilient global financial ecosystem that prioritizes security and integrity. Regulators and industry players must work together to develop robust frameworks that leverage technology to enhance compliance and strengthen anti-money laundering efforts.

Moreover, advancements in artificial intelligence, blockchain technology, and big data analytics offer promising solutions for improving the detection and prevention of bad financial activities. However, such technological advancements also pose new challenges, including the need for continuous adaptation to emerging threats and the complexities of regulating decentralized platforms. Additionally, ensuring inclusivity and accessibility within the FinTech ecosystem is crucial to mitigating financial exclusion and inequality risks.

Enhanced collaboration among financial institutions, regulatory, law enforcement agencies, and FinTech start-ups is essential to foster a united front against economic crime. This collaborative approach should prioritize information sharing, capacity building, and the development of standardized frameworks to facilitate effective AML/CFT (Combating the Financing of Terrorism) efforts across borders. Furthermore, public-private partnerships play a pivotal role in leveraging collective expertise and resources to address evolving threats and safeguard the integrity of the global financial system.

Education and awareness initiatives are also instrumental in empowering individuals and organizations to recognize and report suspicious financial activities efficiently. By promoting a compliance and ethical conduct culture, stakeholders can contribute to building a more resilient and trustworthy financial ecosystem. In conclusion, while the FinTech sector holds innovation and economic growth potential, its success in addressing the inherent risks associated with money laundering and terrorist financing through concerted efforts and collaborative approaches.

6. Conclusions

The FinTech sector changes over time as new technologies revolutionize the world and enable or improve the provision of financial services. The development of the FinTech sector is deeply analysed by distinguishing different indicators of the sector, and FinTech international indices are mostly repeated in the literature. Although this sector is described as a revolutionary new technology, the greatest risk posed by FinTech is the dangers and lack of prevention of money laundering and terrorist financing.

After evaluating the countries with a low AML Basel index using the multi-criteria assessment method TOPSIS, it was found that the United Kingdom took the first place, Switzerland took the second place and Sweden took the third place. Using the multi-criteria evaluation method EDAS, it was found that Portugal took the first place, Latvia took the second place and Denmark took the third place. Using the multi-criteria evaluation method SAW, it was found that the United Kingdom took the first place, Ireland took the second place and Switzerland took the third place.

After evaluating the countries with a high AML Basel index using the multi-criteria assessment method TOPSIS, it was found that Bulgaria took the first place, Italy took the

second place, and Malta took the third place. Using the multi-criteria evaluation method EDAS, it was found that Moldova took first place, Albania second place, and Armenia third place. Using the multi-criteria assessment method SAW, it was found that Bulgaria took the first place, Italy took the third place, and Turkey took the third place.

Author contributions: All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding: This research received no external funding.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

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*Impact of FinTech sector development
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THE RELATIONSHIP BETWEEN ORGANIZATIONAL CLIMATE AND ORGANIZATIONAL COMMITMENT IN LIGHT OF THE EMPLOYEE EMPOWERMENT BEHAVIOR VARIABLE DURING THE COVID-19 PANDEMIC: A CASE STUDY OF THE GENERAL HOSPITAL OF KETTAR ALGERIA

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Cite as: Hadouga, H. (2024). *The relationship between organizational climate and organizational commitment in light of the employee empowerment behaviour variable during the COVID-19 pandemic: A case study of the general hospital of Kettar Algeria*, *Ekonomicko-manazerske spektrum*, 18(1), 67-78.

Available at: dx.doi.org/10.26552/ems.2024.1.67-78

Received: 11 January 2024; Received in revised form: 6 April 2024; Accepted: 21 May 2024; Available online: 30 June 2024

Abstract:

Research background: Organizational commitment within an organization is usually considered a factor that can positively influence employee behaviour, but not only directly, but also through the organizational climate within the organization.

Purpose of the article: Many studies have focused on investigating the relationship of organizational commitment and employee behaviour, as well as by focusing on the relationship between organizational climate and employee behaviour. Therefore, this article also aims to verify the relationship of organizational commitment and organizational climate in light of the employee empowerment behaviour variable for a hospital. The general hospital of Kettar Algeria was selected during the period of the COVID-19 pandemic.

Methods: The analysis uses data collected from the General Hospital in Algeria 2019-2020. The relationship between organizational climate and organizational commitment is verified in light of the employee behaviour variable, and the analysis was also done using the Statistical Package for the Social Sciences, to test the existence of a strong relationship between the organizational climate and organizational commitment and employees' perceptions of empowerment. Through regression analysis and correlation between variables and using analysis of variance (ANOVA) and linear regression analysis to test hypotheses. For data analysis in this study, we used PLS with smart PLS version 3.2.7 and version 20. With Smart PLS, two steps were implemented, namely, the scaling model and the structural model.

Findings & Value added: The results of the analysis confirm that organizational commitment and organizational climate have a strong impact on the employee behaviour variable as well as other indicators within the organization under study. During the COVID-19 pandemic period, therefore, it is necessary to prepare policies that can enhance worker performance within the organization under study.

Keywords: public hospitals; environment; culture inside the institution; staff empowerment; organizational dedication

JEL Classification: D23; H83

1. Introduction

Organizational climate may be defined as the culmination of reasonable psychological climates, or people's assessments of their work surroundings. In addition, organizations in the modern world, which is experiencing a global financial crisis and operating in highly competitive environments like the COVID-19 pandemic, need to establish an organizational climate that supports them in achieving their goals with critical efficiency. They can also strengthen their competitiveness by introducing novel and imaginative ideas into their operations and by continuously updating and improving them to deliver the best and fastest services.

Since the 1930s, the connection between management and employees has also attracted increasing attention from the corporate and academic communities. One major topic in the literature on organizational behavior is how workers' opinions regarding their company are influenced by their work environment (Gunlu et al., 2010). Employee conduct in firms is influenced by both their personal traits and the workplace culture. The organizational behavior literature has addressed organizational climate as a crucial component of comprehending employee behavior connected to the workplace (Katou and Budhwar, 2010).

Thus, this study's objective was to evaluate the relationship among health care professionals employed at Hospital of KETTAR in Algeria between organizational climate (Meyer and Allen, 1991), organizational commitment, and employee empowerment (Stringer and Didham, 2011). It also sought to identify the nature of the relationship between dependent and independent variables that is empowering workers (independent variable), regarding organizational commitment (dependent variable 2) and climate (dependent variable 1).

In light of the aforementioned and within the parameters of the conversation, the following formulation of the study's problem might be used. Using the Kettar Public Hospital in Algeria as a case study, this study aims to investigate the relationship between organizational environment and organizational commitment and how it influences workers' behavior in terms of empowerment during the COVID-19 epidemic. To answer the problem formulated in the study, we formulated the following hypotheses:

H1: There is a positive relationship between employee empowerment and organizational climate.

H2: There is a positive relationship between employee empowerment and organizational commitment.

H3: Employee empowerment is statistically significant in predicting the organizational climate.

H4: Empowerment of employees is statistically significant in predicting organizational commitment.

Study's significance can be found in its attempt to investigate the relationship between organizational climate (Bamel et al., 2013), organizational commitment (Hayunintyas et al., 2018), and health care (Lu et al., 2016) workers' perceived empowerment. By adding empirical data regarding the impact of worker empowerment on commitment, the study will further the field's current understanding of this relationship. Health care workers' perspectives of the organizational (Hom et al., 2009) climate in Algerian public hospitals are used to analyze the organization. The link between these three ideas has been extensively studied in the past, but

this study adds to the body of knowledge by examining how worker empowerment affects organizational commitment and perceived organizational climate. are in contrast to the recent research reported in the literature.

Contemporary studies and intellectual trends in the study of organizational behaviour have been largely concerned with the organizational climate (Adiguzel and Okcu, 2021) as it includes all the prevailing variables in the work framework such as intellectual values, customs, cultural effects and material dimensions that mainly affect the organizational behaviour of individuals, groups and organizations (Alinejad et al., 2015).

While Besancon and Lubart (2008) emphasized that it is a set of laws, regulations, methods and policies that govern the behavior of individuals in a particular organization, and it also distinguishes the organization from other organizations that an organization enjoys a democratic and archaic climate as it is archaic and archaic. It is said with what is available in it (Bohorquez et al., 2020). They pointed out that the organizational climate is a set of characteristics that take care of the organization from other organizations, and these characteristics have the characteristic of relative stability in the organization's work environment, and these characteristics and characteristics of management policies and practices constitute the characteristics of it. in the organization (Lavian, 2012).

By reviewing the previous definitions, the organizational climate can be defined as a set of elements and distinctive characteristics of the organization that employees perceive through their interaction with organizational variables in the work environment and with other individuals. These characteristics have the ability to influence employees, by influencing their behaviors.

The importance of the organizational climate lies in the study of its concepts and dimensions, which act as a mediator between job satisfaction and organizational performance, and then achieving compatibility between the goals of the individual and the goals of the organization, as well as contributing to the success of the national economy, as well as contributing to the success of the national economy. Providing an appropriate organizational climate for it that will lead to an increase in the national product and national income (Olsson et al., 2019), and then the individual income, which achieves satisfaction and psychological stability and drives performance and creativity at work. On its impact on the reactions of workers, as it guarantees high productivity and job stability, as well as towards their work and the work of their colleagues and senior management (Aiswarya and Ramasundaram, 2012).

Arabaci (2010) defined it as a management strategy based on giving employees the power to act, take decisions, and actively participate in managing their organizations, solving their problems, creative thinking, and taking responsibility and control ().

There are those who see empowerment as representing the administrative strategy that is based on giving workers the power that enables them to participate in the management of the organization, and provides the opportunity for them to take the appropriate decisions required by the nature of their work (Ahmad et al., 2018).

There is a noticeable discrepancy among researchers about determining the dimensions of employee empowerment (Jing et al., 2011), and accordingly, the dimensions on which most of the book is unanimous have been chosen, and they are as follows (Albdour and Altarawneh, 2014): (i) communication and information sharing means the information needed to make decisions that managers obtain and keep because they do not trust employees, so it is considered one of the main dimensions because it contains participation, trust and information; (ii) team building is one of the strengths in the application of empowerment because of the important role of teamwork in facing problems and rationalizing the consumption of resources effectively and efficiently (Albrecht et al., 2018); (iii) the individual's awareness that he has an influence

on the decisions that are taken and the policies set by the organization, especially those related to his work, and this awareness or feeling does not come if the individual influences or controls less important matters in his work (Castro and Martins, 2010); (iv) material and moral incentives contribute to empowering workers by increasing their motivation, satisfaction, and job affiliation, especially when their needs are satisfied (Bakker et al., 2011); and (v) the organization should have the desire and ability to change the power structure in the organization, and encourage its employees to feel strong and successful, by giving them more freedom to act in everything related to their work (Berberoglu, 2018).

There have been many definitions that explain organizational commitment. As for the first to provide a definition of organizational commitment, Choi et al. (2005) looked at it from a psychological perspective and described it as an active and positive orientation towards the organization. As Wiener defined it as the inner feeling that pressures an individual to act in the manner in which the interests of the enterprise can be served. It is noted that there is clear agreement that the concept of commitment is embodied in three elements: (i) congruence between the individual and the organization with values and goals, (ii) strong desire to retain the individual's membership in the organization, and (iii) willingness to make an extra effort for the benefit of the organization to achieve its goals (Peng et al., 2014).

Dimensions of organizational commitment are as follows: (i) emotional (emotional) commitment refers to the worker's emotional connection, compatibility and integration with the organization (Ampofo, 2020) where we find that workers with high emotional commitment continue to work in the organization because they want to continue working because they agree with him (Bastug et al., 2016); (ii) continuity commitment (survival) refers to the individual's readiness to remain in the organization because of his indispensable personal investments (Celep and Yilmazturk, 2012), which are represented by working relationships with colleagues, retirement, and profession (Chen et al., 2015); and (iii) normative commitment is the last dimension of organizational commitment that expresses the moral and personal commitment to adhere to the values and objectives of the organization and is the result of being influenced by social, cultural and religious values (Cruz et al., 2014).

2. Methodology

Through this axis, we will try to present the results of the statistical analysis of the data in the questionnaire, by reviewing the characteristics and components of the sample and describing the study variables.

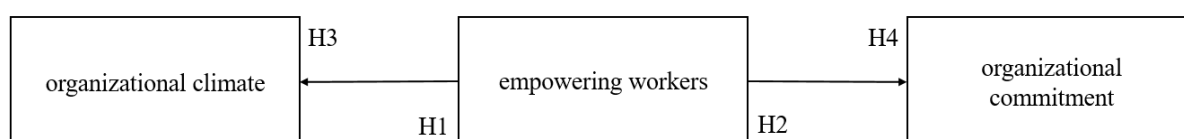
The deductive technique was utilized, along with its following instruments: theoretical description, explanation, and analysis of different ideas pertaining to organizational climate, worker empowerment, and organizational commitment; after which, the study area was examined. Using the questionnaire tool, the case was studied using the proper inductive technique. In addition to gathering, arranging, and evaluating data for a hypothesis test.

In order for the study to achieve its desired goals, we used the questionnaire as a tool for data collection, and the statistical program SPSS for analysis.

For data analysis in this study, we used PLS with smart PLS version 3.2.7 and version 20. With Smart PLS, two steps were implemented, namely, the scaling model and the structural model. The study used the information collected from the Kettar Public Hospital Algeria, the study sample consists of 300 health care employees who are currently working full-time at the Kettar Public Hospital Algeria for the year 2020. A simple random sampling method was used in order to select study participants. When calculating the minimum sample for respondents, which was required to represent the universe, a 90% confidence level and 5 confidence intervals

were taken into account for the total BGH healthcare workers, approximately 300 questionnaires were manually dispensed, and 300 were collected again. However, an inadequate answer was found to some of them, so they were left out of consideration. Finally, 300 feedback questionnaires were used with a response rate of 100%, and the reliability of the measurement tools was studied before moving on to the actual analysis to test the hypotheses. The minimum Cronbach's alpha level was above 0.7 for all instruments. Through the questionnaire data, we were able to know the distinctive characteristics of the study sample. Study model is shown in Figure 1, based on previous studies.

Figure 1: A putative model of the study



Source: compiled by author

3. Results and Discussion

It is noted from Table 1 that the majority of the study sample were female respondents (70%), and it was found that the majority of the sample were nurses (66.66%). Followed by the percentage of nurses, due to the fact that the emergency department requires the intervention of a larger number of patients, then followed by a large number of other health care employees such as pharmacists, radiology technicians and doctors. The age group of the questioned sample ranged between 31 and 50 (51.33%), due to the fact that most The employees in the hospital are young people, while at the level of the experience component more than five years, the highest percentage was (61.66%).

Table 1: Demographic data of respondents (N = 300)

Variables	Frequency	Percentage (%)
Gender		
Female	210	70
Male	90	30
Total		100
Age		
Between 20 and 30	65	21.66
Between 31 and 50	154	51.33
More than 50	81	27
Total		100
Profession		
Doctor/Practitioner	100	33.33
Nurse	200	66.66
Total		100
Tenure		
Less than 5 year	115	38.33
More than 5 year	185	61.66
Total		100

Source: compiled by author in SPSS

It is noted from Table 2 that all the items of the organizational climate have a high level, where the arithmetic averages ranged between (4.03-3.65), all the items of employee empowerment behaviour have a high level, where the arithmetic averages ranged between (3.92-3.21) where I took the paragraph that states the administration respects the opinions of employees about their work and does not work to change them in order to preserve their

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independence. The highest average, all the paragraphs of organizational commitment have a high level, as the arithmetic averages ranged between (3.91-2.91).

Table 2: Description of the analysis of the results

Indicators	Mean	Category
Organizational climate		
Management gives freedom of communication and exchange of information among employees in all departments.	3.12	High
The administration is keen on the effectiveness of the communication system to achieve information exchange and dissemination	3.65	High
Rewards are offered to employees who are creative, consistent with their initiatives and their quality.	3.32	High
Management considers mistakes as learning opportunities.	3.27	High
I contribute a great deal to decisions related to my career	3.60	High
Management believes in teamwork and team spirit in making decisions	23.32	High
The management believes in the mutual trust between it and the employees, which helps in outstanding performance.	3.38	High
Management has the ability to increase the enthusiasm of the employees and gain their support.	3.31	High
Management relates rewards proposal to employees with their outstanding performance.	3.78	High
The management takes into account the ideas and opinions that I present to improve the quality of the services provided	4.03	High
Empowering workers		
Get the information needed to get my work done at any time without any difficulty	3.64	High
The work environment is characterized by the provision of means, channels and methods that allow the flow of diverse and clear information.	3.52	High
Employees participate in clarifying and improving the available information about the work environment	2.65	High
Completing daily tasks is distributed to different work teams	3.41	High
I am highly committed to the tasks assigned to me when I work in a team	2.63	High
My relationship with my superiors is characterized by cooperation, trust and mutual respect	2.91	High
I feel completely free to choose the method that I think is right for my work	3.21	High
I have the opportunity to take any action to ensure that I do my job well	3.82	High
While the employees deal with the problems they face, they do not need to refer to the management except in certain cases.	3.41	High
The management respects the opinions of employees about their work and does not work to change them in order to preserve their independence	3.92	High
Organizational commitment		
The working atmosphere in the hospital makes me feel comfortable and stable	2.92	High
Take care of the hospital's reputation and future while doing my job	3.91	High
I am willing to stay in my current job even if another alternative opportunity arises	3.04	High
My values and principles match the work directed at me	3.51	High
There is cooperation between different interests in order to achieve the objectives of the institution	3.28	High
Feeling that the problems of this institution are your own problems	3.01	High
I feel proud to work in my workplace.	3.61	High
As a worker within the organization, I respect and abide by the working hours and times	3.81	High
Your organization deserves sincerity and commitment from you and your colleagues	3.71	High
Is your relationship with your boss affecting your commitment to the organization	3.09	High

Source: compiled by author in SPSS

The correlations were verified in order to discuss the hypothesized relationship between independent and dependent variables. When reviewing the relationships, it is possible to conclude that organizational climate is positively correlated with both organizational commitment and perceived empowerment (Table 2), and according to the correlation coefficients for organizational climate and empowerment of workers, these two concepts have a positive effect in the relationship, whose strength level was found to be moderate 0.318. Therefore, it is possible to accept that there is a positive relationship between organizational climate and employee empowerment, and therefore, this result supports the first hypothesis, when reviewing the correlation coefficient between employee empowerment and organizational commitment, it was found that the relationship is positive at a level of 0.576, it is possible to

accept that there is a positive relationship between employee empowerment and organizational commitment. Employees and organizational commitment for each form, and hypothesis 2 is supported by this result, and as a general result, it was concluded that employee empowerment has a positive linear relationship with the organization, as well as commitment and organizational climate perceived at a medium to high level in terms of correlation coefficients. After concluding that the relationship between the variables is linear, a normality test was also performed to find out the normal distribution before simple linear regression. As a result, it was found that both organizational commitment and organizational climate values have a normal distribution ($\text{sig. } 0.200 > 0.05$). In addition, control variables were included in the central relationships matrix in order to understand the relationships between demographic variables, organizational climate, organizational commitment and empowerment of workers.

According to the results of the correlation analysis, employee empowerment behaviour and age have a positive correlation at the level of significance of 0.05 (0.1616). This can be concluded because older employees tend to have higher levels of worker empowerment behaviour. The experience and organizational commitment variable has a positive correlation of 0.526 which means that as employees stay in the same organization for a longer period of time, their organizational commitment tends to increase. There is a positive but weak relationship between employee empowerment behaviour and duty 0.815, which can be interpreted as employees working in other jobs (e.g. pharmacists, pharmacy assistants, dieticians, radiology technicians, etc.) It was found that organizational climate has a negative and weak relationship with salary -0.222.

Table 3: Correlations between the control variables: employee empowerment, organizational commitment, and organizational climate

Variable	1	2	3	4	5	6	7	8	9
Organizational climate	1								
Empowering workers	0.318*	1							
Organizational commitment	0.576*	0.027*	1						
Gender	-0.022	0.046*	0.027*	1					
Age	0.459*	0.162*	-0.007	0.012	1				
Marital status	0.109*	-0.018	0.046**	0.056**	0.002	1			
Duty	0.063*	0.815	-0.018	0.018	-0.031	0.472	1		
Salary	-0.222	-0.015	-0.001	-0.015	0.019	0.358	0.431	1	
Experience	0.265*	0.265	0.526	0.065**	0.017	0.374	0.526	0.356	1

Source: compiled by author in SPSS

Since the study only adopted one independent variable and aims to find out the direct effect of employee empowerment behaviour on the dependent variables, a simple linear regression analysis was performed. Conducting a preliminary regression analysis to test the relationship between employee empowerment and organizational climate in El-Kettar Public Hospital in Algeria, it was found that employee empowerment had no statistical significance in predicting organizational climate ($0.000 < 0.05$), therefore, hypothesis 3 was supported (Table 4).

Table 4: Organizational climate for simple linear regression and organizational commitment

	B	Std. Error	Beta	t	Sig.
Constant	0.965	0.214		5.654	0.000
Empowering workers	0.654	0.132	0.325	9.754	0.000

Source: compiled by author in SPSS

Moreover, as a result of regression analysis, it is possible to predict organizational commitment to organizational climate with the following equation:

$$OR = 0.965 + 0.654 \cdot EF \quad (1)$$

where OR is the organizational climate
 EF is the empowerment of two factors

The predictive power of the regression equation was found to be 0.364 which means that 36.4% of the organizational climate variance can be predicted by employee empowerment behaviour continuously, a second linear regression analysis was performed in order to evaluate the relationship between employee empowerment and organizational commitment for each form. It was found that the employee empowerment behaviour was statistically significant in predicting perceived organizational commitment ($0.000 < 0.05$), and the fourth hypothesis was accepted.

