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*INSTITUTIONS AND ECONOMIC GROWTH:
COMPARATIVE ANALYSIS - NORTH MACEDONIA
AND SELECTED COUNTRIES FROM THE REGION
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*THE RELATIONSHIP BETWEEN CAPITAL MARKET
DEVELOPMENT AND ECONOMIC GROWTH:
A MACEDONIAN OUTLOOK
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EDITORIAL

Monika Angeloska-Dichovska

Southeast European Review of Business and Economics (SERBE) is a peer-reviewed academic journal published by the Faculty of Economics - Prilep, University “St. Kliment Ohridski” - Bitola, Republic of North Macedonia. It has been founded on the rich academic and publishing heritage, including the Yearbook of the Faculty of Economics - Prilep, and Proceedings from many international conferences. Based on this tradition, we intend to publish original papers, which have not been previously published or submitted for review to other journals.

The journal aims to provide opportunities for researchers to present their findings in the areas of business and economics, including those combining business and economics with other fields of research, and to assist in the creation of alternative approaches for the treatment of actual economic and business problems. Hence, we encourage experienced scholars, business practitioners as well as young researchers to submit their original work on various problems in the areas of business and economics.

The fourth issue of the Southeast European Review of Business and Economics (SERBE) presents selected papers by experienced scholars and business practitioners, which cover topics related to economic growth, trade, as well as topics to the assessment of key performance indicators in scientific research.

INSTITUTIONS AND ECONOMIC GROWTH: COMPARATIVE ANALYSIS – NORTH MACEDONIA AND SELECTED COUNTRIES FROM THE REGION

Tatjana Drangovska¹, Marica Antovska-Mitev²
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Abstract

For a long period institutions were either ignored as a relevant economic growth factor or taken as given in standard economic growth theory. The new institutional theory identifies institutional quality as a fundamental factor for the difference in the level of economic development among the countries. Based on the relevant literature and the available data and empirical analysis, this theory seems to the point. The purpose of the paper is to review the characteristics of institutions and to identify their role in achieving economic growth and development in modern societies and economies. The paper is structured in several parts. The first part reviews the new theories, with the main focus on institutional theories, that are elaborating on the linkages between the quality and efficiency of the institutions and their role in sustaining economic growth, and at the same time, they are highlighting the primary importance of the institutions in achieving economic growth. The second part of the paper elaborates on the transmission mechanisms through which institutions impact economic growth. In the third part, a comparative analysis of the quality, capacity, and (in)/efficiency of the institutions in North Macedonia and selected countries from the Region is given. For the purpose of the paper, available data from relevant international organizations are used, such as the World Bank, and Transparency International, which are suitable for the identification of the quality, efficiency, and capacity of institutions. Based on the available data, qualitative and quantitative analyses are performed by the authors. At the end of the paper, a summary overview of the impact of institutions on sustaining economic growth in a long run, based on the conducted analysis within the paper, is given.

Keywords: institutions, economic growth, WGI, institutional capacity and quality, CPI.

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Introduction

Today there exist tremendous differences in incomes and standards of living between rich and poor countries of the world. For example, countries in Sub-Saharan Africa, South America, and South Asia lack functioning markets, their population is poorly educated, their machinery is outdated, and their investments in human and physical capital are at a very low level. On the opposite side, countries in North America, Western Europe, and East Asia have high living standards, long life expectancy, strong human capital, new and innovative technologies, etc. Having in mind those differences the most frequently asked questions among economists are: Why some countries are poor and why some are rich? Which are the main factors that are determining the economic growth and are leading to high differences in the level of growth and development among countries?

In the second half of the twenty century to date, three main approaches emphasize the determinants of growth and explain the country's economic growth and prosperity: the neo-Keynesian Harrod-Domar model, the Solow-Swan neoclassical model, and the Romer-Lucas endogenous growth model (Snowdon and Vane, 2005).

On the other side, some authors explain the fundamental causes of differences in prosperity between countries by differences in institutions and geography (Acemoglu, 2003). In the last decades, the institutional hypothesis has become a very popular and widely accepted hypothesis in academia used for the explanation of differences in growth and prosperity among countries. The studies performed by North (1981), Jones (1987), and Olson (1982) have inspired growth researchers and policy-makers to investigate the role of institutions on economic growth and development.

From ending poverty to addressing climate change, the institutions are recognized as essential to achieving sustainable development goals (SDGs). Their role in implementing SDGs and achieving sustained growth is widely recognized and accepted among policymakers and the academy.

Having in mind those facts, the paper aims to review the role of institutions in explaining the differences in economic growth and development among the countries.

The paper is structured in three main parts. In the first part, the new theories are reviewed, with the main focus on institutional theories, that are elaborating the linkages between the quality and efficiency of the institutions and their role in sustaining economic growth. The second part of the paper elaborates on the institutions responsible for the economic growth and the transmission mechanisms through which these institutions impact the economic growth. In the third part, using the WGI calculated by the World

Bank the institutional quality of North Macedonia and selected countries from the Region is analyzed. Further in the paper, the focus is put on corruption as an obstacle to economic growth and as a factor that hampers the institutional capacity. Using the CPI calculated by Transparency International as an indicator for the perceived level of corruption in the public sector, the comparative analyses for North Macedonia and selected countries from the Region are given. The accent is put on corruption because in recent decades corruption is widely debated in the economic literature, mainly is measured its role in achieving long-run economic growth. North Macedonia permanently is facing a high level of corruption and the corruption by the policy makers is identified as and serious problem in straightening the institutional capacity and achieving long-run economic growth. At the end of the paper summarized conclusions and recommendations for the less-developed countries referring to the essential institutional reforms are given.

Within the paper, the method of analysis and synthesis, the comparative method, and the statistical method are used. In the comparative analysis of the paper North Macedonia, Albania, Bulgaria, Slovenia, Croatia, and Serbia are included. The paper analysis is focused on those countries primarily due to their most significant common characteristic. Namely, all those countries in the 90s of the last century have started the transition process from central planning to a market economy, which was characterized by the implementation of radical economic and political changes and reforms. Having in mind their history and the specific economic situation, the establishment of strong and quality institutions was one of the preconditions for building a market economy and achieving long-run economic growth and development. The analysis within the paper cover different period depending on the data availability.

Literature review

The idea that institutions influence the prosperity and wealth of nations is an old idea firstly expressed by Adam Smith. Since then, economists are aware that the security of property rights by expropriation of fellow persons or by the state is an important precondition for encouraging individuals to invest and accumulate capital. In the last 25 – 30 years the role of institutions in economic development has become one of the most researched areas by economists. Institutions have become the key factor for economic growth and development with the rise of New Institutional Economics in the 1980s. By the early 1990s, international institutions, such as the World Bank and

International Monetary Fund have identified poor-quality institutions as a root cause of economic growth in developing countries and since then institutions started gaining popularity (Stein, 2008). North and Thomas (1973) have stressed the idea that factors such as innovation, the economics of scale, education, capital accumulation, etc., do not cause growth, they represent growth. Accumulation and innovation are the only *proximate* causes of growth. In North and Thomas' view, the fundamental explanation for comparative growth is differences in institutions.

The institutions are defined in different ways. North defines institutions as the “role of the game in a society or, more formally, are the humanly devised constraints that shape human interaction. In consequence, they structure incentives in human exchange, whether political, social or economic” (North, 1990, p. 3). Institutions, defined in this way, can be understood as a set of roles for the society members that shape their behaviors. Institutions provide a set of constraints to society, and the members make decisions under the already established set of constraints. Those set of constraints is created by human beings or has been evaluated through the intervention of human beings (North, 1990). North also defines institutions “as humanly devised constraints that structure political, economic and social interaction” (North, 1991, p. 97). The institutions may be formal (laws, property rights, constitutions) and/or informal (taboos, traditions, sanctions, and code of conduct). The informal and formal institutions will complement each other in an ideal situation. “Institutions provide the incentive structure of an economy; as that structure evolves, it shapes the direction of economic change toward growth, stagnation or decline” (North, 1991, pp. 97). The definition indicates the fact that institutions could not be treated as an exogenous or benign factor in the development process as they were treated by neo-classical economists.

The currently dominant view is that institutions are the ultimate determinants of economic performance (Acemogly *et al.*, 2005; North, 2005). The existing growth literature and cross-country empirical analysis provide strong support for the positive effect of institutions on economic growth and development. Rodrik, Subramanian, and Trebbi (2002) in a study of institutional economics have assessed the importance of institutions, geography, and trade in determining the differences in income between the most developed and the poorest countries, and they find out that institutions “trump” all other factors analyzed. Empirical literature identified different institutions that influence economic growth and development, including governance, regulations, justice, and institutions that are responsible for the

management of fiscal and monetary policy.³ Moers (1999) found that a broader measure of institutions has the strongest effect on growth. March and Olsen (1998) found out that institutions influence productivity i.e. countries with better institutions to have higher productivity. Acemoglu and Johnson's study (2005) shows that institutional quality has a stronger effect on long-run growth than in the short run.

Researchers of economic growth emphasized factors such as the role of property rights, corruption, regulatory structures, and quality of governance on countries' development (North, 1990; World Bank, 1997; Hall and Jones, 1999; Olson, 2000; Acemoglu *et al.*, 2001, 2002). Institutional factors determine the structure of incentives, the ability and willingness of people to invest, and the ability and the incentive to innovate and participate in entrepreneurial activities.

Institutions responsible for economic growth and development

Numerous pieces of evidence confirm that economic incentives influence the productivity of talented individuals who are of key importance for economic growth. For individuals to have the incentive to develop new ideas or to adopt new technologies an institutional framework allowing an adequate rate of return is needed. The role of institutions is continuously increasing as our twenty-first-century economy is markedly different from the previous centuries. These changes have made it imperative that institutions take on a larger role than their role in the earlier eras (Stiglitz 2019). The relevance of institutions for economic growth and development is reflected by four types of institutions (Rodrik and Subramanian, 2003; Fiti and Filipovski, 2019):

- *Market-creating institutions* – those institutions protect property rights and ensure the execution of contracts. They are related to investment incentives and entrepreneurship. Here are included the judicial institutions i.e. the judicial system.
- *Market-regulating institutions* – those are regulatory institutions for market failure domains, such as externalities, natural monopolies related to economies of scale, and asymmetric information. In those domains the market failure is evident, and therefore government regulation is needed. Here are included regulatory institutions in financial services, telecommunication, water supply, etc.

³ For more details see: Barro (1997, 2000); Sachs and Warner (1995); Kauffman and Kraay (2002); Rodrik and Subramanian (2003).

- *Market-stabilizing institutions* – those institutions are responsible for maintaining macroeconomic stability i.e. for maintain price stability, mitigating cyclical movements, and coping with financial crises. Here are included the central bank, institutions responsible for the budget, fiscal roles, and exchange rate regime.
- *Market-legitimizing institutions* – those institutions are responsible for the social protection of the citizens, the redistribution of income, and relativizing of social conflicts. Here are included pension funds, unemployment agencies, and other social funds.

Having in mind the fact that institutions meter the economic growth and development, in the early 90th of the XX century, numerous countries have made institutional reforms. Following this, IMF and the World Bank have supported reforms intended for building ‘better’ institutions and improving ‘governance’ (Kappur and Webb, 2000).

The quality of institutions and economic growth

Institutional quality is determining economic growth and development through incentivizing economic activities, such as consumption and investments, allocating resources more efficiently, and protecting property rights. According to the World Bank, there is growing evidence linking institutional quality to economic growth and efficiency across both time and space, because of that, there is widespread acceptance of the idea that ‘good’ institutions and incentive structures are a precondition for long-run economic change and growth (World Bank, 2002).

The concept of governance or institutional quality is widely discussed among policymakers and academia, but there is not a single definition of governance or institutional quality. Some definitions are broad and they defined governance as roles, enforcement mechanisms, and organizations (World Bank, 2002), others focus only on the public sector and defined it as a manner in which power is exercised in the management of a country’s economic or social resources of development (World Bank, 1992). One of the most widely used indicators for the measurement of institutional quality is the Worldwide Governance Indicator (WGI). For the calculation of WGI, governance is defined as “the traditions and institutions by which authority in a country is exercised. The WGI report on six dimensions of governance”⁴ (Kaufman, Kraay, Mastruzzi, 2010):

⁴WGI for each country is presented in percentile rank, ranging from 0 (the lowest) to 100 (the highest).

- *Voice and accountability* – capturing perceptions of the extent to which a country’s citizens can participate in selecting their government, as well as freedom of expression, freedom of association, and free media.
- *Political stability and absence of violence* – capturing perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism.
- *Government effectiveness* – capturing perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
- *Regulatory quality* – capturing perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.
- *Rule of law*– capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
- *Control of corruption*– capturing perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

WGI has a wide range of usage but mainly is used for the identification of the nature of the ‘governance problem’ in countries and allocation of resources by international organizations for the improvement of institutional quality in the national economies. The results from available analysis using WGI show that countries with effective governance do grow faster at least in the long run (Devarajan, 2008).

Worldwide Government Indicator for North Macedonia

Figure 1 presents the WGI for North Macedonia in six dimensions, covering almost two decades, 2002–2020. All six dimensions are presented in standardized normal units, in a range from –2.5 to +2.5.

Regarding the first dimension, *Voice and Accountability*, the lowest value is registered in 2016 (-0.23) or 38.92 percentiles, which means that, on average, North Macedonia is better ranked of 39 countries among 230, while the highest value is registered in 2007 (0.28) or 55.77, i.e. North Macedonia in average is better ranked than 56 countries. In 2020 this dimension has been slightly improved (0.06) and in 2020 North Macedonia, on average, is better ranked than 50 countries, out of 230. During the analyzed period this dimension is relatively unstable.

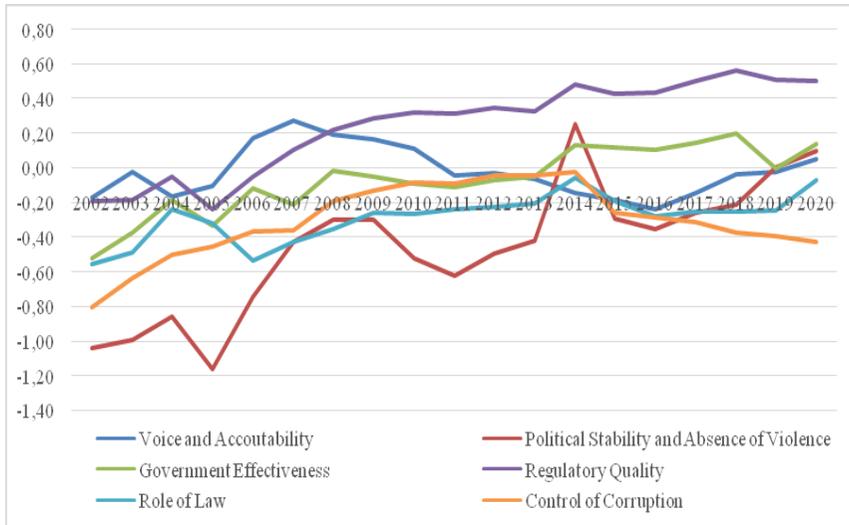
For North Macedonia, *Political instability* is the most serious obstacle due to the institutional quality. In the whole analyzed period, this dimension is negative, with an exception of 2014 (0.26) and 2020 (0.1). The country is worst ranked in 2005, on average is better ranked only by 15 of 230 countries. The average value of this dimension in the analyzed period is negative (-0.45).

From 2014 onward, there is improvement in *Government Effectiveness*, with an exception of 2019. In the initial year of analysis, 2002, it is measured the lowest value (-0.52), while the highest is measured in 2014 (0.13). Despite the achieved progress in the quality of public administration and formulation and implementation of sound policies, still, the average value of this dimension in the analyzed period is negative (-0.07).

As it can be seen from Figure 1, starting from 2008, the *Regulatory Quality* in the country is constantly improving and this improvement is positively reflecting the institutional quality. For almost two decades the average value of this dimension is positive (0.25). The value for this dimension ranges from -0.23 in 2005, to 0.57 in 2018.

In North Macedonia, the *Rule of Law*, as a crucial factor for the protection of property rights, implementation of agreements, as a prerequisite for building the market economy, shows devastating results in the analyzed period. For the whole period, the value of this indicator is negative. In 2002 as the initial period of analysis this dimension is negative (-0.55) and also a negative value is estimated in 2020 (-0.06).

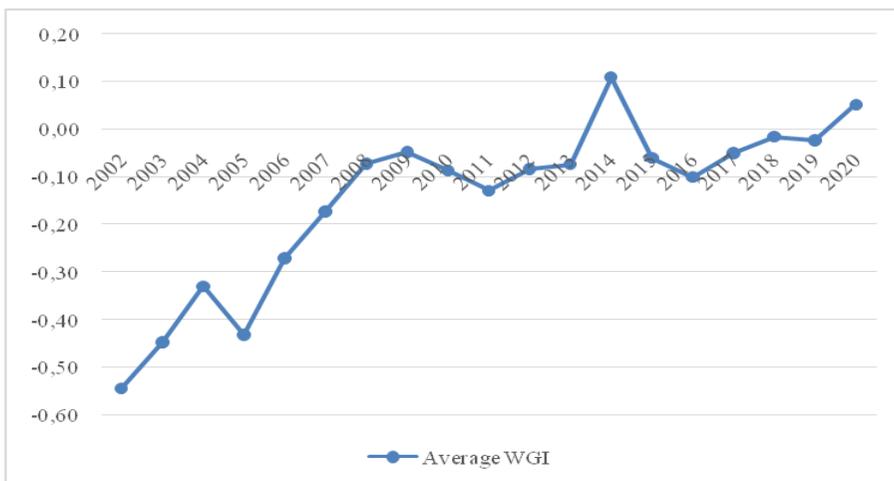
Regarding the last dimension, *Control of Corruption*, it could be concluded that some serious steps in the fight against corruption are not undertaken in the country. Concerning this dimension, in the whole analyzed period, the negative value is measured. In recent years the situation is even more serious because starting from 2015 onwards, a significant increase in corruption in the country is perceived. The average value of this dimension in the period 2002–2020 is -0.3.



Source: World Bank 2021

Figure 1: WGI, by six dimensions for North Macedonia, 2002-2020, (estimate)

The average estimate of good governance in North Macedonia for the period 2002-2020 is -0.15 . The negative value is due to the weak governance in the early years of analysis. The strongest governance is achieved in 2014 (0.11), in the following years a negative value of the WGI is evident for the country, until the last year of analysis, 2020 (0.05) (Figure 2).



Source: Authors' calculations

Figure 2: Average WGI for North Macedonia, 2002-2020

IMF (2020) highlights that in the coming period institutional quality remains one of the main challenges for North Macedonia. The main areas that should be improved in the future are corruption, the rule of law, political instability, and the informal sector. The results from the empirical analysis conducted by the IMF confirm the positive impact of institutional quality, measured by WGI, on the economic growth and development, measured by GDP per capita. The analysis by dimension shows that the control of corruption and promotion of the rule of law have the strongest impact on achieving economic growth and development.

According to the World Bank, the control of corruption, political instability, the rule of law, as well as voice and accountability are areas in which the country should perform strong reforms (World Bank, 2019).

Although from the independence till today major macroeconomic reforms were implemented to build strong and sustained market institutions, the institutional quality indicators still reflect strong institutional weaknesses.

Comparative analysis of Worldwide Governance Indicators (WGIs) in North Macedonia and selected countries from the Region

In Table 1 WGIs are presented (by the six composite dimensions presented in standardized normal units and percentile rank) for 2020, for selected countries from the Region - North Macedonia, Albania, Bulgaria, Serbia, Slovenia, and Croatia. The analysis is focused on those countries because in the 90s of the last century those countries started the transition process from central planning to a market economy, which was characterized by the implementation of radical economic and political changes and reforms. Having in mind their history and the specific economic situation, the establishment of a strong and quality institution was one of the preconditions for the building of a market economy and achieving long-run economic growth and development.

The presented data shows that Slovenia is the country with the strongest institutional quality among the analyzed countries. Slovenia shows the highest performance regarding all six dimensions part from governance, at the same time Slovenia has the highest living standard measured by GDP per capita, which exceeds 25,500 USD in 2020. Albania is a country that is facing with most serious weakness regarding institutional quality. In 2020, among the analyzed countries, Albania has the lowest living standard, (5,216 USD) (World Bank, 2021). By institutional quality, North Macedonia is in the fourth position, after Bulgaria. The improvement of the institutional

quality in North Macedonia in 2020 is achieved by strengthening the regulatory quality, while the limiting factor for the institutional quality presents the control of corruption.

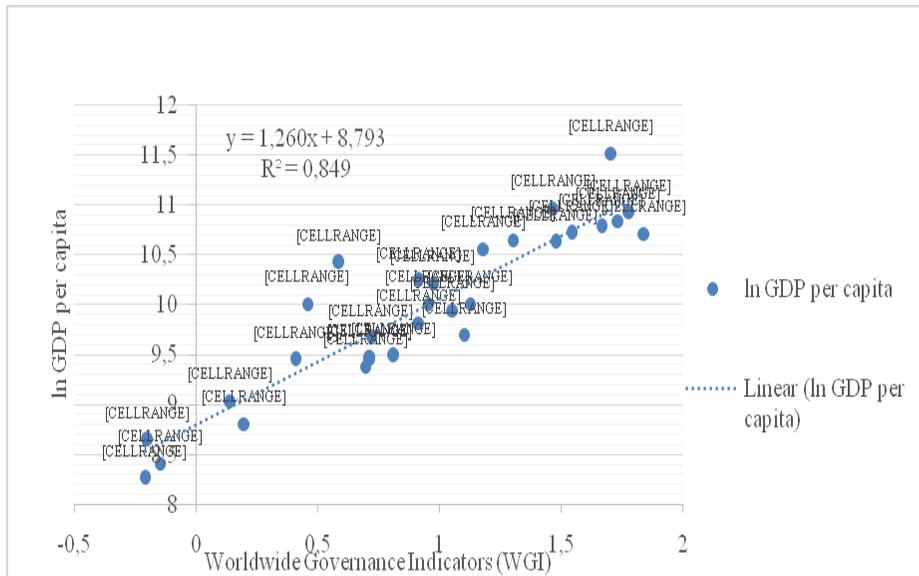
Table 1: WGIs for selected countries from the Region, (estimates and percentile rank), 2020

		North Macedonia	Albania	Bulgaria	Serbia	Slovenia	Croatia
Voice and Accountability	Estimate	0,06	0,09	0,26	-0,12	0,94	0,58
	Percentile Rank	50,24	51,21	56,04	40,58	78,26	64,25
Political Stability and Absence of Violence	Estimate	0,1	0,08	0,47	-0,09	0,71	0,61
	Percentile Rank	50,47	49,53	60,85	43,87	69,81	65,57
Government Effectiveness	Estimate	0,14	-0,14	-0,07	0,03	1,17	0,44
	Percentile Rank	57,69	48,08	50,48	54,33	85,58	68,75
Regulatory Quality	Estimate	0,51	0,24	0,52	0,12	0,92	0,43
	Percentile Rank	68,75	60,58	69,71	57,21	77,4	65,87
Rule of Law	Estimate	-0,06	-0,36	-0,09	-0,18	1,07	0,29
	Percentile Rank	52,4	40,87	51,44	47,6	83,65	62,02
Control of Corruption	Estimate	-0,42	-0,54	-0,27	-0,43	0,81	0,2
	Percentile Rank	37,98	31,73	46,15	37,5	79,33	61,54

Source: World Bank 2021

It is generally expected that a national economy will experience long-run economic growth provided following the WGI indicators if mechanisms for voice and accountability are put in place, the political instability is low, the rule of law prevails, control of corruption exists, government effectiveness is on a high level and the regulatory quality is strong. To explore the relationship between the institutional quality measured by WGI and economic growth measured by GDP per capita, Figure 3 presents the

results from the regression analyses performed for EU member states and North Macedonia, Serbia, and Albania. Within the regression analysis, additional countries are included for the regression analysis to be more reliable. The independent variable is the average WGI index for the period 2002–2020 and the dependent variable is the average GDP per capita for the period 2002–2020 in its logarithm form. The coefficient of correlation exceeds 0.9, which confirms the strong positive correlation between institutional quality and economic growth.



Source: Authors' calculations

Figure 3: Correlation between WGI and GDP per capita (average level for the period 2002 – 2020)

Corruption as a barrier to economic growth

In the last decades, corruption had an important position in economic debate and literature. It has been identified as an important barrier to growth, with dramatic consequences on growth (Mauro, 1995; Kaufmann and Kraay, 2002). Corruption erodes the institutional capacity and further hampers economic development. National economies recognize corruption as a barrier to development when committing to the SDGs. Countries with corrupt bureaucracy, generate rent-seeking activities devoted to the diversion of resources rather than productive activities, such as capital accumulation, skills acquisition, development of new or improved products, or production

techniques (Murphy *et al.*, 1993; Mauro, 1995). Empirical evidence indicates that corruption decreases economic growth, especially in countries with low-quality governance and low investment rates (Mauro, 1995; Mo, 2001; Chang and Hao, 2017).

Corruption comes in many forms and it is difficult to be identified and defined. According to the most popular definition in academia, corruption is defined as the "...absence of public power for private benefits" (World Bank, 1997, p. 8). According to Tanzi (1995, p. 24), corruption is "... the intentional non-compliance with the principle of 'arm's-length relationship' ". The corruption defined in this way indicates that for the efficient functioning of the market economy personal or family relationships ought not to play a role in economic decisions made by government representatives or private economic agents.

Corruption affects long-run economic growth through its impact on investment, taxation, human development, and public expenditures. This, in turn, undermines economic growth, equality, and sustainable development. Corruption is affecting economic development through different channels (Tanzi, 1995; Petreski *et al.*, 2017):

- It reduces the government's ability and effectiveness to perform regulatory controls and inspections intended for correcting market failure. When the regulation is motivated by corruption, for example when the government creates monopolies for private interest, the social costs are exceeding the private costs.
- Distorts the incentives in the economy. Talented individuals allocate their activities to rent-seeking or corrupt practices and not to productive and innovative activities. This leads to a decrease in the entrepreneurship and innovative potential of the national economy.
- Decreases the investments in the national economies. On the other side, the decrease in investments reduces the growth rate to the level to which the growth is determined by the accumulation of physical capital.
- Increases the public spending and decreases the public revenues, this leads to larger fiscal deficits, making it difficult for the government to run sound fiscal policies. The public capital investments are mainly oriented through unproductive ones, with an insignificant impact on economic growth. The allocations of budget resources to corruptive activities lead to a decrease in the quality of the public infrastructure and public services.
- Reduces or distorts the fundamental role of the government (enforcement of contracts, protection of property rights) which affects negatively the economic growth.

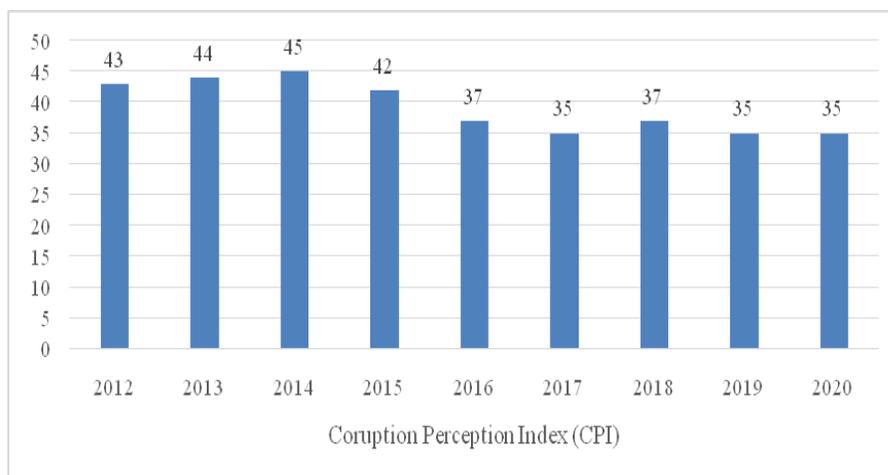
- Besides economic problems it creates also social problems, it increases poverty and income inequality by reducing the potential income earned by the poorest population.
- Corruption undermines the effectiveness and potential benefits of international aid, through the reallocation of the financial funds to unproductive projects or for irrational usage of the funds for productive projects.

To date, no indicator measures corruption directly and exhaustively on a national level, but the Corruption perception index (CPI) calculated by Transparency International is the most widely used indicator of corruption. CPI is a composite index that ranks the countries on how corrupt a country's public sector is perceived to be by the business leaders and experts. The CPI ranks the countries by the perceived level of public sector corruption on a scale of 0 to 100, where 0 indicates that country is perceived as highly corrupted and 100 indicates that country is perceived as very clear (see more details at: <https://www.transparency.org/en/>).

Corruption perception index for North Macedonia

Starting from the transition period, North Macedonia is facing a high level of corruption present in all spheres of social life. Corruption presents one of the main reasons for the slow development dynamics in the country (Petreski *et al.*, 2017).

The CPI for North Macedonia covering the period 2012 – 2020 is presented in Figure 4. In 2020 (43) compared to 2012 (35) the perceived level of corruption has increased, i.e. North Macedonia in 2012 was ranked 69th position, while in 2020 it was ranked devastating 111th place. In the analyzed period, North Macedonia was highest ranked in 2014 (45), at 64th position out of 180 countries. In 2020 compared with the previous year 2019, the country dropped from 111th to 106th position, although the value of the CPI remained unchanged.



Source: Transparency International 2021

Figure 4: CPI (Corruption Perception Index) for North Macedonia, 2012 – 2020

The relatively high perceived level of corruption in North Macedonia, according to Transparency International is due to the phenomena of a “captured” state, the highly corrupted public sector, the non-transparency of the public sector, and the inefficiency of anticorruption regulatory bodies.

In the past period, the corruption in the country presents a serious obstacle to economic growth and development, i.e. the continuously high level of corruption undermines the trust of institutions and their capacity. At the same time, the high level of corruption is identified as one of the most serious institutional weaknesses by WGI.