Table 5: Simple linear regression of employee empowerment behaviour and perceived organizational commitment

	B	Std. Error	Beta	t	Sig.
Constant	0.543	0.342		1.765	0.000
Empowering workers	0.732	0.043	0.723	12.432	0.000

Source: compiled by author in SPSS

As a result of the regression analysis, it is possible to predict organizational commitment perceived by employee empowerment behaviour with the equation as follows:

$$OC = 0.543 + 0.732 \cdot EE \quad (2)$$

where OC is the organizational commitment
 EE is the empowerment of employees

The predictive power of the regression equation was found to be 0.654 which means that 65.4% of the perceived organizational commitment variance could be predicted by the empowering behaviour of the workers as a result of the regression analysis.

It is also appropriate to compare this model with similar research conducted by other authors. Celep and Yilmazturk (2012) indicated that employees view their organization's organizational climate as being at an average level. The mean values of the organizational climate components ranged from a low of 3.38 to a high of 3.77 on a 5-point Likert scale. Commitment to continuity appears to be the lowest among the three components of the organizational commitment construct, with a mean of 3.22. In terms of correlations between variables, the results indicated that there is no correlation between commitment to continuity and organizational design, teamwork, and decision-making. All other variables show significant positive correlations. In general, the results of her study indicated that there is a need to improve the current situation at ABC Company with regard to all components of the organizational climate and organizational commitment.

Albdour and Altarawneh (2014) indicated that there is a positive and significant relationship between organizational commitment and organizational climate ($r = 0.269$, $p = 0.01$). There is also a significant positive relationship between organizational climate avoidance and affective commitment ($r = 0.208$, $p = 0.049$) and between production focus and normative and continuity commitment ($r = 0.308$, $p = 0.003$).

Improving organizational climate can be a valuable strategy for improving organizational commitment. Berberoglu (2018) showed that organizational climate is significantly related to organizational commitment and perceived organizational performance. The results of simple linear regression indicated that organizational climate is important in predicting organizational

commitment and perceived organizational performance. There is a positive and linear relationship between organizational climate, organizational commitment and perceived organizational performance. The results of regression analysis indicated that organizational climate has an impact on predicting organizational commitment and perceived organizational performance of employees in public hospitals in North Cyprus. It was found that organizational climate has statistical significance in determining employees' organizational commitment. The results of the study presented some important issues regarding the relationship between the three concepts in the study. According to the results, if the employees' organizational climate scores are high, the employees' organizational commitment scores are high at the same time. In other words, if employees in public hospitals in North Cyprus view the organizational climate in a positive way, they will have higher levels of organizational commitment. The results indicated that organizational climate is an important factor in health care settings in terms of employee commitment and how employees perceive organizational performance, which would lead to important findings about service delivery in health care organizations.

Berberoglu (2018) focused to develop a conceptual model to determine the relationship between organizational climate and organizational commitment among employees of Maku Free Zone, Maku-West Azerbaijan. Data were collected among 210 Macau Free Zone employees selected by simple random sampling method. They used SPSS and LISREL statistical programs for analysis. The results of testing the research hypotheses in structural equation modelling showed that organizational climate and organizational commitment have a positive effect on service recovery. Moreover, proper use of organizational climate and organizational commitment guides the organization towards more appropriate service recovery.

The organizational climate of employees was in the study by Bamel et al. (2013) medium and high, and the average degree of organizational commitment of employees was 66.11 ± 16.35 . The highest amount of employee burnout was associated with low level (66%). Organizational climate among employees leads to greater organizational commitment ($r = 0.472$, $P < 0.001$), and greater organizational climate and commitment contribute significantly to reduced job burnout ($r = -0.227$, $P < 0.001$; $r = -0.335$, $P < 0.001$).

According to the results, if the managers of these representatives paid more attention to the importance of the services of health care personnel and workforce working in this organization, they could improve the organizational commitment of health care workers and prevent their burnout, in order to maximize the quality of service delivery.

Lu et al. (2016) examined the impact of organizational climate on employees' individual work performance. To deepen understanding of the study concepts, the literature was reviewed. The study used descriptive evaluation and correlational research design, and used descriptive and inferential statistics to analyse the data. The population included all employees of Divine Word College in Laoag, and hence a total census was applied. The study found that all dimensions of the organizational climate were high, but not very high, and the same was true for individual work performance. Analysis of variance showed a significant relationship between organizational climate and individual work performance.

4. Conclusions

The study's findings gave information about Algeria's El-KETTAR Public Hospital, which was the subject of the investigation. Regression analysis results showed that employee empowerment behaviour affects employee perceptions of the organizational atmosphere and organizational commitment in Algerian public hospitals. The organizational atmosphere of employees was shown to be statistically significant to be positively and linearly correlated with

employee empowerment behaviour. This suggests that employees' organizational environment scores are high and their empowerment scores are high simultaneously, based on the relationship between these two factors. Stated differently, stronger organizational climates exist in public hospitals in Algeria if staff members see employee empowerment behaviour favourably.

Similarly, organizational commitment can be predicted by employee empowerment behaviour, indicating that employees can effectively enforce organizational commitment. This means that when employees perceive a supportive and encouraging work environment, they are more likely to perceive organizational commitment overall. Consequently, to achieve high levels of organizational commitment in a hospital, decision-makers must comprehend and enhance the organizational climate's constituent elements as well as the dimensions of employee empowerment behaviour.

To increase workers' organizational commitment and enhance their impression of it, it is critical to establish a trusting atmosphere that includes positive connections with supervisors.

Supervisors and employees should have open communication and provide feedback and assistance as required. Additionally, independence is a crucial component where employees take full responsibility for their work and can take initiative. At this point, decision makers will find the practice of participatory management useful as it shares power with employees, enabling them to take on more responsibilities, which will increase their commitment and perceptions. Work teams can also be adopted to improve the work environment by reducing conflict and fostering a warm and cooperative atmosphere.

It's also crucial that workers experience equity and justice in the awards system. In order to foster a happy work environment, managers must both provide incentives to their staff and oversee how they are distributed. This is because an employee's sense of unfairness may have the opposite impact.

Enhancing work standards is also crucial for fostering a culture of change and motivating medical staff in trying times, like the Covid-19 crisis. This will enable decision-makers to restructure public hospitals into more automated systems with flexibility and centralization.

Author contributions: All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding: This research received no external funding.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflict of interest.

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WHAT AFFECTS GUEST LOYALTY IN SOUTHWESTERN BULGARIA: SOME INSIGHTS FOR HOSPITALITY MANAGEMENT

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Cite as: Yonov, I. Y. (2024). *What Affects Guest Loyalty in Southwestern Bulgaria: Some Insights for Hospitality Management*, *Ekonomicko-manazerske spektrum*, 18(1), 79-89.

Available at: dx.doi.org/10.26552/ems.2024.1.79-89

Received: 27 February 2024; Received in revised form: 15 April 2024; Accepted: 28 May 2024; Available online: 30 June 2024

Abstract:

Research background: The implementation of a customer relationship management approach within the hotel industry yields interdependent benefits including enhanced guest satisfaction, reinforced guest loyalty, and a deeper comprehension of guests and their needs and expectations. Essential for the success of a hotel complex is the identification of factors influencing guest satisfaction and loyalty.

Purpose of the article: The primary objective of this study is to ascertain these factors to augment hotel guests' satisfaction, thereby fostering their loyalty. In investigating hotel guest loyalty, two methods were employed, each instrumental in yielding distinct outcomes. The theoretical method entailed an examination of scientific literature elucidating the evolution and significance of the subject matter. Conversely, the empirical method facilitated the acquisition of requisite data for the analysis, assessment, and enhancement of hotel guest loyalty.

Methods: To achieve the objectives of this research, a survey methodology was employed involving a sample of 187 hotel guests in the region of Blagoevgrad, southwestern Bulgaria, comprising both Bulgarian and foreign tourists who voluntarily participated in the study conducted in the period December 2023 - February 2024. The regional level of research ensured an ample number of hotels and hotel guests that were required for the study.

Findings & Value added: The long-term success of a hotel establishment in the marketplace is primarily contingent upon its ability to expand and maintain a substantial number of loyal guests. Therefore, hotels must continually endeavour to cultivate and sustain the loyalty of its guests. The study delineated a set of indicators crucial for guest satisfaction and, consequently, loyalty, including hotel location, food quality, room comfort, hotel hygiene, staff competence, and value for money.

Keywords: guest satisfaction; guest loyalty; hospitality enterprise

JEL Classification: Z310

1. Introduction

Critical to the success of hospitality management is the rigorous examination of factors influencing guest satisfaction and loyalty. The primary aim of this investigation is to identify

these influential factors with the goal of elevating hotel guest satisfaction and thereby cultivating guest loyalty. In exploring hotel guest loyalty, two distinct methods were employed, each contributing unique insights. The theoretical approach involved a review of scholarly literature detailing the evolution and significance of the subject matter. In contrast, the empirical approach facilitated the collection of necessary data to analyse, evaluate, and enhance hotel guest loyalty. To fulfil the research objectives, a survey methodology was utilized, engaging a sample of 187 hotel guests in the Blagoevgrad region of southwestern Bulgaria, encompassing both Bulgarian and international tourists who voluntarily participated in the study conducted from December 2023 to February 2024. This regional focus ensured access to a sufficient number of hotels and hotel guests essential for the study's scope and depth.

The enduring viability of a hotel enterprise within the market hinges predominantly on its capacity to broaden and uphold a significant per cent of loyal guests. Consequently, hotels must consistently strive to nurture and uphold guest loyalty. The current study elucidated a series of key indicators essential for guest satisfaction and, consequently, loyalty, encompassing hotel location, food quality, room comfort, hotel hygiene, staff competence, and perceived value for money.

This paper is organized into the following sections: Chapter 1 delves into the research background highlighting its significance and practical implications. Chapter 2 provides a comprehensive overview of the individual research methodology steps including the identification of the main research goal, participants, level of study, indicators (factors), methods, and results. Chapter 3 conducts a thorough analysis and evaluation of hotel guest loyalty based on the collected empirical data. Chapter 4 discusses the main research results. Finally, Chapter 5 presents the main findings and conclusions of the study and also outlines some research limitations.

2. Literature Review

The main aim of a hospitality enterprise is to cultivate enduring relationships with its most loyal guests, thereby securing their preference and indispensability. Achieving this objective necessitates a keen focus on understanding and catering to the individual needs and preferences of each guest. By offering personalized products and services tailored to meet these specific requirements, the foundation for long-lasting guest relationships is established and sustained (Vandermerwe, 2004).

In contemporary business paradigms, effective guest care is intrinsically linked to the well-being of employees. Ensuring professional conduct among staff members directed towards hotel guests entails providing an optimal work environment equipped with modern technology and communication tools, alongside diligent monitoring of guest satisfaction levels (Mechinda and Patterson, 2011). The optimization of customer relationship management (CRM) endeavours hinges upon the adept utilization of cutting-edge information technologies. Leveraging technology-driven CRM methodologies enables enterprises to deliver bespoke offerings to their clientele.

At the core of guest awareness management lies the formulation of a comprehensive CRM strategy rooted in well-gathered guest insights. These insights, gleaned through interactions between service personnel and guests across various touch points within the hospitality enterprise, are invaluable for enhancing guest satisfaction and happiness. Effective dissemination and utilization of this accumulated information across all facets of the hospitality enterprise are imperative for nurturing stronger guest relationships, ultimately leading to a positive impact on hotel performance (Brohman et al., 2003).

Technology-driven CRM systems serve as indispensable tools for hospitality businesses to provide customized products and services. Information technology's inherent guest-centricity empowers enterprises to orchestrate and execute successful marketing activities geared towards long-term guest retention (Roberts et al., 2005).

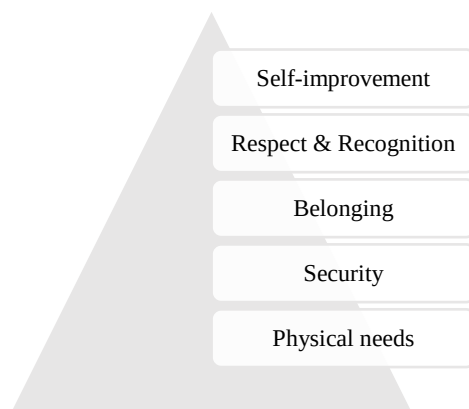
Employing a CRM-centric approach in customer relationship management yields numerous benefits, including heightened guest satisfaction, reinforced guest loyalty, and a deeper understanding of guests and their needs and expectations.

A prominent contemporary trend underscores the capacity of corporate social responsibility (CSR) performance to augment hotel guest loyalty. Within this trend, the effectiveness of CSR initiatives across its three distinct domains manifests varying degrees of influence on guest behavioural loyalty. Empirical investigations by Liu et al. (2019) underscore the mediating roles played by brand image and guest trust in explicating the link between CSR performance and guest loyalty. These findings are corroborated by Latif et al. (2020), who affirm a positive correlation between CSR engagement and guest loyalty, with satisfaction and brand image serving as notable mediators within the CSR-loyalty nexus. Prochazkova and Micak (2023) found out that if a woman held the position of CEO within an enterprise, it is more likely that the enterprise would engage in some form of corporate social responsibility.

Moreover, other pertinent factors such as customer brand identification, trust, commitment, and satisfaction are recognized as pivotal determinants of loyalty. Noteworthy among these is the favourable impact of brand identification on guest trust, commitment, and satisfaction. Consonant with these insights, Rather and Hollebeek (2019) ascertain that satisfaction exerts the most pronounced influence in nurturing commitment, trust, and ultimately, loyalty among guests. A hotel brand is considered successful when 20% of the target group consumes the product or service regularly (Baykov, 2013).

The classification and guidance of basic and additional services offered by hospitality enterprises can be informed by Maslow's theory of the hierarchy of consumer needs within the hospitality industry.

Figure 1: Maslow's pyramid



Source: Maslow (1943)

The paramount importance of addressing guests' physiological needs, such as sleep and sustenance, underscores the foundational role these requirements play in shaping the basic and supplementary services offered within the hotel industry. Following closely is the imperative of security, encompassing measures aimed at assuring guests' safety and peace of mind, including provisions for safeguarding personal belongings and implementing comprehensive security systems such as fire safety, food safety, and video surveillance. Meeting a need entails

seeking a pathway to reach balance. This pathway can involve various factors used to address the imbalance, which is predominantly related to a lack of security (Avilov, 2021).

Next in line is the intrinsic need for belonging, manifested primarily through avenues for communication with both hotel staff and fellow guests, fostering a sense of community within the hotel complex. Subsequently, the necessity for respect and recognition emerges, often realized through thoughtful gestures and amenities that afford each guest a sense of individuality, such as personalized gifts, participation in loyalty programs, and dining discounts.

Additionally, addressing the need for self-improvement represents a niche service offering within the hospitality landscape, albeit one that holds potential for differentiation. While relatively uncommon, certain hotels provide opportunities for guests to engage in group sports, musical events, and cultural excursions, thereby facilitating personal growth and enrichment during their stay.

In an era marked by intense competition, the retention of guests necessitates innovative approaches aimed at surpassing their expectations with unique offers and services. As emphasized by Kusumawati and Rahayu (2020), the delivery of a quality experience significantly influences guest perceived value, satisfaction, and loyalty. Moreover, the implementation of loyalty programs plays a pivotal role in fostering enduring guest-brand relationships, as confirmed by the findings of Shin et al. (2020).

3. Methodology

In hotel industry, guest satisfaction and loyalty are widely recognized as pivotal drivers of success and profitability. The paramount importance of ensuring guests' satisfaction cannot be overstated, as it directly correlates with the overall performance and viability of a business enterprise.

The analysis and evaluation of guest loyalty within the realm of the hospitality sector necessitates adherence to a systematic algorithm and methodology. The *initial phase* of this algorithm pertains to the formulation of the main research objective. The study primary aim is to determine the factors for increasing hotel guests' satisfaction, hence their loyalty.

Subsequently, the *second phase* entails the delineation of the research participants. This involves delineating the social entities engaged in the research, specifically the guests of 3*, 4* and 5* hotels. The selection of the target group of respondents considers the principles of relevance, cognizance, and accessibility of the information source.

Upon the identification of research participants, the determination of the research scope ensues, which is the *third phase* of the research algorithm. In investigating guest loyalty within the hotel sector, a regional-level approach was adopted as it ensures a substantial number of hotels and hotel guests, which guarantees the representativeness of the study. The present investigation comprises hotels from the region of Blagoevgrad, which belongs to the Southwestern district of planning. The choice of this region was determined by the fact that it is a centre for the development of various types of tourism - spa and wellness tourism, mountain tourism, respectively winter ski tourism, ecotourism, cultural and educational tourism and more due to the presence of favourable natural conditions. Moreover, the geographical proximity of the hotel facilitates cost-effectiveness and enhances accessibility to the information source during research implementation. Data from the National Statistical Institute for the year 2023 indicate that the number of accommodation places in the Blagoevgrad region is 259. According to data from the electronic directory of hotels in Bulgaria for the year 2023, the number of hotel

establishments in the Blagoevgrad region is 120, of which 83 are three-, four- and five-star hotels.

The *fourth phase* of the research pertains to the identification of indicators of guest loyalty within the hospitality industry. The current research uses the set of loyalty measurement indicators elaborated and proposed by Kurkina (2008). This phase also corresponds to one of the foremost challenges in formulating the questionnaire for the present study. The indicators utilized to gauge hotel guest loyalty, albeit comprehensive, do not exhaust all possibilities. Their selection is guided and constrained by the research objectives. The framework of indicators should be regarded as dynamic and amenable to expansion and refinement.

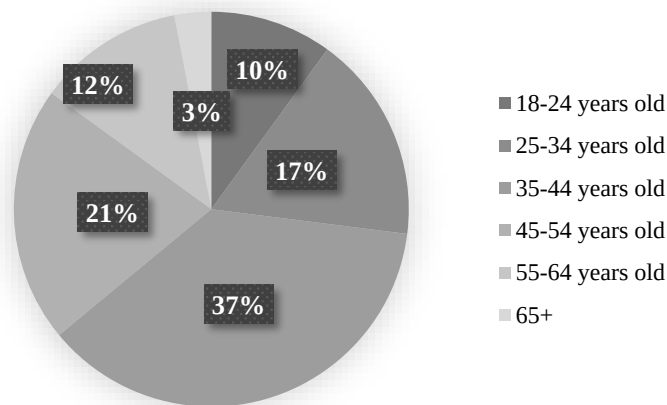
The *subsequent research phase* holds paramount significance for the attainment of accurate, veritable, and contemporary information, crucial for the success of the final outcome. The selection of methods for measuring guest loyalty indicators within the hospitality industry constitutes a multifaceted and weighty endeavour. Within the investigation of hotel guest loyalty, two approaches were deployed, each instrumental in yielding distinct outcomes. The theoretical approach encompasses an examination of scientific literature elucidating the evolution and significance of the subject matter as well as the method of induction in which, through the regional example of these hotels, conclusions can be drawn about guest loyalty in the hotel industry on a national scale. Conversely, the empirical approach facilitates the acquisition of requisite data for the analysis, assessment, and enhancement of hotel guest loyalty. To fulfil the objectives of this research, a survey methodology was employed, encompassing a sample of 187 guests at 3*, 4* and 5* hotels in the region of Blagoevgrad, comprising both Bulgarian and foreign tourists who voluntarily participated in the study held in December 2023 - February 2024. The questionnaires devised for this purpose adhere to principles of clarity and accessibility, incorporating a blend of quantitative and qualitative assessments of the pertinent indicators. The survey method entails the analysis and evaluation of data garnered through survey instruments comprising responses to predetermined queries, part of which were obtained in written form on-site at the hotel and others were completed online. Some queries are structured as closed-ended questions while others solicit evaluations pertaining to the quality of products and services rendered by the hotel offering respondents the options of „Poor,“ „Good,“ or „Excellent.“ Additionally, a subset of questions permits participants to rate their satisfaction on a numerical scale ranging from 1 to 10. The selection of a 10-point rating scale was predicated on its ease of comprehension and completion by respondents, pivotal for the accuracy of responses and the validity of findings.

Subsequently, the *final phase* involving the analysis and evaluation of hotel guest loyalty is carried out on the basis of the literature review on the subject and the empirical data procured. Microsoft Excel serves as the tool for data manipulation facilitating the computation of the proportionate representation of respondents opting for specific qualitative categories as well as specific quantitative assessment given for each indicator evaluated by a 10-point rating scale. Drawing from the synthesized outcomes of the analysis and evaluation of hotel guest loyalty, significant factors contributing to the enhancement of the guest loyalty level are specified.