Comparative analysis of Corruption Perception Index in North Macedonia and selected countries from the Region

Table 2 presents CPIs for North Macedonia, Albania, Bulgaria, Croatia, Slovenia, and Serbia. As in the previous analysis, the highly ranked among the analyzed countries is Slovenia, in 2019 and 2020 is ranked 35th out of 180 countries, with a score of 60. Among the analyzed countries in the last reference period, the public sector in North Macedonia is perceived as the most corrupted by experts and business people. North Macedonia in 2020 is ranked on 111th position among 180 countries, with a score of 35 on the corruption perception index. The corruption in the country seriously undermines the institutional capacity and is an obstacle to economic growth.

The previous analysis of the WGI identifies the control of corruption as the weakest dimension of the institutional quality for North Macedonia,

Albania, and Serbia, and this finding is also confirmed by the analysis of the CPI. In those three countries, a high level of corruption in the public sector is perceived, which negatively affects the institutional quality and capacity and has a negative impact on economic growth and development.

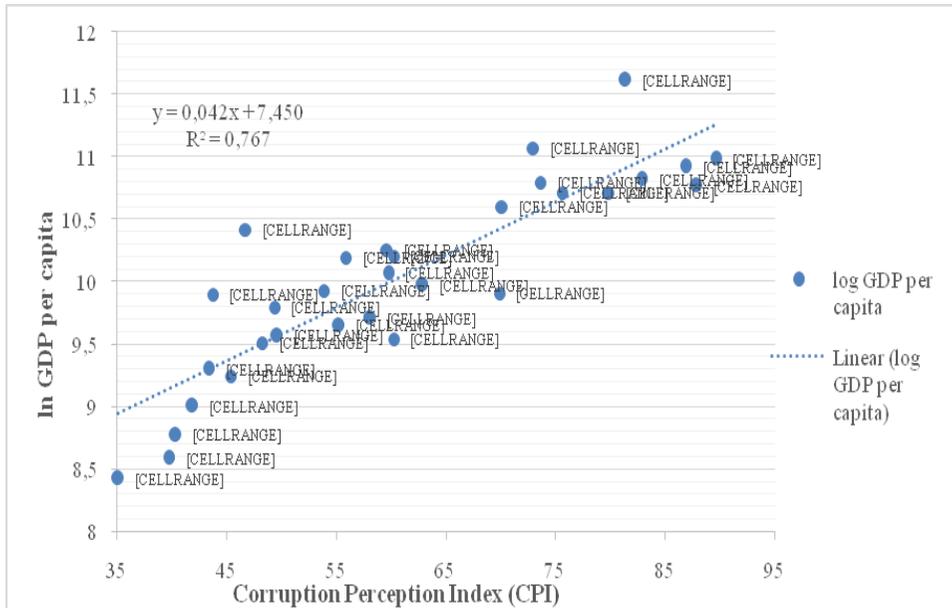
Table 2: Corruption perception index for selected countries from the Region

Country	2016		2017		2018		2019		2020	
	Score	Rank								
North Macedonia	37	90	35	107	37	93	35	106	35	111
Albania	39	83	38	91	36	99	35	106	36	104
Bulgaria	41	75	43	71	42	77	43	74	44	69
Croatia	49	55	49	57	48	60	47	63	47	63
Slovenia	61	31	61	34	60	36	60	35	60	35
Serbia	42	72	41	77	39	87	39	91	38	94

Source: Transparency International 2021

Figure 5 presents the correlation between the corruption measured by CPI and the economic growth, measured by the GDP per capita presented in its logarithm form. The analysis covers the period from 2012 to 2020⁵. Within the regression analysis, additional countries are included for the regression analysis to be more reliable. The graphic presentation confirms the negative correlation between corruption and economic growth. The countries with a low level of corruption at the same time have stable and high economic growth rates and living standards, presented by GDP per capita. The correlation coefficient is 0.91.

⁵ Because of the methodological changes CPI data are not available before 2012. The CPI ranks the countries around the world by their perceived levels of public sector corruption. The results are presented on a scale of 0 (highly corrupted) to 100 (very corrupted).



Source: Authors' calculations

Figure 5: Correlation between Corruption perception index and GDP per capita (average level for the period 2012 – 2020)

Conclusion

The paper has analyzed the institutions and their impact on economic growth and development. For a long period, institutions were either ignored or taken as given in standard economic growth theory, but the rise of the New Institutional Economics has highlighted the importance of institutions in the growth analysis. The essential role of institutions in achieving economic development is recognized and implemented as part of the SDGs. The synthetic review of recent studies in this field has shown that in all countries regardless of the geography, history, and stage of development, the protection of property rights, contract enforcement, and the rule of law, competition, hard budget constraints, financial stability determine the structure of incentives to innovate, invest in new technologies and participate in entrepreneurial activities, which all lead to economic growth on long-run. The regression studies have shown that the institutions are robust determinants of economic development. For economic growth, institutions that protect property rights and ensure the enforcement of contracts are important. Those institutions are so-called market-creating institutions, but for long-run economic development, other three types of institutions are of

crucial importance: market-regulating institutions, market-stabilizing institutions, and market-legitimizing institutions. The institutional quality as a precondition for long-run economic growth in the already existing studies is mostly assessed through the WGI. One of the wide uses of WGI, which reports on six dimensions, is for the identification of the governance problems in the national economies. The analysis of WGI for selected countries in the paper has shown that countries with high living standards have institutions with high quality, measured by the six dimensions part of WGI. The performed correlation analysis within the paper, between WGI and GDP per capita, has shown a positive correlation between institutional quality and long-run economic growth. Corruption is identified as a factor that erodes the institutional capacity and further hampers economic growth and development. Corruption is identified as one of the barriers to development when committing to the SDGs. Corruption erodes economic growth through the devotion of resources to diversion rather than to productive activities. Because of the sensitive nature of corruption, it is hard to be objectively measured, but one of the most widely used measures is Corruption Perception Index. The conducted comparative analysis in the paper has shown that countries that are facing developing problems have highly corrupted institutions i.e., corruption is a serious obstacle to economic growth. Also, the correlation analysis within the paper confirms the negative correlation between corruption, measured by the Corruption Perception Index, and economic growth, measured by GDP per capita. The paper has presented evidence of a positive and significant relation between institutional quality and long-run economic growth and negative and significant relation between corruption and long-run economic growth.

Given the previously noted conclusions, the paper has high value-added for the researchers in the field of the new institutional theories and the theories of economic growth, but also the policy makers in these fields.

Hence, every economy providing effective law and order conditions gained more economic affluence and development and on the other hand, economies having an inefficient environment for economic agents, face the problems of lower levels of development and un-sustained growth.

Furthermore, it is widely agreed that institutional reforms are a key factor for the development of nations but which institutional reforms are more effective for a country is a point of controversy.

In our view, the successful reform of the institutions in the less-developed countries, above all, notices major changes in certain important segments:

- Strengthening the rule of law, by implementing measures to ensure adherence to the principles of supremacy of law, equality before the law,

accountability to the law, fairness in the application of the law, separation of powers, participation in decision-making, legal certainty, avoidance of arbitrariness and procedural and legal transparency, etc.;

- Democratization of political parties, through internal democratization, which is an important precondition for raising the general political culture, for developing a culture of tolerance, dialogue, etc.;

- Strengthening the quality, efficiency, and credibility of institutions, primarily by improving the quality of the education system at all levels of education, because their quality and efficiency are directly related to the quality of the staff employed, and especially the quality of the first people of the institutions;

- Combating Corruption to prevent, detect and suppress malfeasance, conflict of interests in public service, and corruption facts.

Today, faced with strong health, financial, and energy crisis in North Macedonia, in the region, in Europe, and even globally, it is interesting to be emphasized that institutional reforms are necessary either at the growth stage or the crisis stage.

References

1. Acemoglu, D., Johnson, S. and Robinson, J.A. (2001). The Colonial Origins of Comparative Development: An Empirical Investigation. *The American Economic Review*, Vol.91, No. 5, pp: 1369-1401.
2. Acemoglu, D., Johnson, S. and Robinson, J.A. (2002). Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution. *The Quarterly Journal of Economics*, Vol.117, Issue 4, pp: 1231-1294.
3. Acemoglu, D. (2003). Root Causes – A historical approach to assessing the role of institutions in economic development. *Finance and development*. IMF, Washington, DC. June 2003.
4. Acemoglu, D., Johnson, S. and Robinson, J.A. (2005). Institutions as Fundamental Cause of Long-Run Growth, in Aghion, P. and Durlauf, S.N. (eds.) *Handbook of Economic Growth*, Amsterdam: North-Holland, pp:385-472.
5. Acemoglu, D. and Johnson, S. (2005). Unbuilding Institutions. *Journal of Political Economy*, Vol. 113, No. 5.
6. Chang, C. and Hao, Y. (2017). Environmental performance, corruption, and economic growth: global evidence using a new data set. *Applied Economics*, Vol. 49, Issue 5, pp: 498-514.

7. Devarajan, S. (2008). Two Comments on Governance Indicators: Where Are We, Where Should We Be Going? By Daniel Kaufmann and Aart Kraay. *Oxford University Press*.
8. Fiti, T. and Filipovski, V. (2019). The concept of the primary importance of institutions for economic growth. *Proceedings of the round table Rule of Law, Good Governance and Quality of Institutions*. (in Macedonian)
9. Hall, R.E. and Jones, C.I. (1999). Why do Some Countries Produce so Much More Output Per Worker than Others?. *The Quarterly Journal of Economics*, Vol.114, Issue 1, pp: 83-116.
10. IMF (2020). *Republic of North Macedonia: Selected Issues*. Vol. 2020, Issue 025. Available at: <https://www.elibrary.imf.org/view/journals/002/2020/025/002.2020.issue-025-en.xml>, (accessed: 19.08.2021)
11. Kaaufmann, D., Kraay, A. and Mastuzzi, M. (2002). Growth without Governance. *Policy Research Paper*, No. 2928. World Bank Washington, DC.
12. Kaaufmann, D., Kraay, A. and Mastuzzi, M. (2010). The Worldwide Governance Indicators: Methodology and Analytical Issues. World Bank Policy Research Paper No. 5430.
13. Kapur, D. and Webb, R. (2000). Governance-related Conditionalities of the International Financial Institutions. G-24 Discussion Paper Series, No.6 Geneva: UNCTAD.
14. Mauro, P. (1995). Corruption and Growth. *The Quarterly Journal of Economics*, Vol. 110, Issue 3, pp: 681-712.
15. March, J.G. and Olsen, J.P. (1998). The Institutional Dynamics of International Political Orders. *International Organization*, Vol. 52, Issue 4, pp. 943-969.
16. Mo, P. (2001). Corruption and Growth. *Journal of Comparative Economics*, Vol. 29, Issue 1, pp. 66-79.
17. Moers, L. (1999). How important are Institutions for Growth in Transition Countries?. Tinbergen Institute Discussion Paper 99-004/2.
18. Murphy, K.M., Shleifer, A. and Vishny, R.W. (1993). Why Is Rent-Seeking So Costly to Growth?. *The American Economic Review*, Vol.83, No.2, 409-414.
19. North, D.C. and Thomas, R.P. (1973). *The Rise of Western World: A New Economic History*. Cambridge University Press.
20. North, D.C. (1990). *Institutions, Institutional Change and Economic Performance*. Cambridge University Press.

21. North, D.C. (1991). Institutions. *The Journal of Economic Perspectives*, Vol.5, No.1, pp: 97-112.
22. North, D.C. (2005). *Understanding the Process of Economic Change*. Princeton University Press.
23. Olson, M. (2000). *Power and Prosperity: Outgrowing Communist and Capitalist Dictatorships*. New York: Basic Books.
24. Petreski, G., Lazarov, D. and Kostoska, O. (2017). *Pathways of Transition – Empirical analysis of the Macedonian and Bulgarian economy: growth, investments and economic cooperation*. Macedonian Academy of Sciences and Arts, Skopje.
25. Rodrik, D. and Subramanian, A. (2003). The Primacy of Institutions (and what this does and does not mean). *Finance & Development*. IMF, Washington, D.C.
26. Rodrik, D., Subramanian, A. and Trebbi, F. (2004). Institutions Role: The Primacy of Institutions over Geography and Integration in Economic Development. *Journal of Economic Growth*, Vol. 9, No. 2, pp. 131-165.
27. Snowdon, B. and Vane, H.R. (2005). *Modern Macroeconomics – Its Origins, Development and Current State*. Edward Elgar, Cheltenham, UK – Northampton, MA, USA.
28. Stein, H. (2008). *Beyond the World Bank Agenda – An Institutional Approach to Development*. The University of Chicago Press.
29. Stiglitz, J.E. (2019). *People, Power and Profits*. W. W. Norton & Company, New York/London.
30. Tanzi, V. (1995). Corruption, government activities, and markets. *Finance & Development*, Vol.32, Iss. 4. Washington.
31. Transparency International (2021). *Corruption Perception Index Database*. <https://www.transparency.org/en/cpi/2020/index/nzl> (accessed 19.08.2021).
32. World Bank (1997). *World Development Report 1997 – The State in a Changing World*. Published for the World Bank by Oxford University Press.
33. World Bank (2002). *World Development Report 2002 – Building Institutions for Markets*. Published for the World Bank by Oxford University Press.
34. World Bank (2019). *Country Partnership Framework for North Macedonia, January 2019 – June 2023*. Available at: <https://thedocs.worldbank.org/en/doc/594281560881939556-0080022019/original/NorthMacedoniaCPFfullEng.pdf>, (accessed 19.08.2021).
35. World Bank (2021). Worldwide Governance Indicators. <https://info.worldbank.org/governance/wgi/> (accessed 18.08.2021)

36. World Bank (2021). Data. GDP per capita (current US\$). <https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?end=2020&start=1980&view=chart> (accessed 18.08.2021).

EFFICIENCY OF COST MANAGEMENT IN SERBIAN TRADE

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Abstract

The issue of analyzing the factors that affect the efficiency of cost management is very important in all sectors, especially in trade. The structure of costs in trade is, due to the very nature of business, specific concerning production and other service activities. Knowing the specifics of the cost structure in trade is a prerequisite for efficient management to achieve the target profit. With this in mind, this article explores the factors that affect the size and structure of costs in trade. Empirical research has shown that there is a significant share of employee costs in operating costs in Serbian trade, despite the increasing digitalization of the entire business. According to all DEA (Data Envelopment Analysis) models, the trade in Serbia was cost-effective in 2020. The impact of the Covid-19 corona virus pandemic is negligible on cost efficiency in Serbian trade, as is the case in other countries. It has been greatly mitigated with increased electronic sales.

Keywords: costs, profit, factors, efficiency, trade of Serbia

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Introduction

Costs are among the important factors of business success of all companies, which means trade. The structure of trade costs is specific concerning production. Total trade costs consist of costs of goods sold (purchase value of goods sold) and operating costs. Costs of goods sold are included in the value of goods and are covered by the sale value of goods (income from the sale of goods). Operating costs are covered by margins. In the structure of operating costs of trade, the largest part refers to the costs of employees, considering that trade belongs to tertiary activities. Despite the application of digitalization of trade operations, the share of employee costs in operating costs is high. According to its size, the margin should be such that it can cover all operating costs and achieve the target profit for the development and growth of trade. Research is very challenging given the specificity size and cost structure of the trade. Knowledge of size and structure is a prerequisite for efficient cost management in trade in the function of achieving the target profit. Starting from that, the subject of research in this paper is the dynamics of the size and structure of trade costs in Serbia. The goal and purpose of this are to investigate this issue as comprehensively as possible from all relevant angles to take appropriate measures to improve the efficiency of cost management in Serbian trade to achieve the target profit. The contribution of this paper is that based on empirical analysis of the dynamics of the size and structure of costs indicates what the actual cost situation is and what measures should be taken in the future in the function of "optimizing" the size and structure of trade costs in Serbia in the future. It also provides a basis for understanding the cost position of Serbian trade in the international framework.

There is a very rich literature in the world and in Serbia dedicated to the issue of cost and profit management in trade (Garrison, 1997; Anand, 2015; Andersen, 1993; Bambe, 2017; Barros, 2004, 2006; Busu, 2020; Donthu, 1998; Gndhi, 2014; Hsu, 2018; Jorge, 2009; Keener, 2013; Ko, 2017; Lau, 2013, Lee, 2013; Lukic, 2011, 2019, 2020a, b, c, d, e, 2021a, b, c, d; Martino, 2017; Moreno, 2010, 2011; Qiu, 2017; Vaz, 2010; Yu, 2009; Berman, 2018; Ersoy, 2017; Levy, 2019). In this paper, it serves as a theoretical, methodological, and empirical basis for the analysis of factors influencing the efficiency of cost and profit management in Serbian trade. Knowledge of the factors that affect the efficiency of cost and profit management is a prerequisite for improving the performance of Serbian trade in the future by taking adequate measures. This reflects, among other things, the scientific and professional contribution of this paper.

The research hypothesis in this paper is based on the fact that continuous research of size and structure factors provides a realistic basis for "optimizing" trade costs in the function of achieving the target profit by taking appropriate measures (in the specific case of Serbia). This is especially achieved with the application of modern cost management concepts (for example, costing by activity) (Garrison, 1997).

Due to the nature of the problem treated in this paper, and the defined research hypotheses, the research methodology is based on structural cost, analysis, statistical analysis, and DEA analysis.

The main source of data is the Business Registers Agency of the Republic of Serbia. They are "manufactured" following relevant international standards. There are no restrictions on international comparability.

The structure of the paper is designed to include, in addition to the introduction and conclusion, the following thematic units: Size and structure of margin in Serbian trade, Size and structure of operating costs in Serbian trade, Structure of operating costs in Serbian trade according to the manner of behavior concerning changes in sales volume, Cost efficiency in Serbian trade. It enables an understanding of the factors of the dynamics of the size and structure of trade costs in Serbia and provides a basis for comparative international analysis.

Size and structure of margin in Serbian trade

Margin as the difference between the sale and purchase price belongs to the special forms of trade income. It serves to cover operating costs and make some profit. Given this, in terms of margin size, it should be large enough that trade can cover all operating costs and make a target profit for development and sustainability. Also, both producers and consumers are satisfied with the size of the margin.

The initial data for the analysis of the size and structure of the margin trade are shown in Table 1.

Table 1: Initial data for the analysis of the size and structure of the margin in Serbian trade

DMU	(I) Total costs	(I) Cost of goods sold	(I) Operating costs	(O) Gross sale	(O) Gross margin	(O) Net profit
2013	2803788	2300147	503641	2891518	591371	87730
2014	2564581	2288700	275881	2651536	362836	86955
2015	2636734	2350737	285997	2731999	381262	95265
2016	2904413	2593181	311232	3009651	416470	105238
2017	3049666	2710587	339079	3172393	461806	122727
2018	3239278	2864679	374599	3361094	496415	121816
2019	3490714	3083550	407164	3623891	540341	133177
2020	3493495	3085928	407567	3664505	578577	171010

Note: Absolute amounts are expressed in millions of dinars. I - input elements. O - output elements

Source: Financial statements annual bulletin, Agency for Business Registers of the Republic of Serbia

Table 2 and Figure 1 present the percentage of margin and its components in the revenues that come from sales in Serbian trade, and Table 3 presents its statistics.

Table 2: Share of margin and its components in revenues from sales of goods in Serbian trade

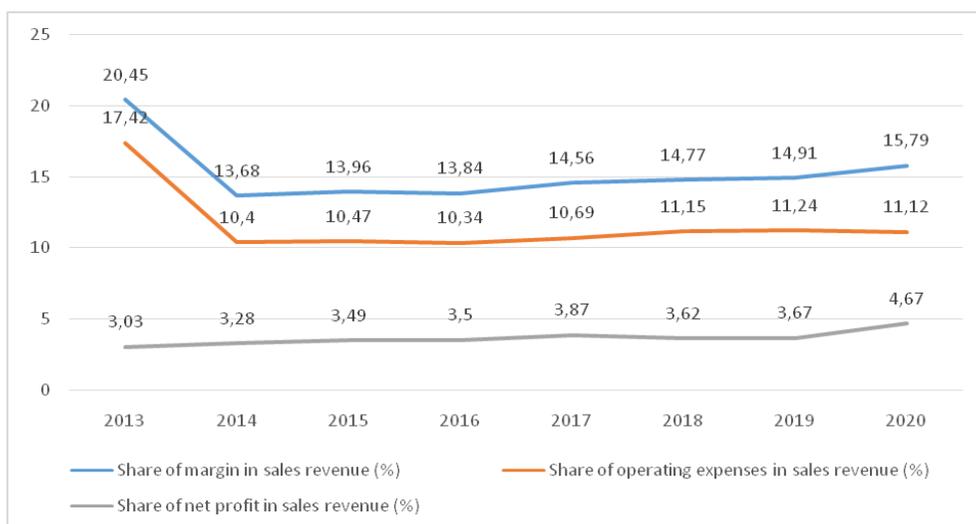
	Share of margin in sales revenue (%)	Share of operating expenses in sales revenue (%)	Share of net profit in sales revenue (%)
2013	20.45	17.42	3.03
2014	13.68	10.40	3.28
2015	13.96	10.47	3.49
2016	13.84	10.34	3.50
2017	14.56	10.69	3.87
2018	14.77	11.15	3.62
2019	14.91	11.24	3.67
2020	15.79	11.12	4.67

Note: Author's calculation.

Table 3: Statistics

Statistics				
		Share of margin in sales revenue	Share of operating expenses in sales revenue	Share of net profit in sales revenue
N	Valid	8	8	8
	Missing	0	0	0
Mean		15.2450	11.6038	3.6413
Std. Error of Mean		.78229	.84057	.17211
Median		14.6650	10.9050	3.5600
Std. Deviation		2.21265	2.37750	.48681
Skewness		2.321	2.700	1.352
Std. Error of Skewness		.752	.752	.752
Kurtosis		5.785	7.457	2.916
Std. Error of Kurtosis		1.481	1.481	1.481
Minimum		13.68	10.34	3.03
Maximum		20.45	17.42	4.67

Note: Author's calculation using the SPSS software program.



Note: Author's image

Figure 1: Share of margin and its components in revenues from sales of goods in Serbian trade

In Serbian trade, the average margin is 15.24%. In 2020, it increased compared to 2019, probably, as one of the reasons, to provide some protection against the risk of the Covid-19 virus pandemic. Average

operating costs (expressed as a percentage of sales revenue) in Serbian trade are 11.60%, and net profit is 3.64%.

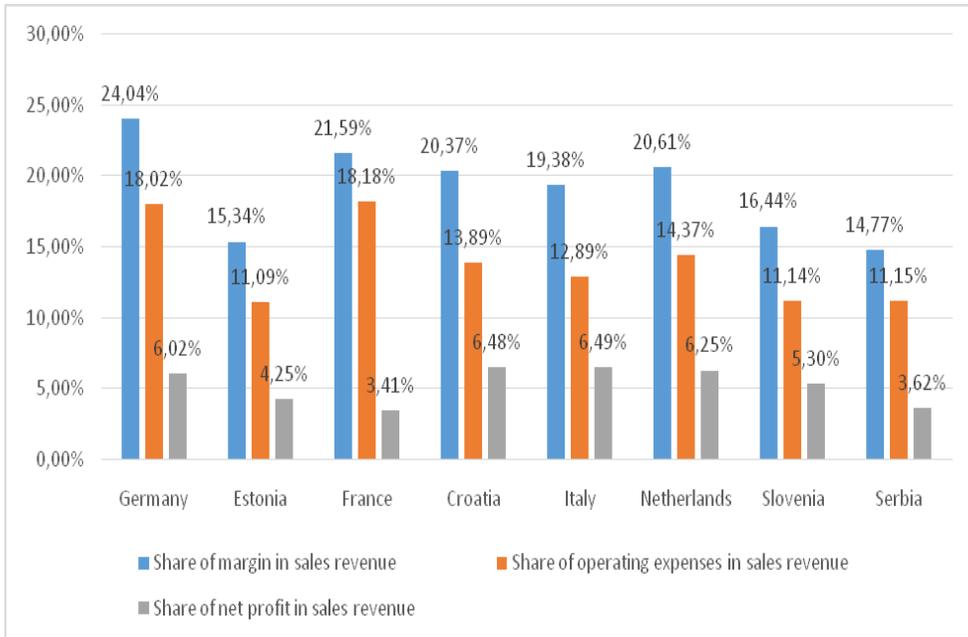
For international comparison, Table 4, as well as Figure 2, shows the percentage share of margin, operating costs, and net profit in the sales revenue of distributive trade of selective countries of the European Union and Serbia for 2018.

Table 4: Share of margin, operating costs, and net profit in sales revenue of selective countries of the European Union and Serbia, 2018

	Share of margin in sales revenue	Share of operating expenses in sales revenue	Share of net profit in sales revenue
Germany	24.04%	18.02%	6.02%
Estonia	15.34%	11.09%	4.25%
France	21.59%	18.18%	3.41%
Croatia	20.37%	13.89%	6.48%
Italy	19.38%	12.89%	6.49%
Netherlands	20.61%	14.37%	6.25%
Slovenia	16.44%	11.14%	5.30%
Serbia	14.77%	11.15%	3.62%

Note: Author's calculation

Source: Eurostat and the Financial statements annual bulletin, Business Registers Agency of the Republic of Serbia



Note: Author's image

Figure 2: Share of margin, operating costs, and net profit in sales revenue of selective countries of the European Union and Serbia, 2018

The data in the given table show that the margin rate in the trade of Serbia is lower than in the observed countries of the European Union. It is also lower compared to countries in the region (Croatia and Slovenia). The percentage share of operating costs in sales revenue in Serbian trade is lower concerning the selective countries of the European Union and the region. The share of net profit in sales revenue (expressed as a percentage) in Serbian trade is lower compared to the observed countries of the European Union, except France. It is also lower compared to Croatia and Slovenia. In any case, the lower margin rate in Serbia's trade among the observed countries of the European Union had a positive effect on its overall performance.

Size and structure of operating costs in Serbian trade

According to the theory, the total costs of trade are the costs of goods sold (purchase value of goods sold) and operating costs (Berman, 2018;

Levy, 2019; Lukić, 2011). The structure of operating costs (operating costs) in trade is specific to other sectors (Lukić, 2020c). The share of employee costs is significant, despite the increasing use of information and communication technology, i.e. digitalization of the entire business. This is a general characteristic of all service sectors to which trade also belongs.

Table 5 shows the initial data for the analysis of the size and structure of operating costs according to the nature of the costs of labor process factors in Serbian trade.

Table 5: Initial data for the analysis of the size and structure of operating costs in Serbian trade

	Operating costs	Material, fuel, and energy costs	Wage costs, wage compensation, and other personal expenses	Depreciation costs	Other operating expenses
2013	506246	109145	151978	29314	215809
2014	514213	113074	154833	30558	215748
2015	541212	117454	164718	32116	226924
2016	613520	146082	180367	34858	252213
2017	634997	135485	194924	36861	267727
2018	684265	140589	218410	41332	283934
2019	750047	153620	239639	49895	306893
2020	753238	143808	262322	53047	294061

Note: Absolute amounts are expressed in millions of dinars

Source: Financial statements annual bulletin, Agency for Business Registers of the Republic of Serbia

Table 6 and Figure 3 show the percentage structure of operating costs of trade in Serbia, and Table 7 shows its statistics.

Table 6: Structure of operational costs of trade in Serbia

	Share of material, fuel, and energy costs in total operating expenses (%)	Share of wage costs, wage compensations, and other personal expenses in operating expenses(%)	Share of depreciation costs in operating expenses (%)	Share of other operating expenses in operating expenses (%)
2013	21.56	30.02	5.79	42.63
2014	21.99	30.11	5.94	41.96
2015	21.70	30.44	5.93	41.93

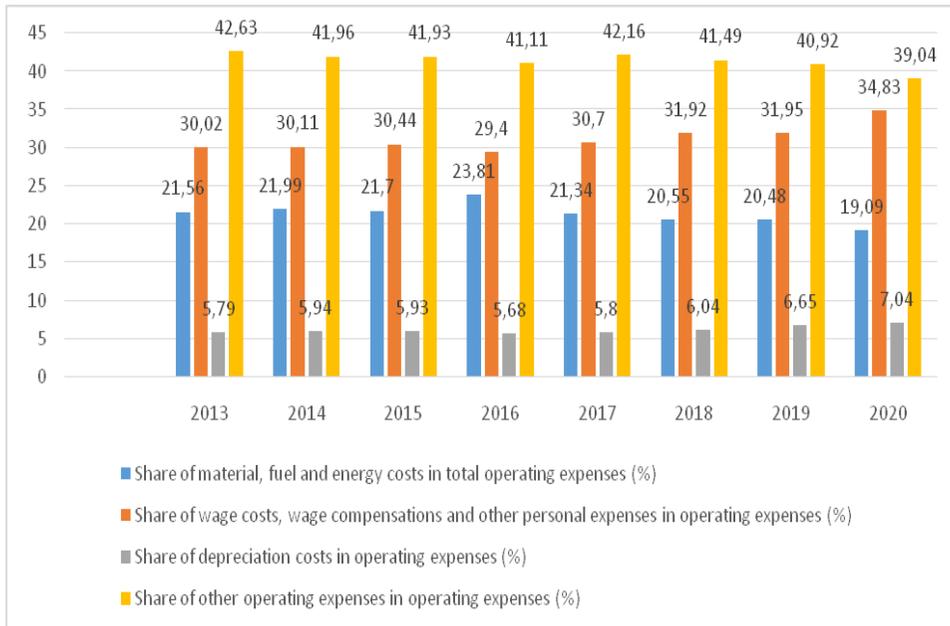
2016	23.81	29.40	5.68	41.11
2017	21.34	30.70	5.80	42.16
2018	20.55	31.92	6.04	41.49
2019	20.48	31.95	6.65	40.92
2020	19.09	34.83	7.04	39.04

Note: Author's calculation

Table 7: Statistics

Statistics					
		Share of material, fuel, and energy costs in total operating costs	Share of wage costs, wage compensations, and other personal expenses in operating expenses	Share of depreciation costs in operating expenses	Share of other operating expenses in operating expenses
N	Valid	8	8	8	8
	Missing	0	0	0	0
Mean		21.3150	31.1713	6.1088	41.4050
Std. Error of Mean		.48408	.61090	.16935	.39136
Median		21.4500	30.5700	5.9350	41.7100
Std. Deviation		1.36918	1.72789	.47900	1.10693
Skewness		.287	1.517	1.412	-1.514
Std. Error of Skewness		.752	.752	.752	.752
Kurtosis		1.375	2.527	.916	2.886
Std. Error of Kurtosis		1.481	1.481	1.481	1.481
Minimum		19.09	29.40	5.68	39.04
Maximum		23.81	34.83	7.04	42.63

Note: Author's calculation using the SPSS software program



Note: Author's image

Figure 3: Structure of operating costs in Serbian trade

Costs of materials, fuel, and energy on average participate in the total operating costs in the trade of Serbia with 21.31%. They decreased in 2020 compared to 2019, partly due to the increasing consumption of energy from renewable sources. Also due to the impact of the Covid-19 virus coronary epidemic, the working hours of stores and delivery of goods were limited.