4. Results

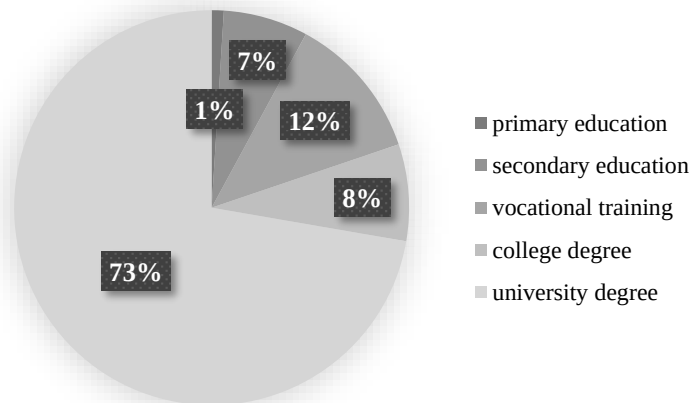
The survey respondents profile was summarized using two fundamental questions about their age and education. While the age distribution among respondents appeared relatively balanced, the distribution of educational backgrounds showed a consistent trend with a predominance of individuals with university degrees indicating a less even spread across categories.

Figure 2: Respondents age structure



Source: author's calculations

Figure 3: Respondents educational background



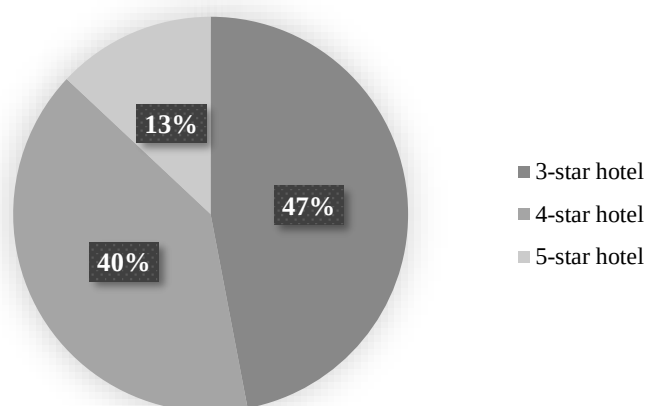
Source: author's calculations

The survey included guests from three-, four-, and five-star hotels, with three-star hotels comprising the largest proportion at 47%, followed by four-star hotels at 40%, and five-star hotels from the Blagoevgrad region at 13%, having the smallest share. By incorporating hotels from various categories, the study aimed to examine potential correlations between hotel ratings and guest loyalty levels. However, the research concluded that guest loyalty is not solely influenced by hotel category; other factors play a more substantial role in determining guest satisfaction and loyalty.

With regards to the choice of hotel, the leading factor turns out to be the location, followed by the value for money, and the rest of the respondents indicated „other“, for example, they mentioned the good hotel superstructure, the clean mountain air, friendly staff, good food, clean rooms, etc.

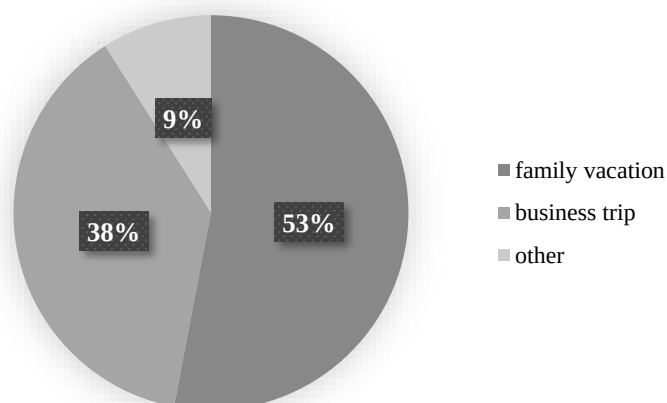
Regarding the frequency of hotel visits, a significant majority of respondents comprising a total of 64%, reported that it was not their first visit. The predominant purpose identified by surveyed participants for their hotel visit was „family vacation“, as indicated by 53% of responses, followed by 38% who cited „business trip“, with the remaining 9% selecting the category of „other“.

Figure 4: Relative share of hotels included in the study



Source: author's calculations

Figure 5: Purpose of guest stay

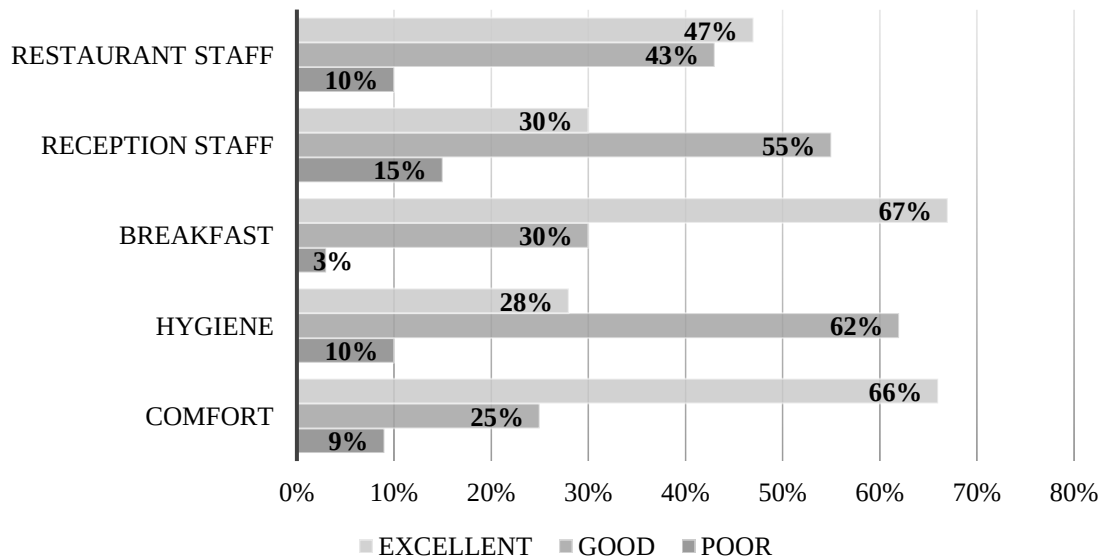


Source: author's calculations

Regarding the level of room comfort, the majority of respondents, constituting 66%, appraised it as „excellent“, while 25% deemed it as „good“, with a mere 9% expressing dissatisfaction with this aspect. Responses to queries concerning the cleanliness of rooms and hotel communal areas mirrored those regarding room comfort, with 62% of participants rating it as „good“, 28% as „excellent“, and 10% expressing dissatisfaction. In terms of breakfast quality, a significant proportion of respondents, totalling 67%, rated it as „excellent“, while 30% considered it „good“, and only 3% perceived it as poor. In relation to the reception service staff, 55% of respondents rated their experience as „good“, 30% as „excellent“, and 15% expressed dissatisfaction by selecting „poor“. Similarly, the evaluation of restaurant service staff indicated that 47% of respondents found them „excellent“, 43% rated them as „good“, and 10% expressed dissatisfaction by rating their service as „poor“.

The vast majority, constituting 68% of respondents, assessed the total quality of hotel products and services as „good“, while 28% deemed them „excellent.“ Only 4% of respondents regarded the total quality of hotel products and services as „poor.“ Regarding the overall guest experience at hotel establishments in the region of Blagoevgrad, 59% of respondents reported their experience as „good“, with 38% rating it as „excellent.“ Merely 3% of guests expressed dissatisfaction with their stay and had negative associations with their hotel stay.

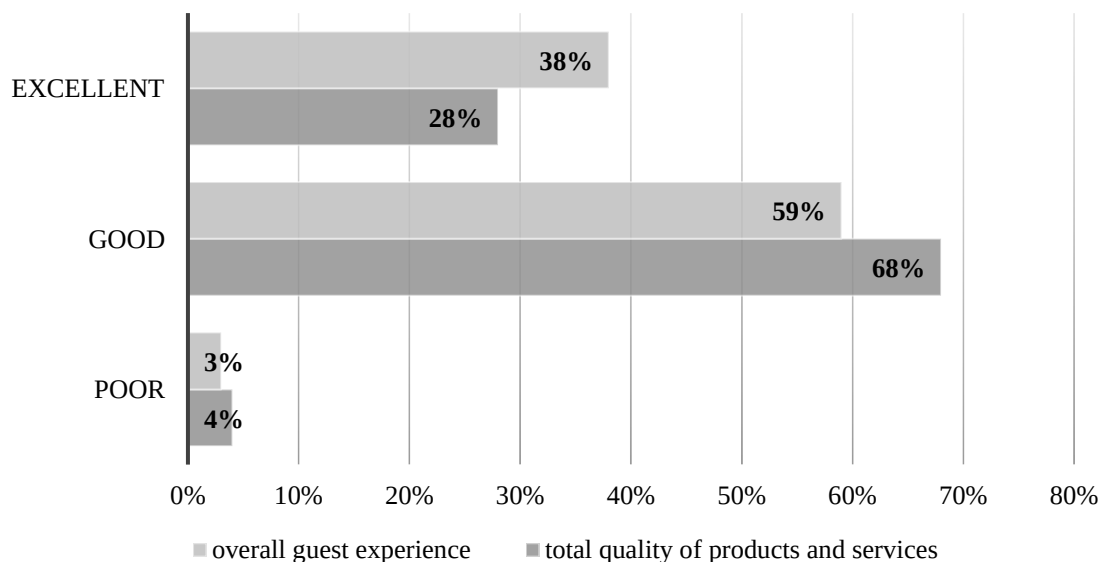
Figure 6: Quality evaluation of services



Source: author's calculations

The generalized evaluation of guest experience showed explicitly that a prevailing per cent of hotel guests were highly satisfied with the quality of hotel products and services and consequently had a memorable experience to take home and share with relatives and friends. This sounds very promising in terms of return visits and frequent stays that is expected to convert into guest loyalty.

Figure 7: Generalized evaluation of guest experience

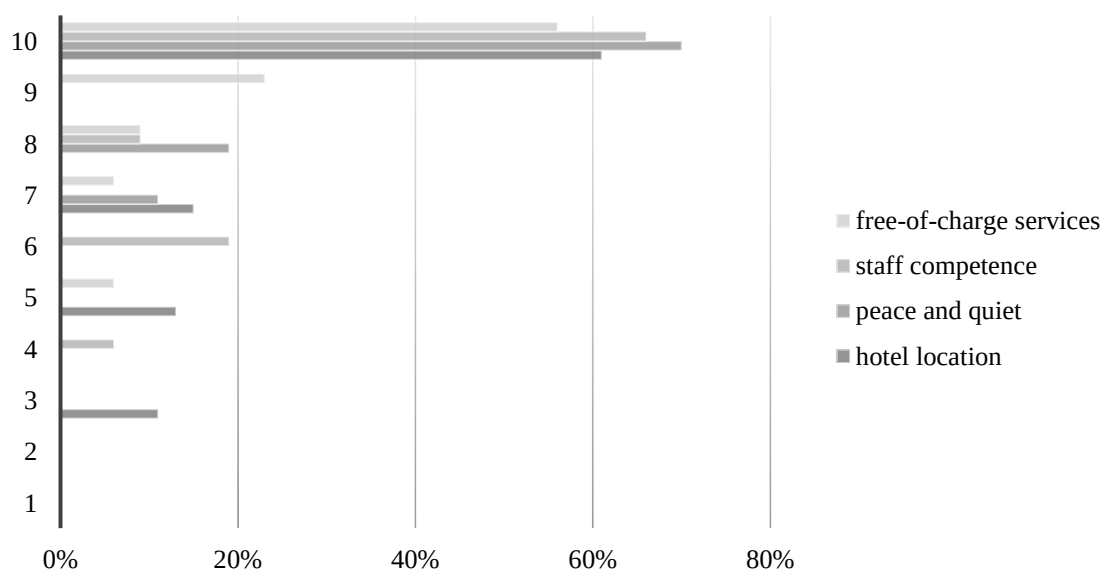


Source: author's calculations

In terms of pricing, the survey highlights that 43% of respondents perceived the prices as „high“, while 38% deemed them „fair“ in relation to quality. Conversely, 19% regarded the prices as „low“. Concerning the competence of hotel staff, an overwhelming 83% of guests

affirmed that the staff members possessed the necessary professional skills for their respective jobs. Meanwhile, 9% expressed doubts, and 8% were unsure. Guest satisfaction and pleasure are the secure precondition for guest loyalty and positive word-of-mouth. In relation to four basic indicators – free-of-charge services, staff competence, peaceful ambience and hotel location, guests expressed a great satisfaction and provided a very high evaluation by a 10-point rating scale, which is very clearly portrayed in the next figure. A prevailing per cent of hotel guests marked the maximum 10-grade for each of the four indicators.

Figure 8: Evaluation of basic indicators by a 10-point rating scale



Source: author's calculations

When asked whether they would make a return visit, the majority of respondents - 91% - were satisfied and would return to the hotel and only 9% were disappointed and would not visit the hotel again. As for the question if they would recommend the hotel to their friends and relatives, the majority of surveyed guests who were satisfied with their stay – 81% would recommend the hotel, and the remaining small portion of 19% would not recommend the hotel to their close friends and relatives. The results for these two indicators – repeat visit and recommendation, clearly show a consistent trend of prospective guest loyalty.

5. Discussion

Guest loyalty in hospitality industry is not solely dictated by the hotel category; rather, several other factors exert a more significant influence on guest satisfaction and loyalty. When selecting a hotel, the foremost determinant is its location, followed closely by perceived value-for-money and the overall quality of the hotel infrastructure, including factors like clean mountain air, friendly staff, good food offerings, and well-maintained rooms.

In the region of southwestern Bulgaria, the primary purpose for hotel visits appears to be family vacations, followed by business trips and other leisure activities. Accordingly, hotel guests emphasize the importance of excellent room comfort and a high standard of hotel hygiene and cleanliness.

Another increasingly vital aspect contributing to guest satisfaction is the quality of food provided. Guests derive pleasure and satisfaction from organic, healthy, and well-presented

meals. Addressing diverse dietary preferences is undeniably crucial for enhancing guest satisfaction.

An aspect that leaves a lasting impression on guests and significantly influences their overall experience is the level of service provided. The professionalism and demeanour of the service staff across all hotel departments greatly impact guest satisfaction and subsequently influence guest loyalty. Therefore, employing staff based on their talent and professional competence is imperative for the success of a hotel business.

Guests' feedback underscores that personalized service remains a strong competitive advantage regardless of a hotel's luxury status. Guests' degree of satisfaction is heavily dependent on the quality of hotel products and services, as well as the memorable experiences they take home and share with others, which in turn fosters repeat visits and guest loyalty.

Undoubtedly, the value-for-money proposition significantly influences guest decisions and subsequent satisfaction. A product or service that provides perceived value is more likely to be recommended and repurchased. Consumers are willing to pay premium prices for products that meet or exceed their expectations and align with their values, establishing an emotional connection that leads to customer loyalty.

Guest satisfaction and delight serve as essential prerequisites for consumer loyalty and positive word-of-mouth promotion. Satisfaction can be gauged across various indicators, including complimentary services, staff competence, hotel facilities, ambiance, location, and food quality. A consistent trend towards prospective guest loyalty is evidenced by metrics such as repeat visits and positive recommendations via word-of-mouth.

6. Conclusions

As it has become clear, most of the marketing literature recognizes guest satisfaction as an important antecedent of brand loyalty. A high level of guest satisfaction has many benefits for the brand, such as increased consumer loyalty, good reputation, reduced price elasticity, positive word-of-mouth and many other advantages. Brand loyalty can provide significant benefits for both consumers and businesses. Guest loyalty is an expression of satisfied, even exceeded, guest expectations. Guest satisfaction plays a critical role in repeat purchase and future loyalty.

The survey results show that guest satisfaction significantly affects their loyalty. The guests' perception of the fair price is an important construct building their satisfaction. It is equally important that consumers of hotel services are satisfied, both with the good staff attitude in each hotel unit, and with the offered basic hotel services including food and accommodation, room cleanliness, hotel location, etc. Ancillary available services are also significant as well as their quality. A hotel long-term success in the marketplace is primarily determined by its ability to expand and maintain a large number of loyal guests. Therefore, hotels must constantly strive to develop and maintain the loyalty of their guests.

The hotels in the Blagoevgrad region boast a great volume – 64%, of reported multiple stays, i.e. repeat visits, for what this region with its hotels served a proper object of research on guest loyalty. The study outlined the set of indicators, which are of crucial importance for guest satisfaction, hence loyalty. These are hotel location, food quality, room comfort, hotel hygiene, staff competence, and value for money and more.

The study constraints stem from the finite set of indicators employed to measure hotel guest loyalty. The scope of evaluation metrics can be expanded offering a foundation for future investigations in this area. Another research limitation was related to the short time span during

which the survey was performed. It is recommended that future research be done at a longer time period (more than three months), hence a larger sample size.

Author contributions: All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding: This research received no external funding.

Data Availability Statement: The data presented in this study are primary data gathered through a questionnaire survey among hotel guests and secondary data withdrawn from the National Statistical Institute in Bulgaria as well as the Electronic Directory of Hotel in Bulgaria.

Conflicts of Interest: The authors declare no conflict of interest.

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ECONOMIC IMPLICATIONS OF DEEP MACHINE LEARNING FOR TOURISM TIME SERIES FORECAST

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Cite as: Vasenska, I. P. (2024). *Economic implications of deep machine learning for tourism time series forecasting*, *Ekonomicko-manazerske spektrum*, 18(1), 90-101.

Available at: dx.doi.org/10.26552/ems.2024.1.90-101

Received: 10 March 2024; Received in revised form: 19 May 2024; Accepted: 6 June 2024; Available online: 30 June 2024

Abstract:

Research background: Predicting the flow of inbound tourism accurately has always posed a significant challenge for all parties involved in the industry. The complex nature of the tourism product, which is directly and indirectly affected by various risks, disasters, and crises, further highlights its susceptibility to disruptions and fluctuations. As a result, there has been a growing interest in forecasting inbound tourism flows using contemporary data science methods and artificial neural network (ANN) methods. This paper, therefore, seeks to explore the AI forecasting techniques by employing a deep machine learning (DML) approach and comparing various Python libraries for time series forecasting within a Jupyter Notebook computing environment. The data from domestic and international tourism stays registered in Bulgaria for the period 2002 to 2023 has been utilized to construct an advanced deep neural network using multiple Python libraries.

Purpose of the article: The purpose of the current paper is to establish which time series forecasting model - Exponential Smoothing, TBATS, Auto ARIMA, Theta or LSTM has better accuracy estimation and may be applied for similar tasks in the future by for research and practical economic purposes.

Methods: The applied methodology was based on the classical scientific method. As to the main findings they could help in daily operation planning, managing and relocating resources in tourism on micro and macro level as well as with insights on the drawbacks and limitations on this research area related to analysis and novelty implications.

Findings & Value added: What is more, the results obtained reaffirmed that ANN can be applied for an accurate forecasting, especially in the case of Bulgaria, where such models have not been applied yet neither by the tourism related academics nor by the business and the policymakers.

Keywords: Bulgaria tourism flows; timeseries forecast; artificial neural network; method accuracy

JEL Classification: C22; C45; Y1; Z32

1. Introduction

Deep machine learning (DML), a subset of artificial intelligence and a specialized field within machine learning (ML), utilizes highly sophisticated artificial neural network (ANN) structures. These structures find applications in various domains such as computer vision, speech recognition, and natural language processing domain (Goodfellow et al., 2016; Geron, 2017). ANNs are complex models that employ network architectures akin to the biological neural networks (NN) used by the human brain, consisting of numerous interconnected processing layers. These models emulate the operational principles of the brain. Specifically, when the brain encounters new information, it seeks to relate it to pre-existing knowledge to comprehend it. Consequently, the brain deciphers the information by labelling and categorizing the elements, a process that deep machine learning models replicate for training purposes

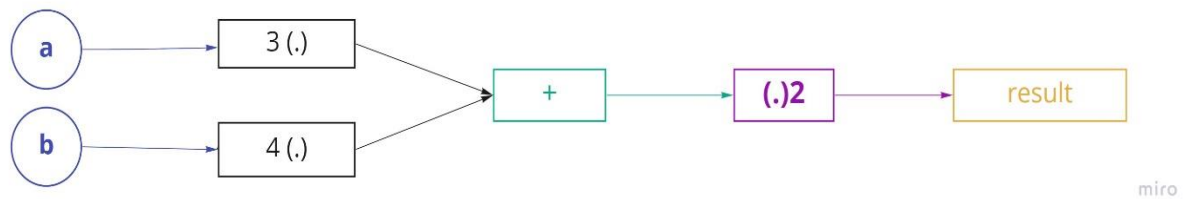
The term “deep” in the context of machine learning is technical and refers to the number of layers in an ANN. A standard ANN consists of three types of layers: the input layer (which receives the data), the output layer (which produces the result of data processing), and the hidden layer (which identifies patterns within the data). While a single-layer neural network can exist, a deep ANN is distinguished from a shallow ANN (with a single hidden layer) by its multiple hidden layers, enabling it to perform more complex estimations (Martin et al., 2018; Jakhar and Kaur, 2019; Nguyen et al., 2019; An and Moon, 2019). As data moves from one hidden layer to another, simpler features are recombined and recomposed into complex features. The layers of the NN consist of organized nodes that are not interconnected. Each node from one layer is connected to each node from the next layer, and each one from the input. The number of connections between layers equals the number of parameters in a layer plus one – for the bias term. The bias neuron is a unique neuron added to each layer in the neural network, which stores the value of 1. This allows for the shifting or “translation” of the activation function left or right on the graph. In simple terms, DML performs exceptionally well on unstructured data and has higher accuracy than traditional machine learning (ML), but it requires a large database, or in other words – big data. The most common methodology for building NN architecture structure is by applying the production-ready computer language Python and its libraries across potentially thousands of multi-GPU servers via computational graphs. Some of these libraries include:

- Scikit-Learn, which is user-friendly and implements many supervised and unsupervised ML algorithms through a consistent interface in Python.
- TensorFlow, a more complex library for distributed numerical computation using data flow graphs.
- Keras, a Python wrapper library, which can be built independently on top of TensorFlow;
- Statsmodels is a Python module that provides classes and functions for the estimation of many different statistical models as well as for conducting statistical tests and statistical data exploration. The results are tested against existing statistical packages to ensure that they are correct (Lazzeri, 2021);
- Darts is a Python library for user-friendly forecasting and anomaly detection on time series.