In the trade of Serbia, wage costs, wage compensation, and other personal expenses on average participate in the total operating costs with 31.17%. They increased in 2020 compared to 2019. The reason for that is probably the increased number of suppliers of goods due to increased electronic sales in the conditions of the Covid-19 virus pandemic.

Depreciation costs on average participate in the total operating costs in Serbian trade at 6.10%. In 2020, compared to 2019, they increased, probably in part due to the purchase and depreciation of new transport vehicles for the delivery of increased sales of goods via the Internet to customers.

The share of other costs in total operating costs in Serbian trade averages 41.40%. They decreased in 2020 compared to 2019. This had a positive effect on the performance of trade in Serbia.

In modern trade, the structure of operating costs has changed to some extent due to the increasing application of the concept of sustainable

development and digitalization of the entire business. Thus, for example, energy costs are lower due to the increasing consumption of energy from renewable sources. The digitalization of the entire business has had a certain reduction in employee costs.

Structure of operating costs in Serbian trade according to the manner of behavior in relation to changes in sales volume

For management purposes, especially product categories, the division of operating costs of trade into fixed and variable is very important. In addition to variable operating costs, the total variable costs of the trade include the costs of goods sold (Lukić, 2020c).

Given the general managerial importance of the division of costs into variable and fixed, the division of operating costs into variable and fixed in the trade of Serbia will be performed using the regression linear equation which reads:

$$Y = a + bX$$

where: Y = total operating costs, a = total fixed costs, b = variable costs per unit, and X = sales volume.

The obtained regression linear equation in this case reads:

$$Y = 85377.572 + 0.089X$$

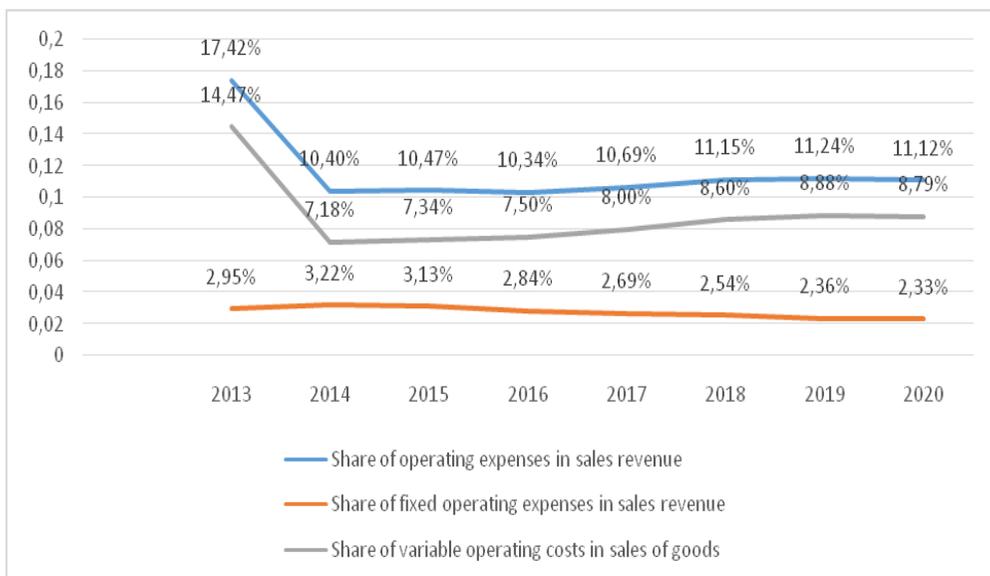
Using a given linear regression equation, projections can be made in the function of "optimizing" operating costs and achieving the target profit in Serbian trade.

In this particular case, fixed and operating costs amount to 85.377 dinars. The rest of the total operating costs relate to variable costs (Table 8, Figure 4). The fixed operating costs of poison in Serbia reflected the „legality of degression”. This had a positive effect on the overall performance of the Serbian trade.

Table 8: Size and share of the total, fixed, and variable operating expenses in revenues from sales of goods in Serbian trade

	Gross sale	Operating costs	Fixed operating costs	Variable operating costs	Share of operating expenses in sales revenue	Share of fixed operating expenses in sales revenue	Share of variable operating costs in sales of goods
2013	2891518	503641	85377	418264	17.42%	2.95%	14.47%
2014	2651536	275881	85377	190504	10.40%	3.22%	7.18%
2015	2731999	285997	85377	200620	10.47%	3.13%	7.34%
2016	3009651	311232	85377	225855	10.34%	2.84%	7.50%
2017	3172393	339079	85377	253702	10.69%	2.69%	8.00%
2018	3361094	374599	85377	289222	11.15%	2.54%	8.60%
2019	3623891	407164	85377	321787	11.24%	2.36%	8.88%
2020	3664505	407567	85377	322190	11.12%	2.33%	8.79%

Note: Author's calculation



Note: Author's image

Figure 4: Structure of operating costs of trade according to the manner of behavior in relation to changes in sales volume

The division of operating costs into fixed and variable costs enables the compilation of the income statement according to the concept of variable

costs. The income statement of trade in Serbia according to the concept of variable costs for 2020 looks like this:

Serbia's trade income statement, 2020

Gross sale	3664505	100.00%
-Costs of goods sold	3085928	84.21%
= Gross margin	578577	15.79%
-Variable operating costs	322190	8.79%
Contribution margin	256387	7.00%
-Fixed costs	85377	2.32 %
= Net profit	171010	4.68%

Note: Author's calculation

The income statement according to the concept of variable costs enables the determination of the break-even point. The break-even point of Serbian trade is

$$\text{Break - even point} = \frac{\text{Fixed costs}}{\text{Contribution margin}}$$

that is

$$\text{Break - even point} = \frac{85377}{0.07} = 1219671$$

At the level of break-even point, the total income from the sale of goods is equal to the total costs, the financial result is equal to zero. With this amount of sales (i.e. at the level of break-even point), the trade in Serbia, therefore, operates without profit or loss. Only with the sale above this amount does he start to make money, i.e. profit.

Cost efficiency in Serbian trade

We will investigate cost efficiency in Serbian trade based on DEA (Data Envelopment Analysis) models. In the context of the theoretical analysis of the DEA approach, we will briefly present the CCR model and the BCC model.

The CCR model is based on a fixed or constant scale yield. This means that a proportional increase in all inputs results in the same proportional increase in all outputs. The dual of CCR efficiency is expressed as:

$$\text{Min } \theta$$

under restriction

$$\sum_{j=1}^n \lambda_j x_{ij} \leq \theta x_{i0} \quad i = 1 \dots m$$

$$\sum_{j=1}^n \lambda_j y_{kj} \geq y_{k0} \quad k = 1 \dots s$$

$$\lambda \geq 0 \quad j = 1 \dots n \quad (1)$$

where θ is the technical efficiency of DMU units 0, λ is a dual variable for identifying comparable inefficient units. If θ^* is equal to the value of one, the observed DMU unit is technically efficient.

The concept of the CCR model has been modified with the introduction of the BCC model (by Banker-Charnes-Cooper, 1984) by changing the constant yield from scale (CRS) with variable yield from scale (VRS). A DMU unit operates under a variable scale yield if the increase in the input does not result in proportional changes in output. The BCC model is shown as:

$$\text{Min } \theta$$

under restriction

$$\sum_{j=1}^n \lambda_j x_{ij} \leq \theta x_{i0} \quad i = 1 \dots m$$

$$\sum_{j=1}^n \lambda_j y_{kj} \geq y_{k0} \quad k = 1 \dots s$$

$$\sum_{j=1}^n \lambda_{j=1} = 1 \quad j = 1 \dots n$$

$$\lambda_j \geq 0 \quad (2)$$

The BCC model divides the technical efficiency (TE) obtained by the CCR model into two parts: 1) pure technical efficiency (PTE), which ignores the influence of scale size by comparing a DMU unit with units of similar scale and measures how a DMU unit uses inputs under exogenous conditions; and 2) scale efficiency (SE), which shows how to scale size affects efficiency, formulated as $SE = TE / PTE$.

We will measure cost efficiency in Serbian trade based on DEA analysis, both input and output orientations with constant and variable yield. The input variables are: total costs, cost of goods sold, and operating costs, and the output elements are: revenues from the sale of goods, gross margin, and net profit (Table 1). DMU units were observed in (2013, 2014, 2015, 2016, 2017, 2018, 2019, and 2020).

Table 9 shows descriptive statistics, and Table 10 shows the correlation matrix of input/output data.

Table 9: Descriptive Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Total cost	8	2564581.00	3493495.00	3022833.6250	360371.85910
Cost of goods sold	8	2288700.00	3085928.00	2659688.6250	332249.32100
Operating costs	8	275881.00	503641.00	363145.0000	76178.60414
Gross sale	8	2651536.00	3664505.00	3138323.3750	385998.04420
Gross margin	8	362836.00	591371.00	478634.7500	87717.22415
Net profit	8	86955.00	171010.00	115489.7500	28250.69093
Valid N (listwise)	8				

Note: Author's calculation using the SPSS software program

Table 10: Input/output data correlation matrix

		Correlations					
		1	2	3	4	5	6
1 Total costs	Pearson Correlation	1	.979 **	.460	.999 **	.690	.900 **
	Sig. (2-tailed)		.000	.251	.000	.058	.002
	N	8	8	8	8	8	8
2 Cost of goods sold	Pearson Correlation	.979 **	1	.270	.981 **	.530	.918 **
	Sig. (2-tailed)	.000		.518	.000	.176	.001
	N	8	8	8	8	8	8
3 Operating costs	Pearson Correlation	.460	.270	1	.448	.950 **	.254
	Sig. (2-tailed)	.251	.518		.265	.000	.544
	N	8	8	8	8	8	8
4 Gross sale	Pearson Correlation	.999 **	.981 **	.448	1	.684	.914 **
	Sig. (2-tailed)	.000	.000	.265		.062	.002
	N	8	8	8	8	8	8
5 Gross margin	Pearson Correlation	.690	.530	.950 **	.684	1	.543
	Sig. (2-tailed)	.058	.176	.000	.062		.165
	N	8	8	8	8	8	8
6 Net profit	Pearson Correlation	.900 **	.918 **	.254	.914 **	.543	1
	Sig. (2-tailed)	.002	.001	.544	.002	.165	
	N	8	8	8	8	8	8

** . Correlation is significant at the 0.01 level (2-tailed).

Note: Author's calculation using the SPSS software program

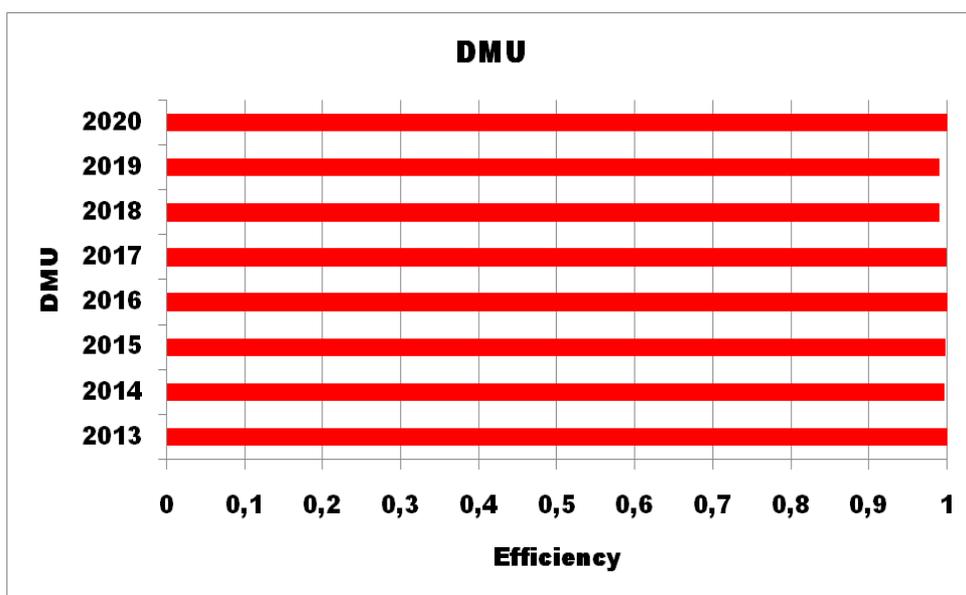
In the period 2017–2020, the trade in Serbia achieved a net profit above the average, which had a positive effect on its overall performance. There is a strong correlation at the level of statistical significance between net profit and total costs, cost of goods sold, and revenue from the sale of goods. Also, between operating costs and gross margin, and the cost of goods sold and revenue from the sale of goods. This means, in other words, that efficient management of these variables can greatly influence the achievement of the target profit in Serbian trade.

Table 11 and Figures 5 and 6 show the cost-efficiency in the Serbian trade according to the DEA model CCR-I and CCR-O.

Table 11: Cost efficiency of trade in Serbia according to the BCC-I and BCC-O model

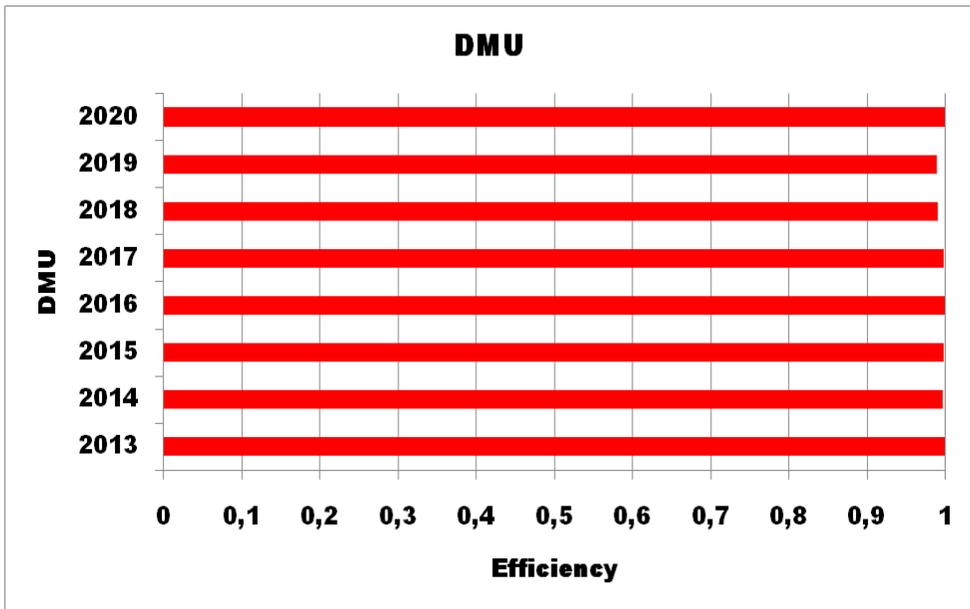
No.	DMU	Model = CCR-I		Model = CCR-O	
		Score	Rank	Score	Rank
1	2013	1	1	1	1
2	2014	0.9972	6	0.9972	6
3	2015	0.9982	5	0.9982	5
4	2016	1	1	1	1
5	2017	0.9987	4	0.9987	4
6	2018	0.9905	7	0.9905	7
7	2019	0.9897	8	0.9897	8
8	2020	1	1	1	1
	Average	0.9968		0.9968	
	Max	1		1	
	Min	0.9897		0.9897	
	St Dev	0.0043		0.0043	
			No. of Efficient DMUs = 3		No. of Efficient DMUs = 3
			No. of Inefficient DMUs = 5		No. of Inefficient DMUs = 5

Note: Author's calculation using the DEA-Solver software program



Note: Author's image

Figure 5. Cost efficiency of trade in Serbia according to Model = CCR-I



Note: Author's image

Figure 6: Cost efficiency of trade in Serbia according to Model = CCR-O

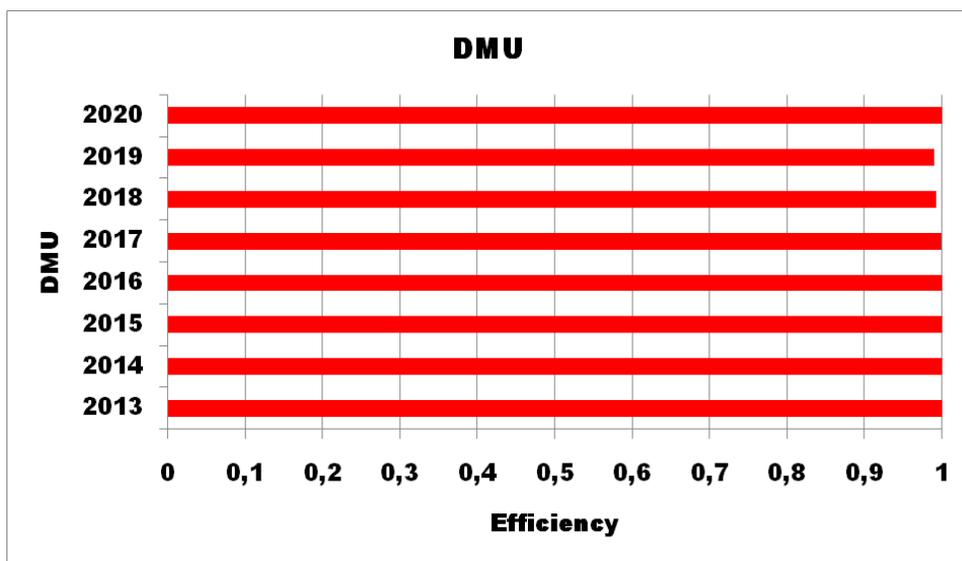
According to the CCR-I and CCR-O models, trade in Serbia was efficient in 2013, 2016, and 2020. In other observed years, it was inefficient (2014, 2015, 2017, 2018, and 2019). The trade in Serbia was cost-effective in 2020 according to both models (CCR-I and CCR-O).

Table 12 and Figures 7 and 8 show the cost-efficiency in Serbian trade according to the DEA model BCC-I and BCC-O.

Table 12: Cost-efficiency of trade in Serbia according to the BCC-I and BCC-O model

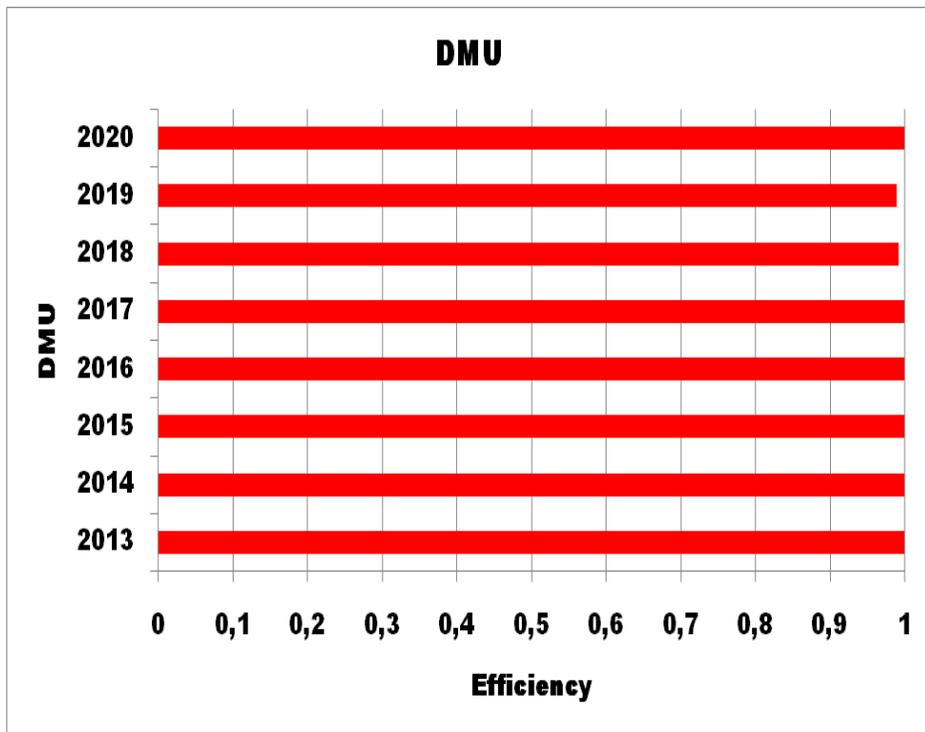
No.	DMU	Model = BCC-I Score	Rank	Model = BCC-O Score	Rank
1	2013	1	1	1	1
2	2014	1	1	1	1
3	2015	1	1	1	1
4	2016	1	1	1	1
5	2017	0.999	6	0.999	6
6	2018	0.9925	7	0.9922	7
7	2019	0.9901	8	0.9897	8
8	2020	1	1	1	1
	Average	0.9977		0.9976	
	Max	1		1	
	Min	0.9901		0.9897	
	St Dev	0.004		0.0042	
		No. of Efficient DMUs = 5			No. of Efficient DMUs = 5
		No. of Inefficient DMUs = 3			No. of Inefficient DMUs = 3

Note: Author's calculation using the DEA-Solver software program



Note: Author's image

Figure 7: Cost efficiency of trade in Serbia according to the BCC-I model



Note: Author's image

Figure 8: Cost efficiency of trade in Serbia according to the BCC-O model

According to the BCC-I and BCC-O models, trade in Serbia was efficient in 2013, 2014, 2015, 2016, and 2020. In other observed years, it was inefficient (2017, 2018, and 2019). According to both the BCC-I and BCC-O models, trade in Serbia in 2020 was cost-effective. The impact of the Covid-19 virus pandemic on cost efficiency in Serbian trade is negligible. It has been greatly mitigated with increased electronic sales.

Table 13 illustrates the projection according to the BCC-O model.

Table 13: Projection

Model = BCC-O																					
No.	DMU	Score	Rank	Total cost			Cost of goods sold			Operating costs			Gross sale			Gross margin			Net profit		
				Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)	Data	Projection	Diff.(%)
1	2013	1	1	2803788	2803788	0	2300147	2300147	0	503641	503641	0	2891518	2891518	0	591371	591371	0	87730	87730	0
2	2014	1	1	2564581	2564581	0	2288700	2288700	0	275881	275881	0	2651536	2651537	0	362836	362837	0	86955	86955.7	0.001
3	2015	1	1	2636734	2636734	0	2350737	2350737	0	285997	285997	0	2731999	2731999	0	381262	381262	0	95265	95265.4	0
4	2016	1	1	2904413	2904413	0	2593181	2593181	0	311232	311232	0	3009651	3009651	0	416470	416470	0	105238	105238	0
5	2017	0.999	6	3049666	3049666	0	2710587	2710587	0	339079	339079	0	3172393	3175519	0.099	461806	464932	0.677	122727	125853	2.547
6	2018	0.9922	7	3239278	3239278	0	2864679	2864679	0	374599	374599	0	3361094	3387458	0.784	496415	522779	5.311	121816	148180	21.642
7	2019	0.9897	8	3490714	3490714	0	3083550	3083550	0	407164	407164	0	3623891	3661470	1.037	540341	577920	6.955	133177	170756	28.217
8	2020			3493495	3493495	0	3085928	3085928	0	407567	407567	0	3664505	3664505	0	578577	578577	0	171010	171010	0

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	St Dev	Min	Max	Average
	0.0042	0.9897	1	0.9976
	3.151	1	8	3.25
	360372	2564581	3493495	3022834
	360372	2564581	3493495	3022834
	0	0	0	0
	332249	2288700	3085928	2659689
	332249	2288700	3085928	2659689
	0	0	0	0
	76178.6	275881	503641	363145
	76178.6	275881	503641	363145
	0	0	0	0
	385998	2651536	3664505	3138323
	395143	2651537	3664505	3146707
	0.4207	0	1.037	0.24
	87717.2	362836	591371	478635
	93262	362837	591371	487018
	2.8309	0	6.955	1.6179
	28250.7	86955	171010	115490
	35555.7	86955.7	171010	123873
	11.5124	0	28.217	6.5509

Note: Author’s calculation using DEA-Solver

Thus, for example, in 2019, the trade in Serbia achieved a lower net profit compared to the projected one by 28.217%. To be efficient this year, it is necessary to manage costs and revenues as efficiently as possible, by applying modern concepts. Table 14 shows Slack.

Table 14: Slack

Model = BCC-O				Slack	Slack	Slack	Slack	Slack	Slack
N o.	DMU	Score	Rank	Total cost	Cost of goods sold	Operating costs	Gross sale	Gross margin	Net profit
1	2013	1	1	0	0	0	0	0	0
2	2014	1	1	0	0	0	0	0.574	0.643
3	2015	1	1	0	0	0	0	0.371	0.417
4	2016	1	1	0	0	0	0	0	0
5	2017	0.999	6	0	0	0	0	2670.73	3004.82
6	2018	0.9922	7	0	0	0	0	22469.8	25408
7	2019	0.9897	8	0	0	0	0	31975.4	36197.6
8	2020	1	1	0	0	0	0	0	0
	Average	0.9976	3.25	0	0	0	0	7139.61	8076.43
	Max	1	8	0	0	0	0	31975.4	36197.6
	Min	0.9897	1	0	0	0	0	0	0
	St Dev	0.0042	3.151	0	0	0	0	12686.7	14357.8

Note: Author’s calculation using DEA-Solver

For the trade in Serbia to be efficient, for example, in 2019, it was necessary to achieve (expressed in millions) a higher gross margin of 32975.4 and a net profit of 36197.6 dinars through more efficient management.

Conclusion

Concerning production, the structure of costs in trade is specific, due to the very nature of business. The total costs of trade are costs of goods sold and operating costs. The share of employee costs in the structure of operating costs of trade is significant. The total variable costs of the trade include the costs of goods sold and variable operating costs. The division of costs into variable and fixed in trade is very important for the formation of sales prices and the management of product categories.

Through empirical research in this paper, on the example of Serbia, the specificity of the structure of costs in trade is shown. Its knowledge is a prerequisite for "optimizing" the size and structure of costs in trade and thus the realization of target costs and profits.

In Serbian trade, the average margin is 15.24%. It covers operating costs and a certain profit. It increased slightly in 2020 compared to 2019. Probably, one of the possible reasons is to provide some protection against the risk of a Covid-19 virus pandemic. Average operating costs (expressed as a percentage of revenue from sales of goods) in Serbian trade are 11.60%, and net profit is 3.64%.

In modern trade, the structure of operating costs has changed to some extent due to the application of the concept of sustainable development and digitalization of the entire business. Thus, for example, energy costs are lower due to the increasing consumption of energy from renewable sources. The digitalization of the entire business has had a certain reduction in employee costs.

The trade in Serbia was cost-effective in 2020 according to both models (CCR-I and CCR-O). According to both the BCC-I and BCC-O models, trade in Serbia in 2020 was cost-effective. This was positively influenced by numerous macro and micro factors (favorable economic climate, foreign retail chains, digitalization of the entire business, and others). The impact of the Covid-19 virus pandemic on cost efficiency in Serbian trade is negligible. It has been greatly mitigated with increased electronic sales.

As far as we know, there is no similar empirical research in the literature, which is a limitation in terms of international comparison of the

size and structure of costs in trade. Given this, it is necessary to conduct similar research in other countries in the future.

To improve the efficiency of cost and profit management in Serbian trade, it is necessary to take the following measures in the future, such as the application of modern cost management concepts (for example, costing by activities, activity management, quality management, target costs, etc.), management profit, human resource management (training, rewarding, flexible employment, career advancement, health, and social care), customer management, product category management, value chain concept, digitalization of the entire business, etc. State policy also plays an important role in this, especially in terms of regulating tax policy and margins.

References

1. Financial statements annual bulletin, Agency for Business Registers of the Republic of Serbia.
2. Anand, N. and Grover, N. (2015). Measuring retail supply chain performance: Theoretical model using key performance indicators (KPIs). *Benchmarking: An International Journal*, 22 (1), 135-166.
3. Andersen, P. and Petersen, N. C. (1993). A procedure for ranking efficient units in data envelopment analysis. *Management Science*, 39 (10), 1261–1264.
4. Banker, R. D., Charnes, A., and Cooper, W. W. (1984). Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis. *Management Science*, 30(9), 1078-1092.
5. Berman, B. R., Evans, J. R., Chatterjee, P. M. (2018). *Retail Management: A Strategic Approach*. 13th Edition, Pearson.
6. Bambe, D. (2017). The Productivity Impact of New Technology: Evidence from the US Retailers Industry. *Advances in Social Sciences Research Journal*, (422), 88-96.
7. Barros, C. P. (2006). Efficiency measurement among hypermarkets and supermarkets and the identification of the efficiency drivers. *International Journal of Retail & Distribution Management*, 34 (2), 135-154.
8. Barros, C. P. and Alves, C. (2004). An empirical analysis of productivity growth in a Portuguese retail chain using the Malmquist productivity index. *Journal of Retailing and Consumer Services*, 11, 269-278.
9. Busu, M., Vargas, M. V. and Gherasim, I. A. (2020). An analysis of the economic performance of retail companies in