All ANN run on the principle of the computational or dataflow graphs. A computational or dataflow graph is a form of a directed graph where vertices or nodes describe operations, while edges represent data flowing between these operations. If an output variable represents the result of applying a binary operation to two inputs a and b , then we draw directed edges from x and y to an output node representing the result (z) and annotate the vertex with a label describing the performed computation via Jupyter Notebook and python. In the example above

(Figure 1), the input data in the circles (a, b) are transformed via the black, blue and purple rectangles representing functions (computational nodes) which compute the example equation $(3a + 4b)^2 = z$ (1).

Figure 1: Computational graph



Source: author's own elaboration

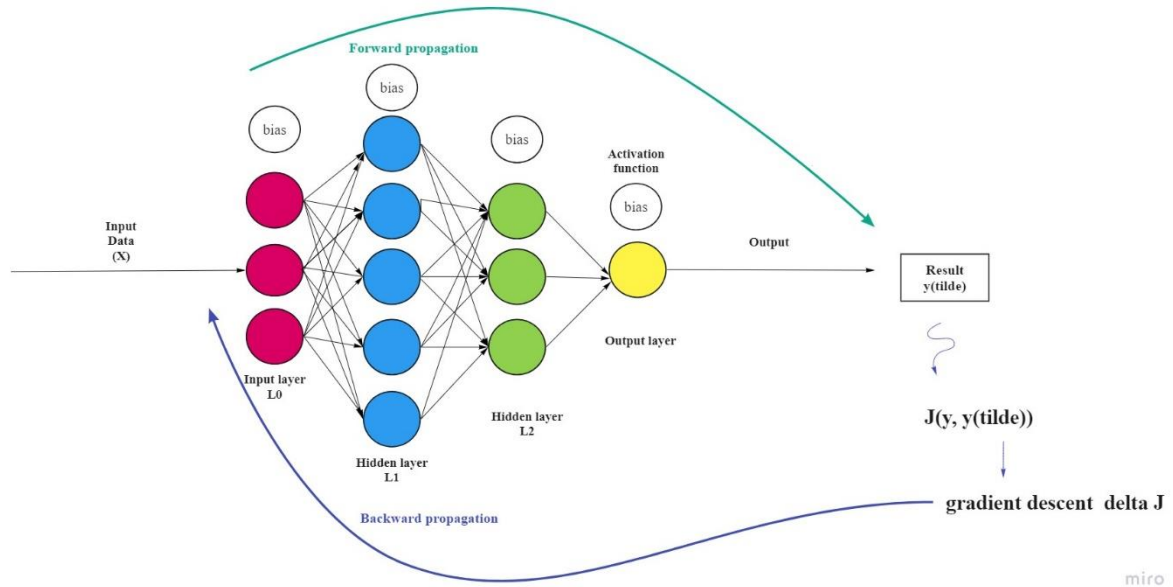
Python, a programming language developed by Guido van Rossum and first introduced in 1991 (Nguyen et al., 2019), has been effectively utilized by major corporations such as Google, Microsoft, Facebook, Tesla, YouTube, Airbnb, and others. Researchers have adopted Python for ML and DML in the fields of tourism and hospitality for tasks such as property management, big data analysis, market segmentation, customer targeting, optimal price calculation, and determining preferences and behaviours. Jupyter Notebook is an open-source tool that supports computations for DML using Python and can function offline (Nguyen et al., 2019).

ANN can be single layer and multilayer. The single-layer ANN, has a single layer of nodes. Each node in the single-layer connects directly to an input variable and contributes to an output variable (similar to the computational graph depicted on Figure 1). Such ANN can be applied for regression models mainly for solving linear ordinary differential equations. Whereas, the multilayered ANNs could be applied for complex regression or classification tasks. A standard multi-layer ANN has three types of layers: an input layer (receives the input data), an output layer (produces the output of the data processing), and a hidden layer (extracts the patterns from the data). A deep Artificial Neural Network (ANN) is distinguished from a shallow ANN (which has only one hidden layer) by its numerous hidden layers, enabling it to perform more intricate tasks (Martin et al., 2018; Jakhar and Kaur, 2019; Nguyen et al., 2019; An and Moon, 2019; Oreshkin et al., 2020). The layers of an ANN are composed of structured nodes, with no interconnections between them. In a fully-connected neural network, every neuron in each layer is linked with every neuron in the subsequent layer, as well as with all inputs. The total number of connections between layers equals the number of parameters in the layer, plus one additional for the bias element. This bias element is a unique neuron added to each layer in the neural network that simply holds a value of one, allowing for the activation function to be shifted or “translated” along the graph.

Fully-connected neural network (FC) is a type of multi-layer ANN, where each neuron in a layer is connected to all neurons in the next layer. The input data (X) passes via the layers on the NN (forward propagation) and after the output layer with the help of the activation function, we have a result. This result has to be compared with the total cost function/loss function $J(y, \tilde{y})$, where y is the expected result and $\tilde{y}$ is the real result. This loss functions (ready to use the function from the API of TensorFlow library) have their gradients and they allow us to make the opposite process – backward propagation. Here TensorFlow is very helpful because when a model based on gradient descent is been applied and only forward propagation has been formed (the combination of layers) the library calculates the gradients and applies the backward propagation by itself. A loss function can be applied by preferences or calculated bearing in mind that this is the most important feature of a neural network. FC can be implemented in the

industry of tourism and hospitality for market segmentations, arrivals predictions, classifying tourists' behaviour, etc.

Figure 2: Fully-connected neural network



Source: author's own elaboration

Neural networks are constructed from individual components that process incoming signals to generate a corresponding output value, which is then disseminated to the connected elements. There are three primary components:

- A collection of connections, or synapses, each characterized by a weight factor w_{ij} , which can assume either positive or negative values.
- An adder that aggregates the input signals, each multiplied by its respective weight factor. The linear adder is the most commonly used type.
- An activation function, or output function, which transforms the total received input into the neuron's output signal.

In mathematical terms, the operation of a neuron can be described as follows. Let us denote $(x_1, x_2, x_3, \dots, x_i)$ as the input signals, w_{ij} as the synaptic weights of the neuron, and w_i as the connection between neurons. x_i are the input signals to the neuron and w_0 represents the bias weight. So the output data z of the neuron is defined accordingly:

$$z = w_0 \sum_{i=1} (w_i x_i) \quad (1)$$

The most common types of activation functions that determine the output signal of the neuron are a single jump function or a threshold function:

$$f(z) = \begin{cases} 1 & z \geq 0 \\ 0 & z < 0 \end{cases} \quad (2)$$

and the sigmoid function, which can be described as follows:

$$y(x) = \frac{1}{1 + e^{\beta z}} \quad (3)$$

The sigmoidal is most commonly used in error backpropagation networks, where the fast-growing function works to maintain the balance between linear and non-linear behaviour. To overcome certain disadvantages of the sigmoidal function, a hyperbolic function (*tanh*) can be used, which functions in a larger space $[-1, 1]$:

$$(z) = \begin{pmatrix} 1: & z > 0 \\ 0: & z = 0 \\ -1: & z < 0 \end{pmatrix} \quad (4)$$

Convolutional Neural Networks (CNNs) are networks specifically designed to work with images (or translation invariant data more generally) (Nguyen et al., 2019). Current applications include a wide variety of image classifiers and have recently been applied in the field of tourism and hospitality – for forecasting and forecasting (Lu et al., 2020a), for personalized travel information (Han et al., 2018), for sentiment analysis for a recommender system (An and Moon, 2019) and sentiment analysis through eWOM (Martin et al., 2018), for cultural information (Hirotsu et al., 2020) and thus, helping businesses understand customer perception and improve their offerings.

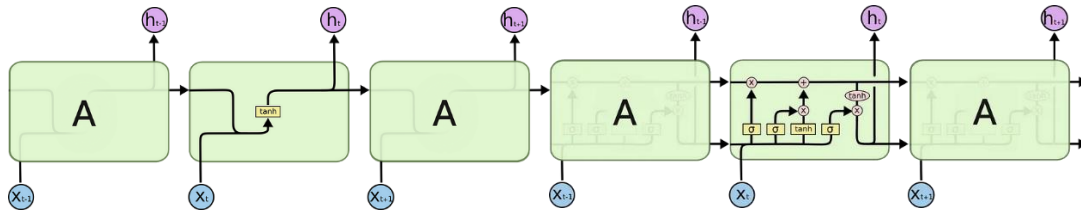
Recurrent Neural Networks (RNN) are specially designed to deal with sequential data (Nguyen et al., 2019). They are widely used by scientists in NLP in the sphere of tourism and hospitality for translations, time series analysis, sentiment analysis, tourist flows and demand forecasting. Furthermore, when RNNs are used in conjunction with CNNs they can be applied for applications such as video classifications. Namely on such ANN is based the method of the current research paper, which is further elaborated in the Methodology section.

DML excels at handling unstructured data and offers greater accuracy than traditional ML, but it necessitates a large database, or in other words, big data (Stylos et al., 2021). Neural networks can exhibit both linear and non-linear characteristics. The ability to handle non-linearity is distributed throughout the network and influences how the input signal is shaped, which can also be non-linear. One of the primary benefits of neural networks is supervised learning, where the input information is mapped to the output. To accomplish this, the synaptic weights are adjusted based on a specific set of training examples. Each training example comprises an input signal and its corresponding desired response. During the training phase, the network alters the synaptic weights to minimize the discrepancy between the desired output signal and the actual output, according to predetermined statistical criteria. Supervised learning can also be viewed as an optimization task.

2. Methodology

For many years, accurately predicting tourism forecast, like overnight stays has been a challenge. To address this, many researchers developed new automated methods that combine traditional forecasting techniques with modern DML models (Frechtling, 2001; Crone and Graffaille, 2004; Akin, 2015; Claveria et al., 2016; Chenguang et al., 2017; Li and Cao, 2018; Brownlee, 2018; Golshani et al., 2018; Cheng et al., 2019; Dwyer et al., 2020; Bi et al., 2021; Egger, 2022; Herzen et al., 2022; Dowlut and Gobin-Rahimbux, 2023; Lu et al., 2020b; Athanasopoulos et al., 2024; Bufalo and Orlando, 2024). Li and Cao (2018) propose the following RNN model (Figure 3): one input unit, one output unit, and one recurrent hidden unit expanded into a full network. x_t is the time step input, o_t is the output of a time step t . s_t is the hidden state at a time step and is the “memory” of the network. W, U, V are parameters in different network layers.

Figure 3: Stanart RNN and LSTM model



Source: adapted by the author based on Li and Cao (2018)

Unlike traditional deep neural network that uses different parameters at each layer, RNN shares the same parameters (W, U, V) in all steps. This greatly reduces the total number of parameters we need to learn. In the forward propagation process, the current layer calculates the input data and outputs to the next layer according to the network connection and weight $s_j(t)$ is the output of the hidden layer at time t . The calculation process is:

$$s_j(t) = f \left(\sum_i^l x_i(t) v_{ji} + \sum_h^m (t-1) u_{jh} + b_j \right) \quad (5)$$

where $\sum_i^l x_i(t) v_{ji}$ is the input of the input layer at the moment t . $\sum_h^m (t-1) u_{jh} + b_j$ is the input of the currently hidden layer $(t-1) \cdot b_j$ is the bias

$f(\cdot)$ is a map function, which applies a given function to each element of a collection that is typically non-linear as tanh or ReLU

According to Li and Cao (2018), the forward pass of a RNN is the same as that of a multilayer perceptron with one hidden layer, except those activations arrive at the hidden layer from both the current external input and the hidden layer activations from previous time steps. Considering, an input sequence of length T_x , which is introduced to RNN with I input units, H hidden units and K output units. x_t is the input value i at the moment t , a_h^t is the network input to a unit h at the moment t and unit activation h at the moment t . The hidden units are:

$$a_h^t = \sum_{i=1}^I \omega_{ih} x_i^t + \sum_{h'=1}^H \omega_{hh'} b_{h'}^{t-1} \quad (6)$$

Non-linear, differentiable activation functions are then applied:

$$b_h^t = \Theta_h(a_h^t) \quad (7)$$

The network inputs to the output units can then be calculated by:

$$a_k^t = \sum_{h=1}^H \omega_{hk} b_h^t \quad (8)$$

The subtlety is that for RNN the loss function depends on the activation of the hidden layer not only through its influence on the source layer, but also through its influence on the hidden layer at the next time step. Therefore:

$$\delta_h^t = \omega'(a_h^t) \sum_{k=1}^K \delta_k^t \omega_{hk} + \sum_{h=1}^H \omega_h^{t+1} \omega_{hh'} \quad (9)$$

Long-Short Term Memory (LSTM) networks were specifically engineered to tackle the issue of long-term dependencies that recurrent neural networks (RNNs) struggle with due to the vanishing gradient problem. Unlike traditional feedforward neural networks, LSTMs possess feedback connections. This unique feature allows LSTMs to handle whole data sequences, like in our case time series, without processing each data point separately. Instead, they preserve valuable information from past data in the sequence to aid in the processing of new data points.

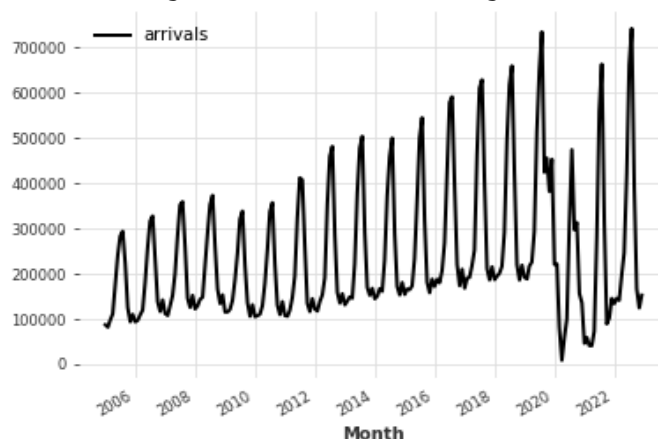
Gated Recurrent Unit (GRU) is an improved model of LSTM, which controls the switch of memorizing and forgetting by setting multiple threshold gates (Lu et al., 2020). Both LSTM and GRU can solve the limitation problem of handling long-term dependencies well, which led to their successful application on various sequence learning problems, such as forecasting.

The method was deployed on a user-friendly Python platform (Jupyter Notebook) which uses a question-based framework to guide users. We compared various forecasting methods, including basic, classical, machine learning, and deep learning approaches. Our goal was to identify the most effective method with the best settings for predicting monthly overnight stays in Bulgarian accommodations from 2002 to 2023. The data was gathered via the statistical office of the European Union (Eurostat, 2023), the Bulgarian National Statistical Institute (National Statistical Institute, 2024) and an emailed paper report from the Ministry of Tourism. To ensure accurate results, we utilized number of python libraries as well as well-regarded DARTS library in order to establish which time series forecasting model performs better and may be applied for similar tasks in the future by for research and practical purposes.

3. Results

From the python environment a TensorFlow environment was activated and then Jupyter Notebook wrapper was created where via the Darts libraries the data was deployed, pre-processed and observed (Figure 4).

Figure 4: Total number room nights



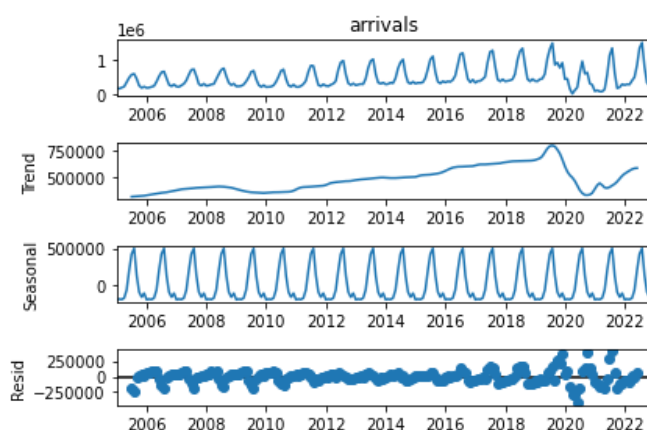
Source: author's own elaboration

Figure 4 represents a line graph showing the total number of room nights from 2005 to 2022. The graph shows a cyclical pattern, indicating seasonality in the data. Peaks in the graph likely

correspond to high tourist seasons, while troughs could indicate off-season periods. This kind of data can be crucial for understanding market trends and planning in the tourism industry.

Via the time series decomposition, the data seasonality, trend and residuals were obtained. The trend represents the trend isolation where a general increasing trend over time can be observed; the seasonal decomposition can provide removing the trend from the original data by subtracting and a clear seasonal trend is depicted; the residual provides an insight of the data noise (Figure 5). The seasonal decomposition can provide removing the trend from the original data by subtracting, and a clear seasonal trend is depicted. Seasonality is the repeating short-term cycle in the series. In the “Seasonal” graph, we can see a consistent pattern of peaks and troughs over the years, which could be related to factors such as tourist seasons or specific events that occur at regular intervals. Residuals are the difference between the actual observations and the values predicted by the model. In the “Resid” scatter plot, the points seem to be randomly scattered around zero, indicating that the model has done a good job capturing the trend and seasonality, leaving only the random noise in the residuals. This allows for an easier understanding of how each component contributes to overall patterns in data over time.

Figure 5: Time series decomposition



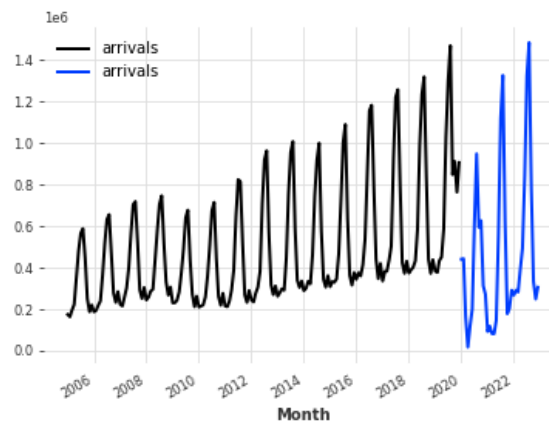
Source: author's own elaboration

Following which, for the purpose of the forecasting task, the time series were split (Figure 6). This is a common practice in time series analysis where the data is divided into a “training” set that includes the historical data, and a “test” or “validation” set that is used for predictions. This method helps validate the performance of the forecasting model on unseen data. As the last 36 months of data were used for the prediction, this suggests that the model was “trained” on the data up to that point, and then used to forecast the subsequent 36 months. This approach allows the model to learn from the most recent trends and patterns in the data.

With accordance to the data observation, the models for the forecast were created and performed, in order to evaluate the best performing model, namely

- ExponentialSmoothing: Holt-Winters Exponential Smoothing, used for time series forecasting when the data has linear trends and seasonal patterns;
- TBATS: Trigonometric seasonality, Box-Cox transformation, ARMA errors, Trend and Seasonal components;
- AutoARIMA: Automatically discover the optimal order for an ARIMA model;
- Theta is a simple method for forecasting the involves fitting two θ -lines, forecasting the lines using a Simple Exponential Smoother, and then combining the forecasts from the two lines to produce the final forecast;

Figure 6: Total number room nights



Source: author's own elaboration

- LSTSM: deep ANN using vanilla RNN or GRU instead, replace LSTM by RNN or GRU, respectively.

4. Discussion

For models estimation the Mean Absolute Percentage Error (MAPE) was used as it is quite convenient and scale independent for empirical experiment purposes due to the fact that measures the average magnitude of error produced by a model, or how far off predictions are on average. In Darts library it is a simple function call instead an equational estimation by a software interface. MAPE models' estimations are represented in Table 1.

Table 1: MAPE Comparison of Forecasting Models

Model	MAPE
Exponential Smoothing	49.96%
TBATS	56.45%
AutoARIMA	77.88%
Theta	51.13%
LSTM	22.16%

Source: author's own elaboration

The results presented in Table 1 highlight the superior performance of the LSTM model in forecasting overnight stays, particularly in the context of the volatile and unprecedented fluctuations caused by the COVID-19 pandemic. The MAPE of 22.16% for LSTM indicates a significantly lower average error compared to other models tested, including traditional time-series methods like Exponential Smoothing, TBATS, and AutoARIMA. This finding aligns with a growing body of international research that underscores the effectiveness of LSTM networks in tourism demand forecasting. Thus, we can assume that the ANN model, including LSTM, was able to adapt to the sudden changes in tourism patterns during the pandemic, outperforming traditional models that struggled to capture the non-linearity and volatility of the data (Silva and Alonso, 2020). What is more, the results considerably demonstrate the ability of LSTM to effectively model the complex relationships between multiple variables influencing tourism demand, such as economic indicators, seasonality, and events (Dowlut and Gobin-Rahimbux, 2023). Numerous other studies have confirmed the superiority of LSTM in various tourism forecasting scenarios, highlighting its ability to handle long-term dependencies and

capture underlying patterns in time-series data (Dwyer et al., 2020; Zhang et al., 2021; Provenzano and Volo, 2022; Bufalo and Orlando, 2024).