- Romania. *Management & Marketing. Challenges for the Knowledge Society*, 15 (1), 125-135.
10. Ersoy, N. (2017). Performance measurement in retail industry by using a multi-criteria decision making methods. *Ege Academic Review*, 17 (4), 539–551. <https://doi.org/10.21121/eab.2017431302>
 11. Eurostat and the Financial statements annual bulletin, Business Registers Agency of the Republic of Serbia.
 12. Garrison, R. H. and Noree, E. W. (1997). *Managerial Accounting*. Irwin. Chicago.
 13. Donthu, N. and Yoo, B. (1998). Retail Productivity Assessment Using Data Envelopment Analysis. *Journal of Retailing*, 74 (1), 89-105.
 14. Gandhi, A. and Shankar, R. (2014). Efficiency measurement of Indian retailers using Data Envelopment Analysis. *International Journal of Retail & Distribution Management*, 42 (6), 500-520.
 15. Hsu, S. C. (2018). Performance Analysis for Major Chain Convenience Stores in Taiwan. *Journal of Social Science Studies*, 5 (1), 2014-222.
 16. Jorge, J. and Suárez, C. (2009). Assessing productivity growth and technical efficiency in Spain's retail sector: An aggregate sectoral perspective. *Journal of Business and Retail Management Research*, 3 (2), 1-19.
 17. Keener, M.H. (August 2013). Predicting The Financial Failure Of Retail Companies In The United States. *Journal of Business & Economics Research*, 11 (8), 373-380.
 18. Ko, K., Chang, M., Bae, E. S., and Kim, D. (2017). Efficiency Analysis of Retail Chain Stores in Korea. *Sustainability*, 9, 1-14.
 19. Levy, M., Weitz, B., Grewal, D. (2019). *Retailing Management*. 10th Edition, McGraw-Hill.
 20. Lau, K. H. (2013). Measuring distribution efficiency of a retail network through data envelopment analysis. *International Journal of Production Economics*, 146(2), 598-611.
 21. Lee, B. L. (2013). Productivity Performance of Singapore's Retail Sector: A Two-Stage Non-Parametric Approach. *Economic Analysis & Policy*, 43(1), 67-.
 22. Lukic, R. (2011). *Evalvacija poslovnih performansi u maloprodaji*. Beograd: Ekonomski fakultet.
 23. Lukic, R. and Hadrovic Zekic, B. (2019). Evaluation of efficiency of trade companies in Serbia using the DEA approach. Proceedings of the 19th International Scientific Conference “Business Logistics in Modern Management”, October 10-11, Osijek, Croatia, Josip Juraj

- Strossmayer University of Osijek, Faculty of Economics in Osijek, 145-165.
24. Lukic, R, Hadrovic Zekic, B. and Crnjac Milic, D. (2020a). Financial performance evaluation of trading companies in Serbia using the integrated Fuzzy AHP - TOPSIS Approach. 9th International Scientific Symposium “Region, Entrepreneurship, Development”, under the auspices of the Ministry of science and education of the Republic of Croatia, Osijek, Croatia, 690-703.
 25. Lukić, R., Hasan Hanić, H., Bugarčić, M. (2020b). Analysis of Profitability and Efficiency of Trade in Serbia, *Economic Analysis*, Vol. 53 (2), 39-50.
 26. Lukić, R. (2020c). *Računovodstvo trgovinskih preduzeća*. Beograd: Ekonomski fakultet.
 27. Lukic, R. (2020d). Analysis of the Efficiency of Trade in Oil Derivatives in Serbia by Applying the Fuzzy AHP-TOPSIS Method. *Business Excellence and Management*, 10(3), 80-98. DOI: [10.24818 / beman / 2020.10.3-06](https://doi.org/10.24818/beman/2020.10.3-06)
 28. Lukic, R., Vojteski Kljenak, D. and Anđelić, S. (2020e). Analyzing financial performances and efficiency of retail food in Serbia by using the AHP-TOPSIS method. *Economics of Agriculture*, 67(1), 55-68. DOI: <https://doi.org/10.5937/ekoPolj2001055L>
 29. Lukic, R., Vojteski Kljenak, D., Anđelic, S. and Gavilovic, M. (2021a). Application of WASPS method in the evaluation of efficiency of agricultural enterprises in Serbia. *Economics of Agriculture*, Year 68, No. 2, (pp. 375-388), Belgrade. DOI: <https://doi.org/10.5937/ekoPolj2102375L>
 30. Lukic, R. (2021b). Application of MABAC Method in Evaluation of Sector Efficiency in Serbia. *Review of International Comparative Management*, 22 (3), 400-417. DOI: 10.24818 / RMCI.2021.3.400
 31. Lukic. R. (2021c). Analysis of the Efficiency of Insurance Companies by Lines of Insurance in Serbia Using the COCOSO Method. *Insurance Trends*, 2, 24-38. DOI: 10.5937/TokOsig2102009L
 32. Lukic, R. (2021d). Application of the EDAS Method in the Evaluation of Bank Efficiency in Serbia. *Bankarstvo*, 50(2), 13-24. DOI: 10.5937/bankarstvo2102064L
 33. Martino, G. *et al.* (2017). Supply Chain Risk Assessment in the Fashion Retail Industry: An Analytic Network Process Approach. *International Journal of Applied Research*, 12(2), 140-154.

34. Melo, F. L., Sampaio, R. M. B. (2018). Efficiency, productivity gains, and the size of Brazilian supermarkets. *International Journal of Production Economics*, 197, 99-111.
35. Moreno, J. J. (2010). Productivity growth of European Retailers: a benchmarking approach. *Journal of Economic Studies*, 37(3), 288-313.
36. Moreno, J. J. and Maria, S. T. (2011). Estimating technical efficiency and bootstrapping Malmquist indices: Analysis of Spanish retail sector. *International Journal of Retail & Distribution Management*, 39(4), 272-288.
37. Qiu, C. and Meng, L. (2017). Study on total productivity factor of retail industry in east China. *Advances in Economics, Business and Management Research*, 33, 756-763.
38. Vaz, C. B., Camanho, A. S., and Guimarães, R. C. (2010). The assessment of retailing efficiency using Network Data Envelopment Analysis. *Annals of Operations Research*, 173(1), 5-24.
39. Vaz, C. B. and Camanho, A. S. (2012). Performance comparison of retailing stores using a Malmquist-type index. *The Journal of Operational Research Society*, 63(5), 631-645.
40. Yu, W. and Ramanathan, R. (2009). An assessment of operational efficiency of retail firms in China. *Journal of Retailing and Consumer Services*, 16, 109-122.

A GENERIC RELATIONAL DATABASE-DRIVEN, FORMAL EVALUATION FRAMEWORK FOR ASSESSING KEY PERFORMANCE INDICATORS IN RESEARCH PUBLISHING

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Abstract

Universities and accompanying faculties, competing to ensure the highest possible quality and status, face the challenge of being continuously evaluated and ranked, both internally and externally. One of the many criteria in such evaluation is the assessment of key performance indicators (KPIs) vis-à-vis published research papers. The general aim of this paper is the definition of a formal KPI evaluation framework for assessing the research publications (published papers and books), written by researchers in universities, faculties, and other research-oriented institutions. It is accomplished in two steps: (1) by proposing a conceptual and logical design of a generic relational database that can provide a solid foundation for acquisition and management of all relevant data related to research publications, based on the projected corresponding Enhanced Entity-Relationship (EE-R) diagram (a conceptual design) and the resulting relational database schema (a logical design); and (2) by addressing relevant KPIs via Structured Query Language (SQL) scripts/queries using the standard SQL notation against the resultant relational design. Since the proposed framework is both generic and platform-independent, it can be easily implemented in various relational database management systems (DBMSs) to provide significant insights into the research performances of the academic staff vis-à-vis their published research publications.

Keywords: scientific research, key performance indicators (KPIs), relational database design, EE-R diagram, relational schema, SQL queries.

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Introduction

Despite the legendary Wernher von Braun's⁶ funny quote claiming that "Research is what I'm doing when I don't know what I'm doing", research is considered a "formalized curiosity" (Zora Neale Hurston⁷) that "creates new knowledge" (Neil Armstrong⁸), by "turning the unknown into reality" (Steven Magee⁹). According to the OECD (2015), research is "creative and systematic work undertaken to increase the stock of knowledge", which includes the gathering, organizing, and analysis of data, facts, and prior knowledge using scientific methods, approaches, and tools to gain a new, better, and improved knowledge of a topic, phenomenon, or a problem. Over time, the results of scientific research have significantly affected individual people's lives, communities, humanity, as well as the world in which we exist. This awareness has resulted in a sustained demand among policy- and decision-makers for keeping records of not only the scientific research itself, but also of the level and nature of both human and financial resources that various countries, research institutions, universities, and faculties devote to such endeavors, as a first step toward understanding how to direct such resources on the road to the fulfillment of specific goals.

It has long been recognized that knowledge is a direct product of scientific research. Its production, exploitation, and dissemination are critical to economic growth, development, and global well-being. The widespread adoption and proliferation of new information technologies in the last few decades vastly improved the capability of generating, manipulating, and distilling information so that it becomes knowledge, bringing to the forefront the issue of how knowledge is created, nurtured, and used for competitive advantage. The need for continuous and improved measurement of scientific achievements in various fields is central to all of this. Therefore, there is an ongoing necessity to produce indicators that can quantify performance and other associated outputs of scientific research, with a particular focus on data needed for assessment, monitoring, and policy-making reasons. Aside from promoting a suitable environment for scientific output creation, dispersion,

⁶ Wernher von Braun (1912-1977), was a German-American aerospace engineer and space architect.

⁷ Zora Neale Hurston (1891-1960), was an American author, anthropologist, and filmmaker.

⁸ Neil Armstrong (1930-2012), was an American astronaut and aeronautical engineer, naval aviator, test pilot, university professor, and the first person to walk on the Moon.

⁹ Steven Magee is a world leading expert on ground-based solar radiation and human health.

and commercialization, there is a growing interest from higher education institutions in better understanding how scientific research creates values and contributes to the assessment of scientific institutions, ultimately leading to a knowledge-based economy, along with economic growth, productivity, and competitiveness.

Many universities throughout the world are still attempting to establish themselves as leaders in scientific research and teaching, on a local, regional, or global scale. The increasing prevalence of science and technology in all areas of human life, as well as the rising importance of higher education both in defining the future of the young generation and in developing societies, made it necessary to change and update educational strategic plans, educational policies, educational structure, and institutional guidelines, as well. One of the most effective ways for universities to attain international recognition and distinction in scientific research and education is the adoption and implementation of relevant Key Performance Indicators (KPIs) that are synchronized with current strategic plans. Such KPIs can significantly help universities and other research institutions to grow in a long term.

On the other hand, it is noteworthy to point out that the career advancement of academic staff is usually based mostly on their research performance regarding the published research papers and other publications (books, textbooks, monographs, encyclopedias, handbooks, technical reports, dictionaries...), even in non-research-intensive universities, although a significant portion of their time is spent on teaching activities that represent a prevailing component of their workload. This is yet another reason to foster the adoption and implementation of research-based KPIs within universities.

Figuring out the way how the generation and diffusion of knowledge contribute to the prosperity of universities and other research centers, economic progress, and overall well-being, entails the creation, management, maintenance, and usage of a solid evidence base. In addition, internationally comparable statistics are needed to support this evidence requirement. In this context, the paper proposes a generic framework for the acquisition of data related to research papers in a form of a relational database design, based on a corresponding conceptual model (E-R diagram) and the resulting relational database schema. Moreover, the paper summarizes some of the most relevant KPIs regarding research papers and proposes corresponding SQL scripts of the queries for extracting those KPIs out of the hypothetically implemented relational database, using the standard SQL notation. The benefits of such an approach are quite obvious since the proposed framework is both generic and platform-independent and it can be easily implemented in various relational database management systems (DBMSs), both within university information

systems and as a standalone software application, to provide significant insights into the research performances of the academic staff vis-à-vis their published research papers.

This paper is divided into seven different sections. The “Related research” section summarizes the most appealing research made on this topic recently. In the subsequent section titled “On performance management and Key Performance Indicators”, a brief introduction to performance management, KPIs, and research-oriented KPIs is being given. The fourth section “Data and methodology” focuses on the data and methodology used, along with the explanation of which aspects of scientific research are being addressed. The two major constituent parts of the relational database design, i.e. the conceptual model (EE-R diagram) and the logical model (the relational database schema), are being subject to the section “Relational database design”. In the sixth section entitled “Definition of research paper-related KPIs using SQL scripts”, the authors provide a set of SQL scripts, suitable for evaluating the most prominent KPIs of the scientific research vis-à-vis the published research papers. The last section concludes.

Related research

The practice has already confirmed that measuring the right KPIs is vital to the health and success of any business. However, when it comes to scientific research at research-oriented institutions, especially universities and faculties, the research made on this topic is quite scarce and obscure. Most of the research carried out on KPIs in higher education institutions refers to the assessment of the quality of teaching and the quality of academic study programs. What follows is a brief and chronologically ordered review of some of the most prominent research made recently.

In her master’s thesis, Wang (2010) distinguishes between two major dimensions of performance management in universities (academic performance and managerial performance) including the four sub-dimensions under those two dimensions (education, research, finances, and human resources). According to her, performance measurements in universities should include four types of measures, i.e. input measures, process measures, output measures, and outcome measures. She elaborates on various research-related KPIs and also proposes the inclusion of qualitative KPIs in addition to quantitative ones.

Based on a combination of both descriptive and deductive methods, and applying factor analysis to survey results, Azma (2010) identifies more than 150 KPIs and presents three conceptual frameworks suitable for the evaluation of the universities’ performance.

Terkla (2011) analyzed the dashboards of 66 colleges and universities and categorized her findings, pointing out the most popular areas of measurement, i.e. those found on more than 50% of the dashboards.

The research, carried out by Kongsamak *et al.* (2013), which was based on a questionnaire survey, deals with the perception of research excellence among researchers in Thailand and Japan. For the study, they focused on three crucial research questions, including what counts as excellence, how to measure excellence, and how to support excellence. Their research suggests that the purely bibliometric approach, which has been used for decades to evaluate individual research performance, is quite inadequate in summarizing the quality of the scientific performance.

The primary goals of the paper written by Rajkaran & Mammen (2014) were to develop consensus-based KPIs for academic departments in a specific South African public higher education institution, as well as to identify challenges to achieving them. Questionnaires and interviews were used for the study, based on a sample that included a representative number of academics and members of the university administration team. The analyzed data provided a starting point for determining optimal KPIs for university departments in the short-, medium-, and long term. The article also pointed out several issues that had to be resolved so the defined KPIs could be addressed successfully.

Recognizing the fact that higher education is the main factor contributing to the competitiveness of nations, Petrov & Kamenova-Timareva (2014) propose a framework for the evaluation of the higher education institutions' performance using the concept of KPIs.

The research made by Zhu (2015) perceives the performance of university teachers as a twofold function: the first one takes into account the skills, opportunities, motivation, and environment, while the second one relies on individual factors, organizational factors, and working factors. Based on the gradient levels' analysis of 33 sub-qualities of university teachers, the research aims at establishing a performance assessment index system and assessment method.

In their paper, Al-Turki *et al.* (2015) are focusing on the process of modification of existing KPIs that were developed to satisfy the needs of a specific, highly ranked university, situated in the Middle East region.

Cadez *et al.* (2017) investigated the relationship between research productivity, research performance, and teaching quality. Their findings, based on a large cross-disciplinary sample of academics within a research-oriented university, suggest that research productivity is not related to teaching quality, whereas research quality is positively related to teaching quality.

In their work, Anuradha *et al.* (2018) focus on the Academic Performance Indicators (APIs) of college teachers in India, which are quantitative measures of the growth of a student, a teacher, and an institution. Those KPIs have been elaborated in four categories, including continuous improvement/professional growth, interactions with industry, student development, and administrative commitment.

Chang (2019) focused on the exploration of performance evaluation reform regarding teachers in private universities and colleges in China, based on the “KPI + Competency” dual-track system, to build a new performance management system for private college teachers.

Alomary (2020) elaborates on the adoption of KPIs in the higher education system in Saudi Arabia to measure the performance of universities in this country.