The findings of this study reaffirm the potential of LSTM networks as a powerful tool for forecasting overnight stays in the tourism industry. By capturing the complex dynamics of demand, even in the face of unexpected disruptions, LSTM offers a valuable asset for researchers, practitioners, and policymakers seeking to navigate the ever-changing landscape of tourism.

5. Conclusions

Various forecasting methods using real data on monthly overnight stays in Bulgaria were deployed via Jupyter Notebook and the computer language python in order to estimate which of them could generalise well thus providing valuable tool for tourism experts. This included seasonal models, exponential smoothing, and neural networks. The results demonstrate that a specific neural network type, RNN-LSTM, performed best according to two different accuracy measures. Recent dramatic drops in tourism due to the pandemic make traditional forecasting methods less reliable. Interestingly, these classical models did worse than expected, while the LSTM neural network performed rather well.

This research is valuable for both academic study and practical applications of artificial intelligence (AI) in tourism as LSTM can be perceived as a powerful and reliable technique for forecasting tourism data as it outperformed one of the most applicable methods like AutoARIMA and exponential smoothing, even those based on Fourier transformations methodology. The future research elaborations can focus on using other deep learning models to forecast tourism data, including single or multivariate models for domestic and international flows. We'll also explore combining tourism data with economic and marketing factors using different neural network architectures.

Finally, the model can be continuously improved by incorporating new data, features optimisation, and parameters adjusting based on the foreseeable results. In such manner, forecasts can stay relevant and reflect the changing dynamics of one of the most dynamic economic sectors, namely tourism. Such improved models could then be applied by various tourism stakeholders to benefit their businesses and operational processes.

Author contributions: All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding: This research was supported by the project RP-A1/24 “Upgrading the capacity of the Scientific research centre „Observatory Economics“ for students and doctoral students training and their participation in scientific research – phase 2”.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to [insert reason here].

Conflicts of Interest: The authors declare no conflict of interest.

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QUALITATIVE CHANGES IN COMMERCIAL BANKING IN THE CONTEXT OF THE IMPACT OF THE COVID-19 PANDEMIC

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Cite as: Hlawiczka, R., Tung, H. T. (2024). Qualitative changes in commercial banking in the context of the impact of the COVID-19 pandemic, *Ekonomicko-manazerske spektrum*, 18(1), 102-120.

Available at: dx.doi.org/10.26552/ems.2024.1.102-120

Received: 15 March 2024; Received in revised form: 18 May 2024; Accepted: 3 June 2024; Available online: 30 June 2024

Abstract:

Research background: The COVID-19 pandemic has significantly impacted the global banking sector, leading to shifts in operational dynamics and customer interactions. This study explores the pandemic's dual impact, emphasizing the rapid transition from traditional to digital and mobile banking, and the resultant decline in physical branch banking.

Purpose of the article: The main of this paper is to examine the changes in customer behaviour and bank operations, with a focus on the integration of digital and physical channels through omnichannel strategies. The research also addresses the increased credit risks, operational challenges, and regulatory hurdles banks now face, alongside the potential for digital innovation and enhanced customer engagement.

Methods: At the core of this analysis is the pandemic's effect on banking distribution channels, with a marked acceleration towards digital and mobile banking, fundamentally altering the banking service landscape. The study investigates how these shifts have influenced customer behaviour and bank operations, noting the decline in traditional branch banking and the emergence of omnichannel strategies that blend digital and physical banking channels. Additionally, the paper assesses the wider implications of these changes for the banking sector, including increased credit risks, operational disruptions, and regulatory challenges, against the backdrop of opportunities for digital transformation and innovation.

Findings & Value added: By synthesizing insights from academic and industry sources, the study aims to provide a comprehensive view of the banking sector's adaptation in the post-pandemic era. This includes a nuanced understanding of the evolving banking landscape and its implications for the future, offering valuable insights for banking professionals, policymakers, and academics

Keywords: COVID-19 pandemic; banking sector; digital banking; omnichannel strategies; customer behaviour

JEL Classification: D53; G21

1. Introduction

The COVID-19 pandemic, a global health crisis of unprecedented scale, has had a profound impact on economies worldwide, triggering a cascade of effects across various sectors, including the banking industry. This paper aims to dissect the multifaceted repercussions of the pandemic on the banking sector, with a particular emphasis on commercial banks. The crisis triggered profound structural changes in the labour market, which supported job creation in healthcare, information technology, and various types of online services, while simultaneously reducing the number of jobs in tourism, manufacturing, retail, recreation, and tourism, among many other business sectors (Orlowski, 2020). Grencikova (2023) addresses the pervasive impact of the COVID-19 pandemic, emphasizing its significance as a central topic of discussion and analysis from 2020 to 2022. He notes that the effects of the pandemic were not limited to significant health crises faced by populations worldwide but also deeply penetrated the structure of the global economy and the economic frameworks of individual countries. Author meticulously examines how the pandemic acted as a catalyst for widespread economic upheavals, affecting sectors across the spectrum from healthcare to hospitality, and from retail to manufacturing, and points out that the economic consequences of COVID-19 were multifaceted, leading to job losses in sectors directly hit by lockdowns and travel restrictions, such as tourism and recreation, while simultaneously spurring growth in areas like healthcare, information technology, and online services. According to author, this shift underscores the pandemic's role in accelerating digital transformation and reshaping labour markets. Furthermore, author explores how various countries responded to these economic challenges, highlighting differences in policy measures, economic resilience, and recovery strategies. His analysis includes a critical look at the role of government interventions in mitigating the economic impacts and supporting recovery, as well as the long-term implications of such measures on national economies.

The pandemic has not only intensified existing challenges within the banking sector but also unveiled new opportunities, particularly in the realm of digital transformation. This paper explores three main themes: the challenges faced by banks during the pandemic, the opportunities that have arisen from this crisis, and the significant evolution in banking distribution channels. A review of the existing literature reveals the depth and complexity of the pandemic's impact. Kose et al. (2021) describe the pandemic as a catalyst for a global recession, highlighting its sweeping economic implications. Berger and Demirguc-Kunt (2021) delve into the initial reactions and adaptations within the banking sector, providing a foundational understanding of the immediate effects of the pandemic on financial institutions. The purpose of this study is to provide a comprehensive analysis of these changes, offering insights into how commercial banks have navigated this tumultuous period and the implications for the future of banking. The aim of the article is to present significant qualitative trends occurring in commercial banking in relation to the impacts of the COVID-19 pandemic and other significant phenomena in the political-economic context. The article focuses on key qualitative trends that are currently shaping the commercial banking sector, with an emphasis on the impacts of the COVID-19 pandemic and other significant political-economic events.

This article focuses on exploring the impact of the COVID-19 pandemic on the global banking sector and its adaptation to the emerging challenges. The introduction section provides an overview of the pandemic's effects on the global economy, with an emphasis on the banking sector. Here, we highlight the importance of analysing the adaptation of commercial banks during the pandemic, which is key to understanding current and future trends in banking. In the theoretical framework of the article, we conduct a detailed analysis of how the pandemic accelerated the digitalization of banking, influenced customer behaviour, and changed the

operational dynamics of banks. We also discuss the challenges presented by the new regulatory environment and the necessity for banks to adapt to these changed conditions, including an increased focus on risk management. Another section focuses on the growing importance of sustainability and ESG (Environmental, Social, and Governance) principles in banking operations, an area significantly strengthened by the pandemic. The methodological section describes the qualitative research approach and the choice of thematic analysis as the main method. This section justifies the selection of the methodology and secondary data sources on which the study is based. In the results and discussion section, the article addresses the specific impacts of COVID-19 on the banking sector, divided into three main areas. The first subsection analyses the pandemic's influence on credit risk management and banks' adaptive strategies. The second subsection examines the development of distribution channels, the transition to digital banking, and the decline of traditional banking. Here, we also discuss the significance of omnichannel strategies that integrate digital and physical banking channels. The third subsection is dedicated to the strengthening of the ESG concept and its increasing importance in banking operations prompted by the pandemic. The concluding part summarizes the key findings on the transformative impact of the pandemic on commercial banking and outlines recommendations for future research. Here, we focus on the need for further exploration of the long-term effects of digitalization, sustainability, and financial inclusion in the banking sector, which are essential for understanding future trends and developments in this area.

2. Literature review

The text focuses on providing an overview of how dynamic changes in this environment manifest and how banks respond to new challenges and capitalize on the opportunities these changes bring. The COVID-19 pandemic has accelerated the shift towards digital banking services, fundamentally altering customer expectations and behaviour. Today, customers prefer online and mobile banking more than ever, requiring banks to continuously innovate and adapt their services and operations to the new digital reality. This trend not only increases pressure on banks to be more technologically advanced but also offers opportunities for improving efficiency and customer service.

In response to the economic shocks caused by the pandemic and the associated uncertainty, banks also need to contend with new regulatory requirements and strengthen their risk management strategies. This includes not only financial risks but also operational, technological, and reputational risks. In this context, it is crucial for banks to develop robust systems and processes that enable them to effectively identify, measure, and manage various types of risks.

Another significant trend is the increasing emphasis on sustainability and social responsibility. In today's world, banks are expected to act responsibly not only towards their customers and employees but also towards society and the environment. This means that banks must integrate environmental, social, and governance (ESG) factors into their decision-making processes and strategies. This approach not only helps build a positive reputation but can also open new markets and opportunities for growth.

International influences and geopolitical tensions present another layer of challenges for commercial banking. In a globally interconnected world, international events and political changes can have a swift and significant impact on financial markets and banking operations. Therefore, banks must remain vigilant and flexible to effectively respond to these changes and minimize potential negative impacts on their business.

The impact of the COVID-19 pandemic extends far beyond commercial banks and affects various aspects of the broader financial sector. Preda et al. (2021) provide a detailed analysis of the pandemic's impact on the global insurance market. Their study highlights the challenges faced by insurance companies, including an increased number of claims, disruptions in operations, and the need to quickly adapt to a digital-first environment. The authors also discuss how the pandemic has led to a reevaluation of risk assessment models and insurance product offerings. Polinkevych et al. (2021) offer a focused analysis of changes in the business models of Ukrainian insurance companies during the pandemic. Their research reveals how these companies had to innovate and adapt to maintain their operations and customer service. This includes the adoption of digital tools for customer interaction, the introduction of new insurance products tailored to pandemic-related risks, and the implementation of flexible working arrangements for their staff.

This research is significant as it sheds light on the resilience and adaptability of the banking sector in the face of an unprecedented global crisis and offers a foundation for future research in this area. The article examines the key impacts of the COVID-19 pandemic on the banking sector, with a focus on credit risk management, distribution channels, and the strengthening of the ESG (Environmental, Social, and Governance factors) concept in commercial banking. This article is structured to provide readers with a comprehensive view of the dynamic changes in banking triggered by the recent global pandemic and the adaptations of banks to newly emerged challenges and opportunities. The introductory part of the article presents the topic and its relevance, outlines the main objectives of the study, and provides a brief overview of the methodology used and the structure of the article. This offers a clear framework for understanding the content and significance of the subsequent research.

2.1. The impact of COVID-19 pandemic on credit risk management

Wyman (2020) examine the impact of the COVID-19 pandemic on the global banking sector. They highlight the economic damage and challenges for financial institutions, including foreign remittances and trade, government revenue, and employment. The pandemic has disrupted the normal operations of banks, increased credit risk and highlighted the need for measures to stabilize financial integrity. The authors stress the need to restructure the banking sector and rethink challenges such as digitalization and low interest rates to increase resilience to future pandemics, with government support and financing packages playing a key role. Marcu (2021) explores banking strategies during the COVID-19 crisis, contrasting it with the 2008-2009 financial crisis. Unlike earlier crises where banks were part of the problem, they now emerge as part of the solution, playing a crucial role in addressing the pandemic's economic challenges. The article highlights the pandemic's profound impact on the global economy and businesses, emphasizing the banking sector's pivotal role. It discusses how the crisis has accelerated digitalization and the pre-existing need for innovation, offering insights into how the banking system is adapting to meet these new challenges. Colak and Oztekin (2021) analyze the global impact of COVID-19 on bank lending, revealing that lending weakens in countries more affected by the pandemic. Utilizing data from 125 countries and a difference-in-differences approach, their findings highlight that the extent of impact is influenced by factors such as banks' financial health, market structure, regulatory environment, development of financial intermediaries, availability of corporate debt capital, and the public health response's effectiveness. Dunbar (2022) assesses the impact of the pandemic on global bank lending and identifies bank and country characteristics that amplify or attenuate the impact of the outbreak on bank lending. Using a sample of banks from 125 countries and applying a difference-in-differences methodology, he finds that bank lending is weaker in countries that are more

affected by the health crisis. The magnitude of this effect depends on the financial condition of the bank, market structure, regulatory and institutional environment, the development of financial intermediaries and bond markets, the ease of access to debt capital by firms, and the response of the public health sector to the crisis. Berger and Demircuc-Kunt (2021) further explore these challenges, discussing the difficulties in maintaining financial stability and liquidity during the pandemic's early stages. They highlight how the sudden economic downturn forced banks to adjust their risk management strategies and seek new ways to support their customers, including loan deferrals and restructuring.

Additionally, Bryan et al. (2020) examine the role of retail banks during this crisis. They point out that retail banks played a crucial role in distributing financial aid and implementing government relief programs, which was essential in mitigating the economic impact on individuals and small businesses. Korzeb and Niedziolka (2020) also contribute to this discussion by analyzing the resilience of commercial banks during the pandemic, particularly focusing on the case of Poland. They observe that banks with strong digital infrastructure and diversified portfolios were better equipped to handle the crisis, suggesting a need for ongoing innovation and adaptation in the banking sector. These collective insights underscore the immediate and profound effects of COVID-19 on the banking sector, highlighting a period of rapid adaptation, risk management challenges, and the critical role banks played in supporting economies through unprecedented times. The COVID-19 crisis has undoubtedly acted as a catalyst for significant changes and innovations within the banking sector. While the pandemic brought numerous challenges, such as operational obstacles and the need for rapid adaptation to changing market conditions, it also opened up space for strategic shifts and new opportunities. One of the most pronounced trends during this period has been the accelerated adoption of digital banking solutions.

As noted by Wyman (2020), the COVID-19 pandemic significantly increased the demand for digital banking services. This surge is a result of movement restrictions and social distancing, forcing customers to seek alternative ways to manage their finances without the need to physically visit bank branches. This shift towards digital banking offers banks new opportunities to engage with their customers and deliver services more efficiently. Digital platforms allow banks to offer personalized services that are accessible 24/7, regardless of the customer's geographical location. This not only enhances customer satisfaction but also enables banks to expand their customer base into areas that were previously unreachable. Furthermore, the digitalization of banking services brings significant cost savings associated with the operation of traditional branches. Investments in technologies such as artificial intelligence and machine learning further allow banks to improve their risk assessment and personalization of offers. However, the transition to digital services also requires banks to face new challenges, including data security and privacy protection. Regulation and standards in cybersecurity become key aspects that banks must address to maintain their customers' trust.

Ultimately, the COVID-19 pandemic has accelerated the transformation of the banking sector towards a more digital and customer-oriented model. This shift represents not only a response to the current crisis but also a strategic investment in the future of banking. KPMG (2020) delves deeper into the strategic shifts towards digitalization and sustainability. Their report showcases how banks are adapting to changing consumer behaviors and expectations in the wake of the pandemic. They highlight that the crisis has acted as a catalyst for banks to reevaluate their digital strategies and invest more heavily in technology to meet the growing demand for online and mobile banking services. Furthermore, Elnahass et al. (2021) discuss the opportunities arising from the crisis in terms of global banking stability. They suggest that the pandemic has provided an impetus for banks to strengthen their risk management frameworks

and develop more resilient business models. This includes diversifying their product offerings and exploring new markets, which could lead to more sustainable growth in the long term. Barua and Barua (2021) also contribute to this discussion by examining the implications of COVID-19 for banks in emerging economies. They observe that while the pandemic has posed significant challenges, it has also forced banks in these regions to innovate and find new ways to serve their customers, particularly in rural and underserved areas.

These perspectives collectively highlight that the COVID-19 crisis, despite its challenges, has been a driving force for change in the banking sector. It has spurred banks to innovate, embrace digital transformation, and rethink their strategies to remain competitive and resilient in a rapidly evolving financial landscape.

2.2. The impact of COVID-19 pandemic on distribution channels in commercial banking

Teresiene et al. (2021) delve into the ramifications of the COVID-19 pandemic on European monetary policy and the banking sector, uncovering a complex landscape of challenges and adaptations. Their research highlights how the pandemic has exacerbated credit risk, financial distress, and concerns over bank solvency, underscoring the pivotal role of banks' risk tolerance in shaping lending standards during this tumultuous period. In an environment fraught with uncertainty, the authors note a paradoxical increase in banking sector liquidity. This uptick in liquidity, however, does not translate into more liberal lending practices. Instead, banks have adopted a more conservative stance towards lending, driven by heightened perceptions of risk and the potential for future financial instability. This cautious approach, while prudent in the short term, carries mixed implications for the broader financial ecosystem. On one hand, it could safeguard the banking sector against immediate threats, preserving capital and ensuring that banks remain solvent even as they navigate through the pandemic's economic fallout. On the other hand, the reluctance to lend could stifle economic recovery, limiting access to capital for businesses and individuals at a time when financial support is crucial for revitalization. The study by Teresiene et al. (2021) sheds light on the delicate balance that banks must strike between maintaining financial stability and supporting economic recovery. It also raises important questions about the long-term impact of COVID-19 on lending practices and financial health within the European banking sector. As banks grapple with these unprecedented challenges, the findings underscore the need for strategic policy interventions to mitigate risk while fostering an environment conducive to economic growth and stability.

Elnahass et al. (2021) delve into the broader implications of these changes, discussing global banking stability in the shadow of the COVID-19 outbreak. They emphasize the evolving nature of distribution channels, particularly the increasing reliance on digital platforms. Their research suggests that the pandemic has accelerated the transition towards online and mobile banking, a trend that is likely to continue post-pandemic. Baicu et al. (2020) examine the impact of the COVID-19 pandemic on consumer behavior in retail banking, focusing on Romania. A survey of 738 consumers reveals how the pandemic affects the adoption of internet and mobile banking services. The findings show that perceptions of the impact of the pandemic positively influence attitudes towards digital banking services. The authors recommend that Romanian banks strengthen financial education and communication with customers to encourage the use of digital channels. Additionally, Korzeb and Niedziolka (2020) explore the resistance of commercial banks to the crisis caused by the COVID-19 pandemic, particularly in the context of Poland. They highlight how banks have adapted their distribution channels to maintain operations and customer service during lockdowns and social distancing measures. This adaptation includes the expansion of online banking services and the introduction of new digital tools to facilitate remote banking. Barua and Barua (2021) also contribute to this discussion by

examining the implications of COVID-19 for banks in emerging economies. They note that the pandemic has forced banks in these regions to rapidly develop and deploy digital banking solutions to serve their customers effectively, especially in areas where traditional banking infrastructure is limited.

These perspectives collectively underscore the significant impact of the COVID-19 pandemic on the evolution of distribution channels in the banking sector. The shift towards digital banking, driven by necessity during the pandemic, is likely to have long-lasting effects on how banks interact with their customers and manage their operations.

2.3. Strengthening the ESG concept in commercial banking

Chiaramonte et al. (2022) show that ESG ratings enhance the stability of European banks in 21 countries (2005-2017), especially during financial crises. Higher ESG scores effectively reduce bank fragility, as confirmed by a difference-in-differences analysis following the introduction of the 2014 EU Non-Financial Reporting Directive. Longer ESG disclosure time brings more stability during turbulence. Galletta et al. (2022) delve into the burgeoning interest surrounding Environmental, Social, and Governance (ESG) factors within the banking sector, highlighting the critical necessity for these elements to be woven into the fabric of banking strategies and financial products to ensure sustainable long-term value creation. Their comprehensive study embarks on a journey through the intellectual landscape of ESG in banking, employing a bibliometric analysis of 271 scholarly publications spanning from 1986 to 2021. This methodical examination not only charts the historical trajectory of ESG research within the banking industry but also identifies pivotal authors, seminal works, and the dynamics of citation networks that have shaped the discourse around ESG factors. The analysis meticulously categorizes the most prevalent keywords, uncovering the thematic cores around which ESG research in banking coalesces, and highlights the papers that have garnered significant academic attention, serving as foundational texts for further exploration. Furthermore, it distinguishes the journals that have been instrumental in disseminating influential ESG research, marking them as key platforms for scholarly dialogue and advancement in this field. By mapping out the evolutionary phases of ESG research within banking, Galletta et al. (2022) not only document the historical progression but also pinpoint emerging trends and new directions that signal the expanding frontiers of ESG scholarship. Their work illuminates the growing consensus on the importance of ESG factors in banking, reflecting a shift towards more ethical, sustainable, and socially responsible banking practices. This shift is not merely a response to regulatory pressures or market demands but represents a deeper recognition of the banking sector's role in addressing global challenges such as climate change, social inequality, and corporate governance.

Zhang et al. (2020) explore the dramatic impacts of the rapid spread of coronavirus (COVID-19) on financial markets worldwide, highlighting the unprecedented level of risk and significant losses faced by investors in a very short period. Their paper aims to identify general patterns of country-specific and systemic risks in global financial markets. Furthermore, it examines the potential consequences of policy interventions, such as the United States' implementation of a zero-percent interest rate and unlimited quantitative easing (QE), and assesses how these policies might introduce further uncertainties into the global financial markets. Kolsi et al. (2022) explore the relationship between Environmental, Social, and Governance (ESG) performance and earnings management (EM) in US commercial banks from 2010–2019. Using abnormal loan loss provisions and EM to avoid losses as proxies, they find that higher ESG performance correlates with less income-increasing EM. Specifically, the governance and social pillars of ESG significantly mitigate EM practices, while the environmental pillar does

not. These results suggest that ESG, particularly its governance and social components, acts as an effective tool against EM in US banks, offering insights for managers, regulators, and stakeholders on the implications of ESG reporting. Azmi et al. (2021) investigate the impact of Environmental, Social, and Governance (ESG) activities on the value of 251 banks from 44 emerging economies between 2011 and 2017. Using System Generalized Method of Moments (GMM) to address endogeneity, they discover a non-linear relationship where initial ESG activities boost bank value, but with diminishing returns over time. Environmentally friendly initiatives show the most significant positive effect. ESG activities enhance cash flows and efficiency, reduce the cost of equity, but do not affect debt costs. These findings reconcile stakeholder and trade-off theories regarding ESG's influence on bank value. Amel-Zadeh and Serafeim (2018) analyze survey data from major investment firms to understand the use of environmental, social, and governance (ESG) information by investors. The primary motivation for utilizing ESG data is its relevance to investment performance, followed by client demand, product strategy, and ethical considerations. A significant barrier to ESG information usage is the absence of standardized reporting. Among ESG investment approaches, negative screening is seen as least beneficial, motivated by product and ethical reasons, whereas full integration and engagement, driven by investment performance relevance, are viewed as more advantageous.

Furthermore, the work of Barua and Barua (2021) sheds light on the implications for banks in emerging economies, which are closely intertwined with the broader financial sector. They emphasize the need for these institutions to enhance their digital capabilities and reevaluate their customer engagement strategies in response to the changing landscape. Additionally, Wyman (2020) explore the role of retail banks in fighting COVID-19, which has broader implications for the financial sector as a whole. Their insights into the strategic shifts towards digitalization and sustainability are indicative of a sector-wide transformation in response to the pandemic.

These studies collectively illustrate the widespread impact of the COVID-19 pandemic on the financial sector. They underscore the need for a comprehensive reevaluation of risk management, customer engagement, and operational strategies across various financial institutions, not just banks.

3. Methodology

In the methodology section, the qualitative research approach, which emphasizes the analysis of secondary data, is comprehensively detailed. This particular approach was selected because of its exceptional ability to deeply explore and understand the complex and multifaceted impacts that the COVID-19 pandemic has had on the banking sector. By employing thematic analysis, a method thoroughly described by Braun and Clarke (2006), the research facilitates the systematic identification and in-depth analysis of key themes and patterns dispersed across a broad and diverse array of literature and reports pertinent to the topic at hand. The data sources meticulously selected for this study encompass an extensive collection of academic journals, detailed industry reports, and insightful white papers. This selection is aimed at ensuring a holistic and comprehensive overview of the current body of knowledge, thereby enriching the research with a broad spectrum of perspectives and insights.

The subsequent sections of the article meticulously address the specific impacts of COVID-19 on the banking sector. It initiates with a detailed analysis of how the pandemic has significantly influenced credit risk management, continues with a thorough examination of the pandemic's profound influence on distribution channels in commercial banking, and concludes

with an insightful discussion on the strengthening of the ESG (Environmental, Social, and Governance) concept within the banking industry. These sections offer deep insights into the ways in which the banking sector has adapted to the new challenges presented by the pandemic and the strategic measures that have been implemented to navigate through the uncertain and dynamic environment. This comprehensive exploration helps to underscore the resilience and innovative adaptations within the banking sector in response to the unprecedented global crisis.

The discussion section of the article meticulously synthesizes the key findings and thoroughly analyses their significance for the banking sector. It engages in a detailed comparison of the findings with the existing body of literature and theoretical frameworks, thereby enriching the analysis. Furthermore, this section delves into the limitations of the current study, openly acknowledging areas that require caution in interpretation, and proposes potential directions for future research to explore. The concluding section thoughtfully summarizes the main insights derived from the study and elaborates on their implications for both practice and policy within the banking industry. It offers well-considered final reflections on the anticipated future of the banking sector in a world that continues to adjust to the aftermath of the COVID-19 pandemic. This comprehensive wrap-up not only highlights the critical learnings but also paves the way for ongoing dialogue and investigation into how banks can navigate the evolving landscape.

The bibliography section located at the conclusion of the article thoughtfully compiles a detailed list of the literature and sources consulted during the research process. This comprehensive list serves as a valuable resource, enabling readers to further explore and deepen their understanding of the complex topic at hand.

In conducting this study, a qualitative research approach is rigorously employed, with a specific emphasis placed on the analysis of secondary data. The selection of this particular methodology is deeply rooted in its suitability and effectiveness for thoroughly examining the complex and layered effects of the COVID-19 pandemic on the banking industry. By leveraging qualitative research, the study embarks on a nuanced and in-depth exploration of an array of existing scholarly literature and industry reports. This approach facilitates a thorough and detailed understanding of the subject matter, providing a rich and comprehensive perspective on the multifaceted impacts of the pandemic. Through this qualitative lens, the research is able to capture the subtle nuances and broad implications of COVID-19 on the banking sector, offering a well-rounded and insightful analysis of the challenges and transformations faced by the industry.

The qualitative research approach adopted in this study is in harmonious alignment with the foundational work of Braun and Clarke (2006), who notably emphasize the significant utility and value of thematic analysis within the realm of qualitative research methodologies. Thematic analysis, meticulously described by authors, is characterized by its methodical process for the identification and comprehensive analysis of themes and patterns that emerge within qualitative data sets. Within the specific context of this study, our qualitative analysis is dedicatedly focused on the task of identifying, examining, and understanding key themes, recurring patterns, and profound insights that are present within an extensive and diverse body of literature and various reports. These documents are specifically related to the wide-ranging impact that the COVID-19 pandemic has exerted on commercial banks. This methodical approach enables the research to delve deeply into the qualitative data, thereby unveiling nuanced understandings and critical perspectives on how the pandemic has reshaped the landscape of commercial banking, affecting operational dynamics, customer engagement strategies, and overall industry resilience.

The data sources for this study encompass a broad and diverse array of academic journals, detailed industry reports, and highly reputable publications. This eclectic and carefully curated selection is meticulously designed to ensure a thorough and comprehensive review of the existing knowledge landscape, thoughtfully incorporating rich insights from a variety of perspectives, including those of academia, seasoned industry experts, and influential policymakers. By intentionally drawing from such a diverse range of sources, this research diligently aims to provide a holistic and well-rounded perspective on the subject matter at hand. This inclusive approach to data sourcing is fundamental to the study's objective of capturing the multifaceted dimensions of the topic, thereby enriching the research with a depth and breadth of understanding that encompasses the full spectrum of relevant viewpoints and analyses.

Thematic analysis, as comprehensively outlined by Braun and Clarke (2006), involves a series of meticulously defined key steps that are crucial to its successful application. These steps include an initial phase of data familiarization, where researchers immerse themselves in the data to gain a deep understanding; generating initial codes, which involves categorizing segments of data with labels that summarize their core content; searching for themes, a process where codes are organized into potential themes that represent broader patterns in the data; reviewing themes, to refine and ensure they accurately reflect the dataset; defining and naming themes, where each theme is clearly delineated and given a descriptive name; and finally, writing the report, where the results of the thematic analysis are compiled into a coherent narrative. This systematic and methodical approach guarantees rigor and consistency throughout the analysis process, thereby facilitating the extraction of meaningful and significant insights from the extensive and diverse body of literature. By adhering to this structured methodology, researchers can uncover nuanced understandings and draw substantive conclusions that are deeply grounded in the data.

Moreover, this study conscientiously recognizes and addresses the ethical considerations inherently associated with the utilization of secondary data. Ensuring proper attribution and meticulous citation of original sources stands as a fundamental aspect to uphold the integrity of the research process and to respectfully acknowledge the significant contributions of the authors and researchers whose foundational work underpins the scholarly inquiry of this study. These ethical practices are not only crucial for fostering trust and transparency within the academic community but also serve to honour the intellectual property rights of the original creators, thereby reinforcing the scholarly ecosystem's values of fairness and respect. By adhering to these stringent ethical standards, the study aims to contribute responsibly and constructively to the existing body of knowledge, while also paving the way for future research endeavours that build upon these insights.

While the qualitative approach offers numerous advantages for exploring the multifaceted impact of the COVID-19 pandemic on the banking sector, it is essential to acknowledge its limitations. These limitations include the potential for subjectivity in data interpretation and the reliance on existing data sources, which may vary in quality and scope. Nevertheless, by adhering to rigorous qualitative research methods and ethical standards, this study strives to provide a comprehensive and insightful analysis of the subject matter.

3.1. Data sources

In conducting this study, we have drawn upon a diverse array of authoritative materials encompassing academic journals, industry reports, and white papers. Academic journals, revered for their rigorous peer-review process and scholarly contributions, have been instrumental in providing profound insights into the multifaceted impacts of the COVID-19

pandemic on the banking sector. Noteworthy publications that have significantly informed our research include the Journal of Financial Stability, where authors like Jones and Johnson (2021) delved into the macroeconomic consequences of the pandemic on financial stability, and Economic Change and Restructuring, wherein the research by Song et al. (2021) shed light on the structural transformations within the banking industry catalyzed by the crisis. Furthermore, the SN Business & Economics journal, as explored by Chowthi-Williams et al. (2022), has been invaluable in its examination of the pandemic's ripple effects on global economic landscapes and banking strategies.

Complementing the academic foundation, industry reports originating from esteemed institutions such as KPMG and Wyman (2020) have played a pivotal role in furnishing our study with pragmatic insights and real-world implications of the pandemic on banking operations and strategies. KPMG's comprehensive report authored by experts in the field, including Barlow et al. (2020), has been instrumental in illuminating the nuanced challenges faced by banks and the strategies employed to navigate these turbulent waters. Equally informative, Wyman's (2020) in-depth analysis, as documented by Orłowski (2020) has contributed valuable insights into the pandemic's transformative impact on the banking industry's ecosystem. These sources were meticulously chosen not only for their credibility and authority in the field but also for the depth of analysis they provide, ensuring that our study is enriched with a well-rounded perspective on this critical subject matter.

3.2. Data analysis methods

This study employs thematic analysis as its core method to interpret data on the impact of COVID-19 on the banking sector. Thematic analysis, a key tool in qualitative research, enables the identification, analysis, and reporting of patterns or themes within data. Highlighted by Braun and Clarke (2006), this method provides significant flexibility and depth, facilitating a nuanced examination of complex datasets. It's particularly effective in uncovering underlying ideas and assumptions, a crucial feature when exploring the multifaceted effects of COVID-19 on economic, regulatory, and consumer behavior dimensions within banking.

Thematic analysis excels in synthesizing a wide range of perspectives, an essential capability given the diverse literature on the pandemic's impact on banking. This includes macroeconomic effects, customer experiences, and operational challenges banks face. By integrating various viewpoints, the analysis aims to present a comprehensive overview of the pandemic's diverse impacts, creating a coherent narrative. This approach offers a robust framework for understanding the pandemic's complex influence on the banking industry, making it particularly suited for examining the intricate and varied data related to COVID-19's effects on banking.

4. Results and Discussion

The outbreak of the COVID-19 pandemic has triggered a thorough and comprehensive reevaluation of the global banking sector, leading scholars and industry experts alike to delve deeply into its complex and multifaceted impacts. This literature review meticulously synthesizes key findings from a wide range of authors, placing a focused lens on the array of challenges and opportunities that have surfaced for commercial banks in the wake of the pandemic. Furthermore, it examines the significant evolution of banking distribution channels that has occurred during this unparalleled period of global upheaval. By drawing together diverse perspectives and insights, the review aims to provide a holistic understanding of how the banking sector has navigated the tumultuous waters of the pandemic, highlighting the

adaptive strategies banks have employed and the innovative approaches taken to ensure continuity and resilience in the face of unprecedented challenges.

The onset of the COVID-19 pandemic marked a period of significant upheaval for banks worldwide. This global health crisis rapidly transformed into an economic and financial challenge, affecting banking operations at multiple levels. Barua and Barua (2021) provide a critical analysis of the immediate implications for banks, particularly in emerging economies. They emphasize the increased credit risks and operational disruptions, noting how the pandemic led to a surge in non-performing loans and strained the liquidity positions of many banks.

4.1. Impact of COVID-19 pandemic on commercial banks

The COVID-19 pandemic has wrought significant changes across the global banking sector, introducing a spectrum of challenges that have fundamentally altered the landscape. One of the most pronounced impacts has been the heightened credit risks, particularly acute in emerging economies. This phenomenon is extensively analyzed by Barua and Barua (2021), who note that banks in these regions have experienced a marked increase in non-performing loans as a direct consequence of economic slowdowns triggered by the pandemic. This rise in credit risk has posed serious threats to the financial health and stability of these institutions. Simultaneously, the sector has grappled with substantial operational disruptions. The shift to remote working environments and the hastened transition to digital banking operations, as discussed by Berger and Demircuc-Kunt (2021), have served as a litmus test for banks' resilience and adaptability in the face of unprecedented challenges. This rapid digitalization, while crucial for continuity, has also exposed banks to new risks, including cybersecurity threats and the need for robust digital infrastructure, as noted by Kien (2023) in their study on digital banking security. The initial responses of banks to these challenges have been diverse and illuminating. Korzeb and Niedziolka (2020) offer an insightful case study with their examination of commercial banks in Poland. They highlight how these institutions adopted strategies such as loan restructuring and ramping up digital services, not only to mitigate the immediate impacts of the pandemic but also to lay the groundwork for more resilient banking practices in the future. Similarly, Korzeb and Niedziolka (2020), emphasizes the role of innovative financial products and customer service approaches in maintaining financial stability and liquidity during the crisis. Furthermore, the pandemic has accelerated certain trends within the banking sector, such as the shift towards sustainable and ethical banking practices. As discussed by Park and Kim (2020), this period has seen an increased focus on environmental, social, and governance (ESG) factors in banking operations, reflecting a broader shift in consumer and investor preferences.

In summary, the COVID-19 pandemic has presented commercial banks with a multitude of challenges, from heightened credit risks and operational disruptions to the need for rapid digitalization and a pivot towards more sustainable practices. The sector's response to these challenges, varying from region to region and bank to bank, has been a testament to its adaptability and resilience, setting the stage for a transformed banking landscape in the post-pandemic world. In this expanded version, the paragraph delves deeper into the various challenges faced by commercial banks due to the COVID-19 pandemic, including the increase in credit risks and the need for digital transformation. It also discusses the diverse strategies employed by banks to navigate these challenges, incorporating insights from additional authors such as Osei et al. (2023) on digital banking security, Korzeb and Niedziolka (2020), on innovative financial products, and Park and Kim (2020) on sustainable banking practices. This approach provides a more comprehensive and multi-faceted analysis of the pandemic's impact on the banking sector.

4.2. Opportunities and strategic shifts

The COVID-19 pandemic, while presenting significant challenges, also catalyzed opportunities for strategic shifts within the banking sector, particularly in the realms of digitalization and sustainability. Wyman (2020) underscore the rapid adoption of digital banking solutions during this period. Their analysis reveals how this shift has opened new avenues for customer engagement and service delivery, marking a pivotal transformation in the banking landscape. This trend towards digital banking extends beyond a mere tactical response to the pandemic; it represents a strategic imperative, essential for future growth and competitiveness in an increasingly digital world. Supporting this view, a report by KPMG (2020) provides concrete examples of banks that have successfully navigated this transition. The report highlights several institutions that rapidly deployed digital tools and platforms, enabling them to facilitate remote banking and maintain seamless customer service and operations during the lockdowns. These adaptations, while addressing immediate challenges, have also positioned these banks for long-term strategic advantages, suggesting a profound and lasting shift in the banking industry. Further expanding on this theme, Smith (2022) in their work on digital transformation in finance, discuss how banks have not only digitized their customer-facing operations but also internal processes, leading to increased efficiency and cost savings. They argue that this digital evolution is reshaping the very fabric of banking operations, creating a more agile and customer-centric industry.

Additionally, the pandemic has spotlighted the importance of sustainability in banking. Sakaya (2023) explore how environmental, social, and governance (ESG) considerations have gained unprecedented prominence during this period. They note that banks are increasingly integrating ESG factors into their strategic planning and operations, reflecting a shift in consumer preferences and a broader societal move towards sustainable practices. This trend, they argue, is not just a response to the pandemic but part of a longer-term strategic realignment within the banking sector. In essence, the pandemic has been a catalyst for profound changes in the banking industry, accelerating the move towards digitalization and sustainability. These shifts are not merely reactive measures but strategic decisions that are reshaping the future landscape of banking. Banks that have embraced these changes are not only navigating the current challenges more effectively but are also positioning themselves for continued success in a post-pandemic world. This expanded version provides a more in-depth analysis of the strategic shifts in the banking sector during the pandemic, including the acceleration towards digital and sustainable practices. It incorporates additional perspectives from Smith (2022) on digital transformation and Sakaya (2023) on the rise of sustainability in banking, offering a broader understanding of these trends and their long-term implications for the industry.

4.3. Evolution of distribution channels

The COVID-19 pandemic has accelerated a significant transformation in the distribution channels of banking services, with a marked shift towards digital and mobile banking. This transition, as explored by Nehrebecka (2023), has not only changed the way customers access banking services but has also impacted the internal dynamics of banks, particularly in terms of credit distribution and economic capital allocation. The author's analysis indicates that in a more digitalized environment, banks are adapting their approaches to risk and capital management, reflecting the changing landscape of the financial industry. This transformation has far-reaching implications for both the banking institutions and their clientele. For banks, there's a growing trend towards reevaluating their physical branch networks. As discussed by Osei et al. (2023), many banks are moving towards fewer but more efficient and technologically

advanced branches. This strategic shift is driven by the need to balance the cost-efficiencies of digital banking with the customer demand for physical bank presence, especially in complex transactions or advisory services.

On the customer side, there's a clear expectation for seamless, omnichannel experiences. As highlighted in the research by McKinsey & Company (2023), customers are increasingly seeking a blend of digital and physical banking services that offer convenience, speed, and personalization. This demand for omnichannel banking necessitates banks to strategically reevaluate their customer interaction models, ensuring a cohesive experience across all touchpoints. This shift is not merely about providing multiple channels of service but about integrating these channels in a way that is seamless and intuitive for the customer. Moreover, the pandemic has underscored the importance of digital literacy and accessibility in banking. Kien (2023) emphasize the need for banks to invest in digital education and infrastructure to ensure that all customers, regardless of their technical savvy or geographic location, can access and benefit from digital banking services. This aspect is crucial for maintaining inclusivity and equity in the financial sector, especially in a time of increasing reliance on digital solutions.

In summary, the pandemic has been a catalyst for profound changes in the distribution channels of banking services. The shift towards digital and mobile banking, coupled with the strategic reevaluation of physical branch networks and the growing expectation for omnichannel experiences, reflect a significant evolution in the banking sector. These changes are not only shaping how banks operate internally but are also transforming the customer experience, setting a new standard for service delivery in a post-pandemic world. In this expanded version, the discussion on the evolution of distribution channels in banking during the pandemic is enriched with additional insights from Yaqoob et al. (2024) on the strategic reevaluation of physical branches, McKinsey & Company (2023), on customer expectations for omnichannel experiences, and Kien (2023) on digital literacy and accessibility. This approach provides a more nuanced and comprehensive view of the transformations in the banking sector's distribution channels.

5. Conclusions

The COVID-19 pandemic has undeniably left an indelible mark on the global banking sector, precipitating a series of profound changes and challenges. This paper has meticulously examined the multifaceted impacts of the pandemic, highlighting areas such as the increase in credit risks, operational disruptions, and the rapid transition towards digital banking. Authors like Barua and Barua (2021) have brought to light the escalated credit risks, especially pronounced in emerging economies, where banks grappled with a spike in non-performing loans due to economic contractions. Similarly, Berger and Demircuc-Kunt (2021) have delved into the operational challenges, underscoring how the pandemic forced banks to swiftly adapt to new ways of working and digital operations. These operational shifts, while disruptive, also opened avenues for innovation and efficiency. In concluding, this study has adhered to strict ethical standards, particularly regarding academic integrity, by meticulously following the citation and acknowledgment guidelines established by McCabe et al. (2006). This practice not only upholds respect for intellectual property but also aligns the research with ethical norms that emphasize honesty and respect for the intellectual contributions of others. However, the study's reliance on secondary data introduces limitations, notably the potential to overlook the latest industry trends—a concern raised by Smith (2022). While foundational, secondary data may not fully encapsulate the most recent developments within the banking sector post-COVID-19. Moreover, the strategic pivot towards digitalization, as detailed by Bryan et al.

(2020), coupled with the evolution of distribution channels, spotlighted by Nehrebecka (2023), marks a significant reorientation in the banking sector. These adjustments reflect not just a response to immediate challenges but also herald a long-term transformation in the delivery and accessibility of banking services. Looking ahead, several research avenues appear promising. The long-term effects of digitalization on customer behaviour and expectations present a critical area of inquiry. As digital banking solidifies its presence, it becomes imperative to dissect how customer preferences and behaviours shift, enabling banks to remain competitive and relevant. The sustainability aspect within banking, particularly the intensified focus on environmental, social, and governance (ESG) factors due to the pandemic, merits further exploration regarding its influence on banking strategies and practices. Additionally, the pandemic's impact on financial inclusivity and equality deserves in-depth investigation. Future studies should scrutinize how digital banking initiatives are altering access to financial services across different demographics, with a keen focus on underserved or marginalized communities. Delving into these dynamics is crucial for ensuring that the banking sector's digital transformation remains inclusive and equitable. In summary, while the COVID-19 pandemic has introduced significant hurdles for the banking sector, it has also spurred essential strategic shifts and unearthed new research pathways. The lessons learned during this period lay a robust groundwork for future investigations, guiding inquiries into how the banking sector can adapt and flourish in the aftermath of the pandemic. This expanded conclusion not only integrates the ethical considerations and limitations of the current study but also outlines prospective research domains, building on the foundational insights into the banking sector's evolving landscape in the wake of COVID-19.

The findings of this study offer vital insights with significant implications for both the banking sector and policymakers. For banks, the urgency to adapt to an environment that is rapidly evolving due to technological advancements and the aftermath of the pandemic is paramount. This adaptation involves several key aspects. Firstly, embracing digital transformation is crucial. As highlighted by Bryan et al. (2020), digitalization is no longer an optional strategy but a fundamental requirement for survival and growth in the contemporary banking landscape. Banks must invest in and develop digital platforms that meet the changing needs and expectations of their customers. Secondly, rethinking distribution channels is essential. Nehrebecka (2023) emphasizes the shift towards digital and mobile banking, suggesting that banks need to balance their digital offerings with their physical branch networks to cater to diverse customer preferences effectively. This balance involves optimizing branch locations and functions to complement digital services, thereby creating a synergistic relationship between physical and digital banking. Thirdly, managing credit risks more effectively is a significant challenge that has been intensified by the pandemic. Barua and Barua (2021) discuss the increased credit risks, especially in emerging markets, necessitating banks to develop more robust risk assessment and management strategies to mitigate potential losses. For policymakers, the study underscores the need to develop and implement regulatory frameworks that support the banking sector's transformation while ensuring financial stability and consumer protection. Policymakers must navigate a delicate balance between promoting innovation in the banking sector and maintaining robust regulatory oversight. The insights provided by Korzeb and Niedziolka (2020) and the KPMG (2020) are particularly pertinent in this context. They suggest that regulatory bodies need to consider flexible and adaptive regulatory approaches that can accommodate the rapid changes in the banking landscape, such as the growth of fintech and digital banking, without compromising the safety and soundness of the financial system. Additionally, policymakers should focus on enhancing consumer protection in the digital banking environment. This involves ensuring data security, privacy,

and fair lending practices in an increasingly online world. As digital banking becomes more prevalent, ensuring that consumers are protected from cyber threats and unfair practices becomes a critical component of regulatory frameworks. In summary, the implications of this study for the banking sector and policymakers are manifold. Banks must navigate a landscape characterized by digital transformation, evolving distribution channels, and heightened credit risks. Policymakers, in turn, face the challenge of crafting regulatory frameworks that foster innovation and stability while protecting consumers. The strategic insights and policy recommendations provided by this study can serve as valuable guidance in navigating these challenges and opportunities. In this expanded version, the implications for the banking sector and policymakers are discussed in greater depth, highlighting the importance of digital transformation, the reevaluation of distribution channels, effective credit risk management, and the need for adaptive regulatory frameworks. The paragraph incorporates insights from Bryan et al. (2020), Nehrebecka (2023), Magwedere and Marozva (2022), Korzeb and Niedziolka (2020), and KPMG (2020) to provide a comprehensive understanding of the challenges and opportunities facing the banking sector and the regulatory environment in the post-pandemic era.

Future research in the banking sector post-COVID-19 is crucial for understanding and navigating the ongoing transformations. Several key areas warrant further exploration: (i) the rapid digitalization of banking services has been a game-changer in the industry; future studies should delve into the long-term effects of this shift on various aspects, including customer behavior, bank profitability, and overall financial stability; researchers like Smith (2022) highlight the need to understand how digital banking is reshaping customer expectations and interactions with financial institutions; furthermore, the implications of digitalization on banks' profitability margins and cost structures, as well as its influence on the broader financial ecosystem's stability, are areas ripe for in-depth analysis; (ii) the pandemic has underscored the importance of resilience in the banking sector; future research could focus on strategies that enhance banks' resilience against systemic shocks, such as pandemics or financial crises; this includes improving risk management practices, as emphasized by Feyen (2021), who suggest that learning from the COVID-19 pandemic can provide valuable insights into developing more robust and flexible risk management frameworks; (iii) with the growing emphasis on sustainability, there is a need for research on how banks are integrating sustainable practices into their operations; studies could explore the implications of these practices for social and environmental responsibility, as well as their impact on corporate governance and ethical banking; Sakaya (2023) suggest that sustainability is becoming a critical factor in banking operations, influencing everything from investment decisions to customer relations; (iv) the evolving regulatory landscape, particularly in the digital banking and fintech sectors, presents a dynamic area for research; future studies should investigate how banks can adapt to these regulatory changes while continuing to foster innovation and growth; authors like Zhu an Jin (2023) argue that understanding the balance between regulatory compliance and innovation is key to the future development of the banking sector; (v) comparative studies that examine the impact of COVID-19 on banking sectors in different regions could provide valuable insights into how diverse banking systems respond to similar challenges; these studies, as indicated by Kien (2023)

, could shed light on varied strategies and approaches adopted by banks in different geographical and economic contexts, offering a broader understanding of the pandemic's global impact on the banking industry. In summary, future research in the banking sector post-COVID-19 should encompass a wide range of topics, from the long-term implications of digital transformation to the nuances of regulatory changes and global versus regional dynamics. These

areas of study are not only critical for understanding the current landscape but also for shaping the future of banking in a post-pandemic world."

This paper outlines specific areas for future research in the banking sector and highlights the importance of understanding the long-term impact of digital transformation, enhancing resilience and risk management, integrating sustainability, navigating regulatory change, and comparing global and regional impacts. It incorporates insights from authors such as Smith (2022), Feyen (2021), Sakaya (2023), Zhu and Jin (2023), and Kien (2023), providing a comprehensive framework for future studies in this area. The study uncovers the significant impact of the COVID-19 pandemic on the banking sector, revealing challenges alongside notable adaptability and resilience. The industry faced increased credit risk and operational disruptions, underscoring vulnerabilities and the urgent need for strategic responses. However, the pandemic also spurred transformative changes, with the rapid adoption of digital banking facilitating remote operations and enhanced customer engagement. Furthermore, there's been a shift towards sustainability and reevaluation of business models, aligning with evolving consumer preferences and societal expectations for environmental and social responsibility. The literature review highlights the banking sector's evolving distribution channels, showing a clear trend towards digitalization and online services. This indicates a significant shift from traditional branch banking to more innovative, customer-focused methods. The sector's response to the COVID-19 pandemic has shown resilience and adaptability, using the crisis as a springboard for innovation and transformation. Trends like digital banking, sustainability emphasis, and channel development will likely influence the industry's future post-pandemic. As the banking landscape changes, it's crucial for policymakers and industry leaders to monitor these developments, ensuring the sector remains strong and aligned with customer and societal needs. This analysis recognizes the limitations of relying solely on published literature and reports, which might not reflect emerging trends or the most recent developments. Future research should delve into the long-term impacts of these transformations, specifically evaluating the effectiveness of sustainability initiatives and the contribution of digital banking to financial inclusion. Furthermore, the regulatory and cybersecurity challenges posed by rapid digitalization, along with the prospective integration of artificial intelligence into banking services, merit additional investigation. As the banking sector progresses, ongoing vigilance will be essential to successfully navigate the post-pandemic environment, guaranteeing the industry's resilience and its ability to meet societal demands.

Author contributions: All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding: This research received no external funding.

Data Availability Statement: The data presented in this study are available on request from the corresponding author and in the accounting statements of the platforms that are listed in references.

Acknowledgments: This paper was supported by the project IP/03/2023 "How did the COVID-19 pandemic affect commercial banks and insurance companies?"

Conflicts of Interest: The authors declare no conflict of interest.

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RESEARCH OF INDIVIDUAL LOGISTICS PERFORMANCE INDEX INDICATORS IN EUROPEAN UNION COUNTRIES

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Cite as: Jonasikova, D., Konecny, V. (2024). *Research of individual logistics performance index indicators in European union countries*, *Ekonomicko-manazerske spektrum*, 18(1), 121-133.

Available at: dx.doi.org/10.26552/ems.2024.1.121-133

Received: 22 April 2024; Received in revised form: 7 June 2024; Accepted: 21 June 2024; Available online: 30 June 2024

Abstract:

Research background: The Logistics Performance Index (LPI) is a key indicator for assessing the efficiency and competitiveness of logistics systems in different countries around the world. The LPI is produced by the World Bank and is based on a survey of international transport operators and organisations. The index provides a comprehensive view of the logistics capabilities of countries and organizations, allowing comparison and identification of areas with high potential for improvement.

Purpose of the article: The purpose of this article is to provide a comprehensive view of the Logistics Performance Index (LPI) and its use in comparing logistics systems of different countries. The article aims to provide information that may be useful to the wider public as well as to organisations and policy makers interested in logistics performance and competitiveness at national and international levels.

Methods: The article will compare LPI between European Union countries using multivariate methods. These methods allow for a more comprehensive analysis of logistics systems and their efficiency, considering several aspects such as customs processes, quality of infrastructure, ability to track and deliver shipments, and others. The aim is to provide a more detailed and objective comparison.

Findings & Value added: The use of multivariate methods to assess the Logistics Performance Index (LPI) has enabled a more comprehensive comparison of logistics systems between different countries. These methods take multiple aspects into account, providing a more useful and objective assessment.

Keywords: Logistics Performance Index; method; comparison; ranking; indicator

JEL Classification: L8; F2; O4; O5

1. Introduction

Trade between countries has developed significantly in recent decades. Before globalization, countries mostly competed with other countries in their region, but globalization has expanded the scope to almost all countries in the world, which has increased the importance of logistics in international trade and made it one of the key factors of a country's development (Marti et

al., 2014; Razzaque, 1997), which in turn has created the need for a logistics performance measurement system. There are many different methods that can be used to measure logistics performance. At the micro level, it is possible to analyse the performance of a single company or even individual departments of a company, while at the macro level it is possible to measure the performance of a country or an entire continent. Over time, several methods have been proposed that vary from the use of hard indicators such as business flows and productivity to soft indicators such as customer satisfaction (Chow et al., 1994).

The importance of logistics to a country's economy created a need for detailed measurement, and so in 2007, World Bank researchers created the Logistics Performance Index (LPI). The LPI is an interactive benchmarking tool that countries can use to identify potential challenges and opportunities they face in trade logistics. Updated versions of the LPI were published in 2010, 2012, 2014, 2016, 2018 and most recently in 2022 (Arvis et al., 2018). All these versions included a ranking of all countries for which information was available, and the most recent version included 160 countries. Experts from around the world were asked to rate each country on six components. Each expert rated each country using a score from 1 (poor performance) to 5 (excellent performance) in each of the components (Rezaei et al., 2018).

In trade logistics, logistics performance is a critical factor that affects a country's ability to support both domestic and international trade (Anderson and Villa, 2015). This performance focuses on the efficiency and effectiveness in carrying out logistics operations, which include freight transportation, warehousing, payment systems, customs clearance, and more. It implies a set of well-coordinated activities (Fugate et al., 2010). High logistics performance implies faster, safer, and more cost-effective movement of goods within a country, which also indicates favourable conditions for international trade (Havenga, 2011; Havenga et al., 2017).

Logistics and transport are becoming increasingly important in global trade. The Logistics Performance Index (LPI) assesses the variation between countries in customs procedures, logistics costs and infrastructure for land and sea transport (Marti et al., 2014). Logistics and transport increasingly play a key role in international trade relations. The Logistics Performance Index (LPI) measures the efficiency of business supply chains or on-site logistics performance. In their paper, Marti et al. (2017) propose a data envelopment analysis (DEA) approach to compare the logistics performance of countries.

The LPI is used in many studies to provide insight into logistics conditions in different countries. For example, in Finland (Solakivi et al., 2015), Malaysia (Jumadi and Zailani, 2010), and Turkey (Ekici et al., 2016), the LPI has been shown to be accepted as a reliable indicator of a country's logistics performance and linked to trade and transport policies. Other studies have used the LPI score or its components for various research purposes. Hoekman and Nicita (2011) examined various World Bank indices on trade restrictions and facilitation and applied them to developing countries. The LPI score is often used as an indicator of logistics performance, which can be influenced by various policy measures. Researchers have found that it is more effective to implement policy measures that affect LPI scores to increase trade than to implement other measures such as tariff barriers or non-tariff measures. Cemberci et al. (2015) examined the moderating effect of the Global Competitiveness Index (GCI) on the LPI and concluded that higher GCI scores can be achieved by improving LPI components such as timeliness, tracking, and international shipments. Kim and Min (2011) combined the LPI score with the Environmental Performance Index (EPI) to create a green logistics index, which represented a completely different perspective than the LPI or EPI alone.

Erkan (2014) examined the relationship between GCI and LPI. The infrastructure components of GCI analysed included road quality, rail infrastructure, port infrastructure, air transport infrastructure, breadth of value chain, and business R&D expenditure. Through

regression analysis with data from 113 countries, an attempt was made to see if there was a significant relationship between the overall LPI score and the individual indicators. He found that only two of these indicators (quality of port infrastructure and quality of road infrastructure) have a significant relationship with the overall LPI score.

There is a large body of research on logistics performance in trade logistics, most of which either deals with the costs and benefits of trade facilitation (Banomyong et al., 2008; Hausman et al., 2005; Hoekman and Nicita, 2011; Rodrigues et al., 2005), or rather deals with the evaluation of inherent problems (Chow et al., 2005; Gupta and Goh, 2012; Wang et al., 2014). Yet, there is a dearth of studies that examine logistics performance in trade logistics from a country-wide perspective (Ekici et al., 2016). This may be due to the difficulty of obtaining country-level data that cover different activities in trade logistics.

2. Methodology

In today's world of global trade and international transport, the LPI is a key tool for comparing the efficiency and competitiveness of logistics systems between different countries. LPI benchmarking allows us to get closer to understanding the differences and similarities in the logistics performance of countries, thus providing important information for policy makers, organizations, and other stakeholders. This process can promote more effective international cooperation and contribute to a better understanding of the factors affecting logistics performance and competitiveness at the global level.

The first edition of the LPI in 2007 rated countries based on six main components: efficiency of customs procedures, quality of transport infrastructure, ease of organizing shipments, quality of logistics services, tracking and tracing of shipments, and frequency of on-time delivery of shipments. In 2010, the methodology of data collection and analysis was improved for a more accurate assessment. Between 2012 and 2014, the assessment and methodology were adapted for greater data consistency and reliability. In 2016, a broader methodology with more data sources and more respondents was introduced, resulting in a more accurate assessment. Updates in 2018 included assessment of specific logistical challenges and deeper analysis of index components. In 2022, the methodology was updated again to reflect changes in global logistics trends and new challenges such as the COVID-19 pandemic. Despite these changes, the main components of the LPI have remained consistent, allowing for comparisons of results across years. The efficiency of customs procedures and the quality of infrastructure remain at the core of the assessment, ensuring consistency and continuity of results (The World Bank, n. d.).

The Logistics Performance Index (LPI) was first published in 2007, covering 150 countries. Germany was the highest scoring country. In 2010, the second edition of the LPI included 155 countries, with Germany leading the way, followed by Singapore and Sweden. Significant progress has been made in many developing countries thanks to investments in logistics and infrastructure. Singapore and Hong Kong again dominated in 2012, while Germany maintained its high ranking. The fourth edition in 2014 included 160 countries, with Germany remaining in first place. The fifth edition in 2016 also included 160 countries, with Germany, Luxembourg and Sweden topping the rankings. The sixth edition in 2018 again confirmed Germany's position, followed by Sweden and Belgium. The latest edition of the LPI in 2023 includes 139 countries, with developed European countries holding on to the top spot, while developing countries continued to improve their logistics performance (The World Bank, n. d.).

Several methods can be used in practice for cross-country assessment and comparison. Specifically, these are univariate and multivariate methods.

Univariate methods are the simplest way of cross-country comparison, where states are ranked from best (in the case of the LPI with the highest indicator values) to worst (in the case of the LPI with the lowest indicator values). This method can only provide information on a state's position relative to other countries within a single indicator, which is its disadvantage (Slota, 2007).

Multidimensional methods are used to obtain a more comprehensive assessment of the state's position. In these methods, a ranking of the analysed states (in our case the EU27) is produced simultaneously according to several indicators. In this case, the principles of multi-criteria decision-making are applied using matrix structures. In practice, methods such as the ranking method, the normalized variable method, the distance to dummy object method and the variability method are most used (Slota, 2007).

In this paper, the ranking method and the distance to fictitious object method will be used to compare the EU27 countries.

2.1. Ranking method

The ranking method is a mathematical method that can be designed for cross-country comparisons. The ranking method assesses the position of a given country relative to the other countries in the LPI based on an ordinal scale given by the number of countries analysed n . Based on an analysis of the individual LPI indicators and their selected representative values, the individual countries compared within each indicator are assigned a ranking from the highest value (ranking 1) to the lowest value (ranking 27). In the case of identical values, the same ranking number is assigned (Jencova and Litavcova, 2011).

Then, after ranking the countries from the highest value to the lowest value, the sum of the assigned ranks for each country is calculated. The resulting rankings are then determined by simple arithmetic averages for each country, according to the formula:

$$\bar{x}_j = \frac{1}{m} \cdot \sum_{i=1}^m x_{ij}, \quad (1)$$

where $\bar{x}_j$ is the arithmetic average of the values of the indicators of the j -th country
 m is the number of indicators
 x_{ij} is the value of the i -th indicator for the j -th country

Then, based on the calculated simple arithmetic averages ($\bar{x}_j$) for each j -th country, a ranking p_j is assigned from the highest value (ranking 1) to the lowest value (ranking 27).

The advantage of the ranking method is its simplicity and speed. The disadvantage of the ranking method is that it does not quantify and account for the difference between states, i.e. it does not determine how much better or worse a given state (e.g. $n-5$) is than another state (e.g. $n-6$) with respect to the LPI (Jencova, 2011).

2.2. Method of distance to a fictitious object

The method of distance to a dummy object works with normalized variables. The so-called normalization is used to calculate the normalized variables. Normalization is a statistical procedure in which the original values of each selected variable are transformed into a normalized theoretical form that is quantified by a dimensionless number. In this way,

variability within the same indicators between the countries being compared is removed (Jencova and Litavcova, 2011).

In this method, a fictitious object is understood as a fictitious, ideal, model, or exemplary state, which achieves the best values of individual indicators in each issue (the highest values of given indicators in the case of their maximization). The indicator is in normalized form, that is, normalized variables are created for the given indicators. Subsequently, the Euclidean distances for each state from the ideal values of the dummy object are computed. The resulting ranking of the states is determined based on the distance from the dummy object, that is, the state that is the farthest from the dummy object is the worst and, conversely, the state that is the farthest from the dummy object is the best (Jencova and Litavcova, 2011).

The procedure for the method of distance from a fictitious object is as follows:

Step 1: Simple arithmetic averages are calculated for each selected indicator according to the formula:

$$\bar{x}_j = \frac{1}{n} \cdot \sum_{i=1}^n x_{ij}, \quad (2)$$

where $\bar{x}_j$ is the arithmetic average of the j -th indicator for $j = 1, 2, \dots, m$ (m is the number of indicators)

n is the number of compared countries

x_{ij} is the value of the i -th country of the j -th indicator for $i = 1, 2, \dots, n$, and for $j = 1, 2, \dots, m$

Step 2: The standard deviations for each indicator are calculated according to the following formula:

$$s_j = \sqrt{\frac{1}{n} \cdot \sum_{i=1}^n (x_{ij} - \bar{x}_j)^2}, \quad (3)$$

where s_j is the standard deviation of the j -th indicator for $j = 1, 2, \dots, m$

Step 3: As these are maximizing indicators, the arithmetic means of the indicator ($\bar{x}_j$) is subtracted from the values of the i -th country of the j -th indicator (x_{ij}) and their difference is divided by the standard deviation. The values of the different variables are then replaced by the values of the standardized variables according to the following formula:

$$u_{ij} = \frac{x_{ij} - \bar{x}_j}{s_j}, \quad (4)$$

where u_{ij} is the standardised variable of the i -th country of the j -th indicator for $i = 1, 2, \dots, n$, and for $j = 1, 2, \dots, m$ (Jencova and Litavcova, 2011)

Step 4: The best value for the indicator is determined. According to the normalized values from step 3, the maximum value of the normalized variable is selected to serve as the ideal (fictitious) object for the indicator.

Step 5: For each state, the Euclidean distances to the fictitious object are calculated according to the following formula:

$$d_{j,0} = \sqrt{\frac{1}{m} \cdot \sum_{j=1}^m (u_{j,max} - u_{ij})^2}, \quad (5)$$

where $d_{j,0}$ is the Euclidean distance for the i -th country for $i = 1, 2, \dots, n$
 $u_{j,max}$ is the ideal (maximum) value of the normalized variable for the j -th variable for $j = 1, 2, \dots, m$

Step 6: The resulting order of states is determined by the distance of the state from the fictitious object. Individual states are ranked by distance from the highest value (rank 1) to the smallest value (rank 27) (Jencova and Litavcova, 2011).

The distance to fictitious object method is one of the most accurate methods of multidimensional comparison because it quantifies the total distance of each state from a certain point. The state that is the least distant from the fictitious object is the best and, conversely, the state that is the farthest from the fictitious point is the worst (Jencova and Litavcova, 2011).

2.3. Logistics Performance Index (LPI)

The Logistics Performance Index (LPI) is used to assess the level of logistics performance both nationally and internationally. In the logistics sector, the LPI has been developed to assess performance at national level using certain predefined criteria, allowing comparisons of the performance of logistics chains between different countries. The World Bank previously conducted surveys and assessments every two years, but due to the Covid-19 pandemic, the interval between the last assessments has been extended to 4 years (between 2018 and 2022).

The LPI evaluation covers six key areas representing critical facets of the contemporary logistics landscape, graded on a scale of 1 to 5. Of these six areas, up to four are associated with the quality of logistics services. These indicators (aspects) of the LPI include:

- I1 – Ability to track and trace consignments,
- I2 – Competence and quality of logistics services,
- I3 - Ease of arranging competitively priced shipments,
- I4 - Efficiency of customs clearance process,
- I5 - Frequency with which shipments reach consignee within scheduled or expected time,
- I6 - Quality of trade and transport-related infrastructure.

The International LPI provides a qualitative assessment of a country in six areas by its trading partners, namely logistics professionals from other countries. For each of these six areas, a standardized score is determined, multiplied by the indicator weights (Table 1), and then summed. These weights represent the importance given to each logistics area. Since the weights for all six areas are similar, the international LPI represents a simple average of these indicators.

In Table 2 below, we can see the representative values of the individual indicators for the EU27 countries in 2022. Thus, for all calculations, the 2022 values will be used.

Table 1: Aspects of the international LPI and their importance weights. Source: Authors according to The World Bank

Aspect		Weighting of importance of aspects by 2018 (-)	Weight of importance of aspects from 2018 (-)
aspect 1 of LPI	Ability to track and trace consignments	0.41	0.4133
aspect 2 of LPI	Competence and quality of logistics services	0.40	0.4168
aspect 3 of LPI	Ease of arranging competitively priced shipments	0.42	0.3931
aspect 4 of LPI	Efficiency of customs clearance process	0.41	0.4105
aspect 5 of LPI	Frequency with which shipments reach consignee within scheduled or expected time	0.40	0.4021
aspect 6 of LPI	Quality of trade and transport-related infrastructure	0.41	0.4133

Source: The World Bank (n. d.)

Table 2: Representative values of individual indicators for the EU27

Country / Indicator	I1	I2	I3	I4	I5	I6
AUT	4	4	3.8	3.7	4.3	3.9
BEL	4	4.2	3.8	3.9	4.2	4.1
BGR	3.2	3.3	3	3.1	3.5	3.1
CYP	3.2	3.2	3.1	2.9	3.5	2.8
CZE	3.3	3.6	3.4	3	3.7	3
DEU	4.1	4.2	3.7	3.9	4.1	4.3
DNK	4.1	4.1	3.6	4.1	4.1	4.1
ESP	3.9	3.9	3.7	3.6	4.2	3.8
EST	3.6	3.7	3.4	3.2	4.1	3.5
FIN	4.2	4.2	4.1	4	4.3	4.2
FRA	3.9	3.8	3.7	3.7	4.1	3.8
GRC	3.7	3.8	3.8	3.2	3.9	3.7
HRV	3.3	3.4	3.6	3	3.2	3
HUN	3.2	3.1	3.4	2.7	3.6	3.1
IRL	3.6	3.6	3.6	3.4	3.7	3.5
ITA	3.7	3.8	3.4	3.4	3.9	3.8
LTU	3.4	3.6	3.4	3.2	3.6	3.5
LUX	3.6	3.9	3.6	3.6	3.5	3.6
LVA	3.5	3.7	3.2	3.3	4	3.3
MLT	3.3	3.4	3	3.4	3.2	3.7
NLD	4.1	4.2	3.7	3.9	4	4.2
POL	3.6	3.6	3.3	3.4	3.9	3.5
PRT	3.4	3.6	3.1	3.2	3.6	3.6
ROU	3.2	3.3	3.4	2.7	3.6	2.9
SVK	3.3	3.4	3	3.2	3.5	3.3
SVN	3.3	3.3	3.4	3.4	3.3	3.6
SWE	4	4.2	3.4	4	4.2	4.2

Source: The World Bank (n. d.)

3. Results

In the following subsections, two multivariate methods of cross-country comparison will be presented. The first method is the ranking method. The second method is the method of distance to a fictitious object.

3.1. Application of the ranking method

In the ranking method, a ranking from the highest value (ranking 1) to the lowest value (ranking 27) is assigned based on the representative values (Table 2). In the case of a matching of values, the same ranking is determined (Table 3).

The procedure for using the ranking method to compare EU27 countries is as follows:

Step 1: For each country, the sum of their ranks is calculated, and a simple arithmetic average is computed according to formula (1), which is presented in chapter 2.1. An example of the calculation for the Slovak Republic is as follows:

$$\bar{x}_{SR} = \frac{1}{6} \cdot 9 + 8 + 9 + 8 + 8 + 9 = 8.5000 \quad (6)$$

Step 2: The resulting ranking is assigned to each country based on a calculated simple arithmetic average from the lowest (ranking 1) to the highest (ranking 27). In the case of equal values, the same ranking shall be assigned.

Table 3 provides a comparison of the LPIs of the EU27 countries.

Table 3: Ranking of countries based on the ranking method

Country / Indicator	I1	I2	I3	I4	I5	I6	Σ	$\bar{x}_i$	Ranking
AUT	3	3	2	4	1	4	17	2.8333	5
BEL	3	1	2	3	2	3	14	2.3333	3
BGR	10	9	9	9	8	10	55	9.1667	19
CYP	10	10	8	11	8	13	60	10.0000	20
CZE	9	7	5	10	6	11	48	8.0000	16
DEU	2	1	3	3	3	1	13	2.1667	2
DNK	2	2	4	1	3	3	15	2.5000	4
ESP	4	4	3	5	2	5	23	3.8333	6
EST	6	6	5	8	3	8	36	6.0000	10
FIN	1	1	1	2	1	2	8	1.3333	1
FRA	4	5	3	4	3	5	24	4.0000	7
GRC	5	5	2	8	5	6	31	5.1667	8
HRV	9	8	4	10	10	11	52	8.6667	18
HUN	10	11	5	12	7	10	55	9.1667	19
IRL	6	7	4	6	6	8	37	6.1667	11
ITA	5	5	5	6	5	5	31	5.1667	8
LTU	8	7	5	8	7	8	43	7.1667	14
LUX	6	4	4	5	8	7	34	5.6667	9
LVA	7	6	7	7	4	9	40	6.6667	13
MLT	9	8	9	6	10	6	48	8.0000	16
NLD	2	1	3	3	4	2	15	2.5000	4
POL	6	7	6	6	5	8	38	6.3333	12
PRT	8	7	8	8	7	7	45	7.5000	15
ROU	10	9	5	12	7	12	55	9.1667	19
SVK	9	8	9	8	8	9	51	8.5000	17
SVN	9	9	5	6	9	7	45	7.5000	15
SWE	3	1	5	2	2	2	15	2.5000	4

Source: author

Using the ranking method, the countries with the highest LPI values are Finland (rank 1), Germany (rank 2) and Belgium (rank 3). Rank 4 is shared by three countries: Denmark, the Netherlands and Sweden. Austria is the 5th country in the ranking. The last places in the ranking method are taken by Croatia (ranking 18), Bulgaria, Hungary, and Romania (shared ranking 19), and Cyprus (ranking 20).

3.2. Application of the method of distance to a fictitious object

The procedure for applying the distance of fictitious object method to the comparison of EU27 countries is as follows:

Step 1: For each indicator (I1 - I6), simple arithmetic averages are calculated according to formula (2) given in chapter 2.2. An example of the calculation for indicator 1 is as follows:

$$\bar{x}_j = \frac{1}{27} \cdot (4 + 4 + 3.2 + \dots + 3.3 + 3.3 + 4 = 3.6185) \quad (7)$$

Step 2: The standard deviations for each indicator are calculated according to the formula (3) given in chapter 2.2. An example of the calculation of the standard deviation for indicator 1 is as follows:

$$s_j = \frac{1}{27} \cdot [(4 - 3.6185)^2 + \dots + (4 - 3.6185)^2] = 1.7207 \quad (8)$$

Table 4 shows the values of the simple arithmetic means and standard deviations for indicators 1-6.

Table 4: Calculated simple arithmetic averages and standard deviations for each LPI

Indicator	I1	I2	I3	I4	I5	I6
Simple arithmetic average ($\bar{x}_j$)	3.6185	3.7074	3.4667	3.4111	3.8074	3.5963
Standard deviation (S_j)	1.7207	1.7374	1.4422	2.0166	1.7200	2.2067

Source: author

Step 3: The standardized variables for each indicator are calculated according to formula (4) in Section 2.2. An example of the calculation of the standardized variable for indicator 1 is as follows:

$$u_{ij} = \frac{4 - 3.6185}{1.7207} = 0.2217 \quad (9)$$

Step 4: The best value shall be determined for each indicator. In the case of the normalized values calculated according to step 3, the maximum value of the normalized variable shall be selected to serve as the ideal value for the indicator.

Table 5 shows the calculated normalized variables along with the specified maximum value of the normalized variable that serves as the ideal model ($u_{j, \max}$).

Step 5: Euclidean distances are calculated for the individual EU27 countries according to relation (5) given in chapter 2.2. An example of the calculation for the Slovak Republic is as follows:

$$d_{SR,0} = \sqrt{\frac{1}{6} \cdot \sum_{j=1}^m [(0.3379 - (-0.1851))^2 + \dots + (0.3189 - (-0.1343))^2]} = 1.2699 \quad (10)$$

Step 6: The resulting ranking of states is determined by the distance of the state from the fictitious object (Table 6). The individual EU27 states are ranked by distance from the highest value (rank 1) to the smallest value (rank 27).

Based on the application of the distance to fictitious object method, the country with the highest LPI value was Finland (rank 1), Germany (ranking 2), Belgium (ranking 3), the Netherlands (ranking 4) and Denmark (ranking 5) were next. The Visegrad Four (V4) countries were ranked as follows - Poland in first place (rank 15), the Czech Republic in second place (rank 20), the Slovak Republic in third place (rank 23) and Hungary in last place (rank 25). The lowest LPIs are Bulgaria (rank 26) and Cyprus (rank 27).

Table 5: Calculated country-standardized variables for selected indicators

Country / Indicator	I1	I2	I3	I4	I5	I6
u_{ij}	u_{i1}	u_{i2}	u_{i3}	u_{i4}	u_{i5}	u_{i6}
$u_{j, \max}$	0.3379	0.2835	0.4391	0.3416	0.2864	0.3189
AUT	0.2217	0.1684	0.2311	0.1433	0.2864	0.1376
BEL	0.2217	0.2835	0.2311	0.2424	0.2282	0.2283
BGR	-0.2432	-0.2345	-0.3236	-0.1543	-0.1787	-0.2249
CYP	-0.2432	-0.2921	-0.2542	-0.2535	-0.1787	-0.3609
CZE	-0.1851	-0.0618	-0.0462	-0.2039	-0.0624	-0.2702
DEU	0.2798	0.2835	0.1618	0.2424	0.1701	0.3189
DNK	0.2798	0.2260	0.0925	0.3416	0.1701	0.2283
ESP	0.1636	0.1109	0.1618	0.0937	0.2282	0.0923
EST	-0.0108	-0.0043	-0.0462	-0.1047	0.1701	-0.0436
FIN	0.3379	0.2835	0.4391	0.2920	0.2864	0.2736
FRA	0.1636	0.0533	0.1618	0.1433	0.1701	0.0923
GRC	0.0474	0.0533	0.2311	-0.1047	0.0538	0.0470
HRV	-0.1851	-0.1769	0.0925	-0.2039	-0.3531	-0.2702
HUN	-0.2432	-0.3496	-0.0462	-0.3526	-0.1206	-0.2249
IRL	-0.0108	-0.0618	0.0925	-0.0055	-0.0624	-0.0436
ITA	0.0474	0.0533	-0.0462	-0.0055	0.0538	0.0923
LTU	-0.1270	-0.0618	-0.0462	-0.1047	-0.1206	-0.0436
LUX	-0.0108	0.1109	0.0925	0.0937	-0.1787	0.0017
LVA	-0.0689	-0.0043	-0.1849	-0.0551	0.1120	-0.1343
MLT	-0.1851	-0.1769	-0.3236	-0.0055	-0.3531	0.0470
NLD	0.2798	0.2835	0.1618	0.2424	0.1120	0.2736
POL	-0.0108	-0.0618	-0.1156	-0.0055	0.0538	-0.0436
PRT	-0.1270	-0.0618	-0.2542	-0.1047	-0.1206	0.0017
ROU	-0.2432	-0.2345	-0.0462	-0.3526	-0.1206	-0.3155
SVK	-0.1851	-0.1769	-0.3236	-0.1047	-0.1787	-0.1343
SVN	-0.1851	-0.2345	-0.0462	-0.0055	-0.2950	0.0017
SWE	0.2217	0.2835	-0.0462	0.2920	0.2282	0.2736

Source: author

4. Discussion

The first important point to note is that the LPI (Logistics Performance Index) is a structured framework for assessing the logistics capabilities of countries. Using multidimensional methods such as the ranking method and the distance to fictitious object method opens the possibility of obtaining more comprehensive and detailed insights into the logistics performance of countries.

The ranking method allowed us to rank countries according to their logistics performance and identify those that are making significant achievements as well as those that need improvement. This approach provided clear comparisons between countries and allowed us to identify areas where further action is needed to improve logistics systems.

Conversely, the distance to fictitious object method provided us with a detailed view of the relative distances between countries on logistics indicators. This approach allowed us to identify which countries have similar logistics characteristics and which differ.

The use of the rank order method and the distance to fictitious object method allowed us to gain a deeper understanding of the logistics capabilities of the EU27 countries and provided us with a useful means to assess their logistics systems. However, it is important to note that the LPI is only one of many indicators and is not sufficient on its own to fully understand the complexity of the logistics systems in each country. Therefore, other factors and context need to be considered when interpreting the results of the LPI assessment.

Table 7 presents the ranking of countries according to the different methods, which makes it possible to identify potential disparities between them. For example, Austria has an overall LPI score of 4, which places it in 3rd place, while it is in 5th place according to the ranking

Table 6: Ranking of states based on the distance to fictitious object method

Country / Indicator	I1	I2	I3	I4	I5	I6	Σ	d _{j,0}	Ranking
U _{ij}	U _{i1}	U _{i2}	U _{i3}	U _{i4}	U _{i5}	U _{i6}			
U_{j, max}	0.3379	0.2835	0.4391	0.3416	0.2864	0.3189			
AUT	0.2217	0.1684	0.2311	0.1433	0.2864	0.1376	1.1885	0.3343	7
BEL	0.2217	0.2835	0.2311	0.2424	0.2282	0.2283	1.4353	0.2336	3
BGR	-0.2432	-0.2345	-0.3236	-0.1543	-0.1787	-0.2249	-1.3592	1.3744	26
CYP	-0.2432	-0.2921	-0.2542	-0.2535	-0.1787	-0.3609	-1.5825	1.4656	27
CZE	-0.1851	-0.0618	-0.0462	-0.2039	-0.0624	-0.2702	-0.8297	1.1582	20
DEU	0.2798	0.2835	0.1618	0.2424	0.1701	0.3189	1.4566	0.2249	2
DNK	0.2798	0.2260	0.0925	0.3416	0.1701	0.2283	1.3382	0.2732	5
ESP	0.1636	0.1109	0.1618	0.0937	0.2282	0.0923	0.8505	0.4723	8
EST	-0.0108	-0.0043	-0.0462	-0.1047	0.1701	-0.0436	-0.0395	0.8356	13
FIN	0.3379	0.2835	0.4391	0.2920	0.2864	0.2736	1.9126	0.0387	1
FRA	0.1636	0.0533	0.1618	0.1433	0.1701	0.0923	0.7843	0.4993	9
GRC	0.0474	0.0533	0.2311	-0.1047	0.0538	0.0470	0.3279	0.6856	10
HRV	-0.1851	-0.1769	0.0925	-0.2039	-0.3531	-0.2702	-1.0968	1.2673	22
HUN	-0.2432	-0.3496	-0.0462	-0.3526	-0.1206	-0.2249	-1.3372	1.3654	25
IRL	-0.0108	-0.0618	0.0925	-0.0055	-0.0624	-0.0436	-0.0917	0.8570	14
ITA	0.0474	0.0533	-0.0462	-0.0055	0.0538	0.0923	0.1951	0.7399	11
LTU	-0.1270	-0.0618	-0.0462	-0.1047	-0.1206	-0.0436	-0.5039	1.0253	17
LUX	-0.0108	0.1109	0.0925	0.0937	-0.1787	0.0017	0.1092	0.7750	12
LVA	-0.0689	-0.0043	-0.1849	-0.0551	0.1120	-0.1343	-0.3354	0.9565	16
MLT	-0.1851	-0.1769	-0.3236	-0.0055	-0.3531	0.0470	-0.9973	1.2267	21
NLD	0.2798	0.2835	0.1618	0.2424	0.1120	0.2736	1.3531	0.2671	4
POL	-0.0108	-0.0618	-0.1156	-0.0055	0.0538	-0.0436	-0.1835	0.8944	15
PRT	-0.1270	-0.0618	-0.2542	-0.1047	-0.1206	0.0017	-0.6666	1.0917	18
ROU	-0.2432	-0.2345	-0.0462	-0.3526	-0.1206	-0.3155	-1.3127	1.3554	24
SVK	-0.1851	-0.1769	-0.3236	-0.1047	-0.1787	-0.1343	-1.1033	1.2699	23
SVN	-0.1851	-0.2345	-0.0462	-0.0055	-0.2950	0.0017	-0.7647	1.1317	19
SWE	0.2217	0.2835	-0.0462	0.2920	0.2282	0.2736	1.2528	0.3080	6

Source: author

method and in 7th place according to the distance to a fictitious object method. Belgium has consistent scores across all methods, as it ranks 3rd in all three parameters. On the other hand, Bulgaria has significant differences between methods - its overall LPI score is 3.2, which places it in 10th place, but it ranks as high as 19th according to the ranking method and even 26th according to the distance to a fictitious object method, indicating an inconsistent assessment of its logistics performance. Similarly, the Czech Republic has an overall LPI score of 3.3, which places it in 9th place, while it ranks 16th according to the ranking method and 20th according to the distance to a fictitious object method, again indicating differences in the evaluation of the different methods. These disparities suggest that different ranking methods may lead to different results, and it is important to consider several aspects when evaluating countries' logistics performance.

5. Conclusions

Conclusions from the ranking of the EU27 countries on the basis of individual LPI indicators such as Ability to track and trace consignments, Competence and quality of logistics services, Ease of arranging competitively priced shipments, Efficiency of customs clearance process, Frequency with which shipments reach consignee within scheduled or expected time and Quality of trade and transport-related infrastructure have provided us with valuable insights into the positioning of their logistics systems.

Based on both the ranking method and the distance to a fictitious object method, we identified the ranking of the EU27 countries. For both the ranking method and the distance to a fictitious point method, the top three places were taken by Finland, Germany, and Belgium. In

Table 7: Country rankings by different methods

Country	LPI Overall	Ranking method	Method of distance to a fictitious object	Ranking by overall LPI
AUT	4	5	7	3
BEL	4	3	3	3
BGR	3.2	19	26	10
CYP	3.2	20	27	10
CZE	3.3	16	20	9
DEU	4.1	2	2	2
DNK	4.1	4	5	2
ESP	3.9	6	8	4
EST	3.6	10	13	6
FIN	4.2	1	1	1
FRA	3.9	7	9	4
GRC	3.7	8	10	5
HRV	3.3	18	22	9
HUN	3.2	19	25	10
IRL	3.6	11	14	6
ITA	3.7	8	11	5
LTU	3.4	14	17	8
LUX	3.6	9	12	6
LVA	3.5	13	16	7
MLT	3.3	16	21	9
NLD	4.1	4	4	2
POL	3.6	12	15	6
PRT	3.4	15	18	8
ROU	3.2	19	24	10
SVK	3.3	17	23	9
SVN	3.3	15	19	9
SWE	4	4	6	3

Source: author based on the The World Bank (n. d.)

the ranking method, Croatia, Bulgaria, Hungary, Romania, and Cyprus ranked in the last three places, while Bulgaria, Hungary, Romania, and Cyprus This information can serve as a basis for policies and strategies aimed at optimising logistics processes and improving competitiveness within the EU.

However, it is important to note that the LPI is not the only indicator of logistics capability and is not able to consider all factors affecting logistics systems. Therefore, it is necessary to complement the LPI assessment with other indicators and analyses to get a more comprehensive view of the logistics situation in each country. Overall, understanding and assessing the logistics capabilities of the EU27 countries is essential for their sustainable and competitive development in today's.

Author contributions: All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding: This work was supported by the Slovak Research and Development Agency under the Contract no. APVV-22-0524.

Data Availability Statement: Data available in a publicly accessible repository that does not issue DOIs. Publicly available datasets were analysed in this study. This data can be found here: [https://datacatalog.worldbank.org/search/dataset/0038649].

Conflicts of Interest: The authors declare no conflict of interest.

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