All of the previously reported research endeavors confirm that KPIs used for measuring the performance of higher education institutions, and especially KPIs oriented toward measuring the performance of scientific research, have recently become of utmost importance, since they are a highly significant tool in the complex process of selection and breeding of research staff in universities and other research-oriented institutions, as well as for their overall ranking, regardless of their status (private or public), the country of origin (throughout the world), or KPIs’ nature (qualitative or quantitative).

On performance management and Key Performance Indicators

According to Harris *et al.* (2003), Performance Management (PM) is “the process of ensuring that a set of activities and outputs meets an organization’s goals effectively and efficiently. Performance management can focus on the performance of an organization, a department, an employee, or the processes in place to manage particular tasks.” A comprehensive and well-executed performance management system incorporating elements such as performance appraisals and processes to manage underperformance is an important component of developing employees, departments, and whole organizations. It is a well-established, all-encompassing term used to describe the practice that drives decisions about performance, rewards, promotions, disciplinary procedures, terminations, transfers, and development needs within an organization. Performance management is a much broader concept than performance measurement since it aims to improve organizational, functional, team, and individual performances. So far, a few performance measurement frameworks, such as the Balanced Scorecard (BSC) approach, which was originally developed for the business sector, have been adapted for performance management in research-oriented

institutions, despite the existing risk of incompletely capturing the essence of such organization type's fundamental operations. However, since research-oriented institutions are generally characterized by a varying number of versatile primary goals, the appliance of any traditional performance measurement approach may not be quite appropriate. The performance of research-oriented institutions can be assessed by the extent to which each of their fundamental operations is sustained toward the fulfillment of their unique goals.

When it comes to answering the question "What are KPIs?" perhaps it is more straightforward to consider what isn't a KPI? A Key Performance Indicator (KPI) is not a piece of information that should be known just because the organization may need to refer to it. Also, it is not something that should be presented simply because that is what the others are monitoring regularly. At last, it is not a measure of something that cannot be managed or utilized in making decisions. KPIs are performance metrics that can be tracked, measured, and analyzed. KPIs are not goals themselves, but rather measures used to evaluate the factors that are crucial or critical to the success of an organization. They are measurable quantitative leading indicators that show how well an organization or their particular departments or even individuals are performing vis-à-vis their key objectives, goals, and priorities. KPIs' importance cannot be underestimated, because they are much more than simply statistics that are being reported. They help in understanding and measuring the performance and health of a given organization, as well as to find out whether the organization is heading in the right direction based on the adopted strategy, allowing the management team to make necessary modifications in operations to reach organizational strategic goals and performance targets. Knowing and evaluating the proper KPIs can help the management team to accomplish the predefined organizational goals faster and more efficiently. Monitoring the performance by using KPIs is an efficient strategy that allows organizations to gain a competitive advantage over their competitors.

In universities and other higher education institutions, specific KPIs are used to understand how an institution, study program, department, faculty, course, or even a particular student or professor/lecturer is progressing toward the projected goals. Besides in the field of scientific research (to be widely recognized research and knowledge exchange center), KPIs can be defined and assessed regarding many other aspects, roughly broken down into the following categories: education (outstanding teaching & learning), community services (support of various programs for the students), international cooperation, university environment, administration & finances (endowments & expenses), human resources, student success,

admission & enrollments, faculty & staff, facilities & resources (excellence in services and infrastructure), sustainability (CO₂ emissions, electricity spending, water consumption...), internationalization, development, and alumni, etc. All of these can be further divided into many sub-categories (Petrov & Kamenova-Timareva, 2014, pp. 114–119; SQU, 2018; Spear, 2019; UCC, 2020; Ordenes, 2021; NEIU, 2022). No matter how many KPI categories are assessed, setting up an insightful university KPI system requires five main components: (1) setting up accurate and realistic goals, following the SMART strategy (Specific, Measurable, Achievable, Relevant, and Time-Bound); (2) defining at least one performance measure/KPI for each identified goal; (3) effective and accurate data collection/acquisition, storage, and management; (4) automated process of extracting information from data and computing the values of relevant KPIs (e.g. KPI dashboard software, reporting software, database-driven analytics); (5) evaluation of the obtained KPIs' values (results) against the predefined goals to set new goals or adjust previous ones (Petrov & Kamenova-Timareva, 2014, p. 114; InsightSoftware, 2021).

Research is an essential activity for all research-oriented institutions. Developing KPIs for measuring the success of scientific research is crucial in creating a culture wherein scientific achievement is both recognized and appreciated. They also offer the additional function of propelling an organization toward objectives that would otherwise be idled by day-to-day activities or stagnate due to a lack of commitment and a lack of comparison of actual outcomes to intended/projected results.

Data and methodology

This research is focused solely on addressing the research-oriented KPIs related to research papers and books, published by academic staff/researchers. It is based on data/facts about commonly utilized research-oriented KPIs, found in several self-evaluation reports (SER, 2015; SER, 2018; SER, 2021), other relevant documents dealing with KPIs in universities (SQU, 2018; UoE, 2019; UoT, –), as well as the metadata found with eprints.uklo.edu.mk online institutional repository of research outputs (ePrints, –). The data/facts have been gathered (identified, selected, and analyzed) using the method of observation. The usage of collected data/facts follows the induction approach since they are used to identify common patterns, and to come up with a conceptual framework as a general conclusion, in a bottom-up manner: the final, high-level solution is gained by combining several low-level solutions addressing specific aspects. The specification of research-oriented KPIs follows the relational database design

methodology, including the first two phases: the conceptual design (EE-R diagram) and the logical design (relational database schema) (Bagui & Earp, 2011; Teorey *et al.*, 2011).

More specifically, this research takes into account the following, frequently addressed aspects of publishing research publications:

- Authors/researchers;
- Research papers: journal papers, proceedings papers, book chapters;
- Publications: books, conference proceedings, and journals;
- Citations of research papers in books and other research papers;
- Academic meetings (conferences, congresses, symposiums);
- Indexation of research publications in relevant databases;
- Researchers' membership in editorial/advisory boards of journals, as well as in organizing and program committees of academic meetings;

Having minded this, the paper is strictly oriented toward the KPIs that reflect a spectrum of significant “internal” aspects of the scientific research, i.e. the KPIs used in the process of a scientific research assessment from the perspective of a particular university/faculty, rather than external aspects, which measure how outer subjects (potentially interested public audience) validate the scientific research, such as Journal Citation Reports (JCR) impact factor, Source-Normalized Impact per Paper (SNIP), SCImago Journal Rank (SJR), relative citation rates, *h*-index, full-text downloads, altmetrics, webometrics, etc.

Relational database design

In this section, the focus is put on the conceptual and logical design of a relational database that can represent a solid basis for obtaining relevant KPIs regarding several important aspects of publishing research publications. The proposed design can be easily modified (adapted, upgraded, and/or enhanced) to capture additional KPIs that are relevant for other types of research institutions, as well.

Conceptual design

The EE-R diagram, shown in Figure 1, encompasses all the entities and relationships between them, involved in the process of publishing scientific publications (research papers and books). For simplicity reasons, only the relationships' attributes are displayed. Relationships' degree, cardinality, and modality are also shown.

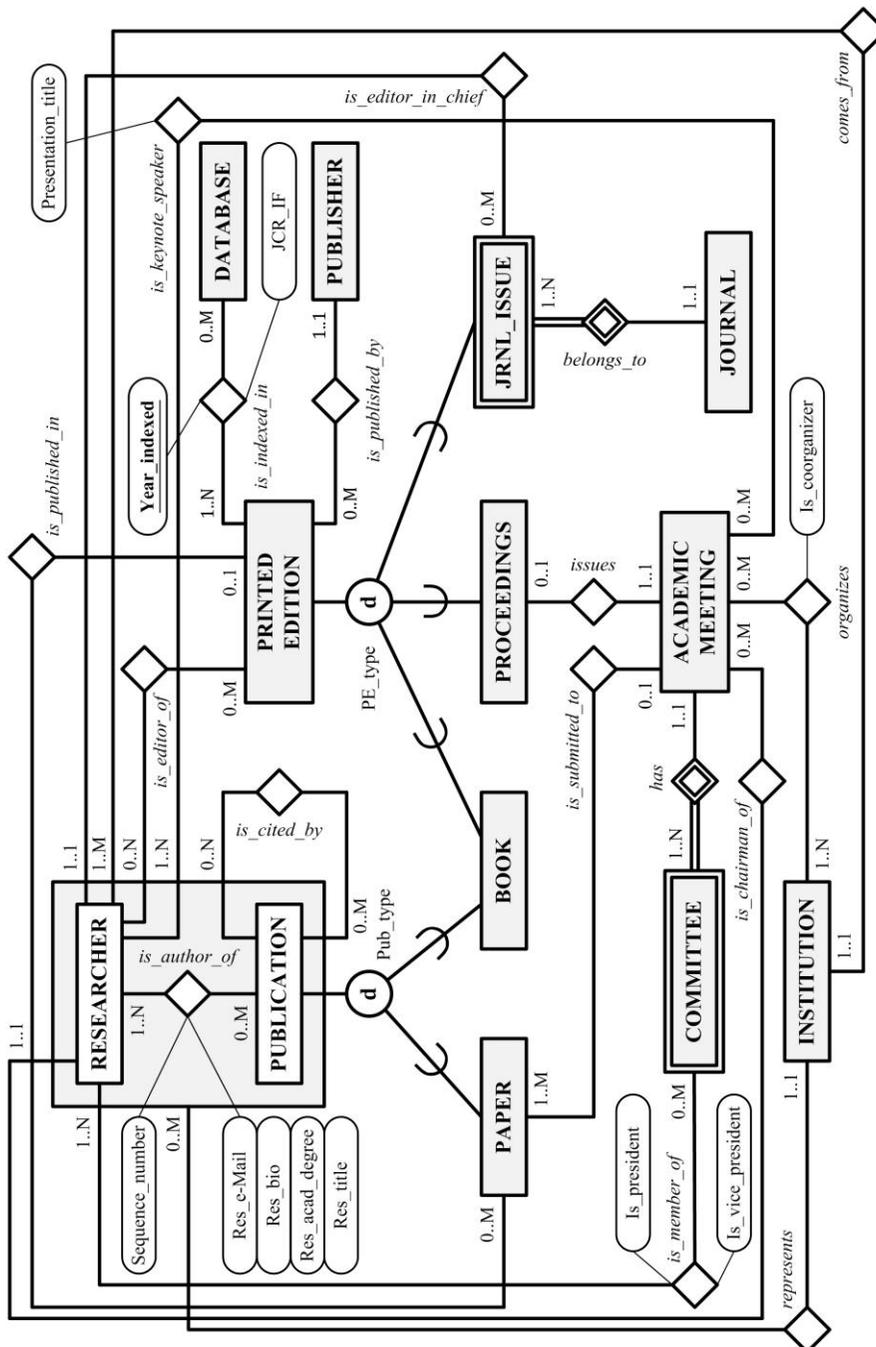


Figure 1: Conceptual design (EE-R diagram) of a relational database suitable for capturing research-oriented KPIs about scientific publications, rotated counterclockwise (Source: Authors' representation)

The key attributes of identified entity types portrayed in Figure 1, along with their corresponding non-key attributes, are given in Table 1. Key attributes are bolded and underlined with a solid line. Partial key attributes of weak entity types are bolded and underlined with a dotted line. Since the subtypes inherit the attributes from their corresponding supertype, only their specific attributes are presented in Table 1.

Table 1: Key attributes and non-key attributes of entity types

Entity type	Attribute
RESEARCHER	<u>Researcher ID</u> Res_name Res_mid_name Res_surname Res_ORCID Res_gender Res_title_now Res_degree_now Res_e-Mail_now Res_bio_now Res_birthdate Res_birthplace Res_country
PUBLISHER	<u>Publisher ID</u> P-sher_name P-sher_address P-sher_website
PUBLICATION (supertype)	<u>Publication ID</u> Pub_type (e.g. Paper, Book) Pub_title Classification (Frascati_field, Frascati_area, Frascati_discipline)
PRINTED_EDITION (supertype)	<u>PE ID</u> PE_type (e.g. Book, Proceedings, Journal issue) PE_title PE_format (e.g. A4, B5...) PE_binding (e.g. hardcover, paperback) PE_pub_date PE_pub_year PE_total_pages
DATABASE	<u>Database ID</u> D-base_name D-base_disciplines D-base_website

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INSTITUTION	<p><u>Institution ID</u> Inst_type (e.g. Faculty, University, Institute, Laboratory...) Inst_name Inst_address Inst_postcode Inst_city Inst_country Inst_e-Mail Inst_website Inst_phones</p>
ACADEMIC_MEETING	<p><u>Meeting ID</u> Meet_type (e.g. Conference, Symposium, Congress) Meet_title Meet_acronym Meet_place Meet_city Meet_country Meet_date_from Meet_date_to Meet_website</p>
COMMITTEE (weak entity type)	<p><u>Comm ID</u> Comm_type (e.g. Program committee, Organizing committee)</p>
PAPER (subtype of PUBLICATION)	<p>Paper_DOI Paper_abstract Paper_keywords Paper_pdf From_page To_page</p>
BOOK (a shared subtype of PUBLICATION and PRINTED_EDITION)	<p>Book_title Book_ISBN Book_e-ISBN Book_type (e.g. textbook, manual, monograph, encyclopedia, handbook, technical report, dictionary...)</p>
JRNL_ISSUE (subtype + weak entity type)	<p><u>Volume</u> <u>Issue</u></p>
JOURNAL	<p><u>Journal ID</u> Jrnl_title Jrnl_e-ISSN Jrnl_print-ISSN Jrnl_website</p>
PROCEEDINGS (subtype)	<p>Proc_title Proc_ISBN Proc_e-ISBN Proc_e-ISSN Proc_print-ISSN</p>

Logical design

Given the EE-R diagram, previously introduced in Figure 1, and the list of all key and non-key attributes of the identified entity types given in Table 1, the logical design of the relational database can be incurred by transforming the conceptual design into the following relational schema:

- INSTITUTION (**Institution ID**, Inst_type, Inst_name, Inst_address, Inst_postcode, Inst_city, Inst_country, Inst_e-Mail, Inst_website, Inst_phones)
- RESEARCHER (**Researcher ID**, Res_name, Res_mid_name, Res_surname, Res_ORCID, Res_gender, Res_title_now, Res_degree_now, Res_e-Mail_now, Res_bio_now, Res_birthdate, Res_birthplace, Res_country, *Institution_ID**)
- PUBLISHER (**Publisher ID**, P-sher_name, P-sher_address, P-sher_website)
- DATABASE (**Database ID**, D-base_name, D-base_disciplines, D-base_website)
- ACADEMIC_MEETING (**Meeting ID**, Meet_type, Meet_title, Meet_acronym, Meet_place, Meet_city, Meet_country, Meet_date_from, Meet_date_to, Meet_year, Meet_website, *Chairman_ID**)
- COMMITTEE (**Meeting ID***, **Comm ID**, Comm_type)
- PUBLICATION (**Publication ID**, Pub_type, Pub_title, Pub_language, Frascati_field, Frascati_area, Frascati_discipline)
- PRINTED_EDITION (**PE ID**, PE_type, PE_title, PE_format, PE_binding, PE_pub_date, PE_pub_year, PE_total_pages)
- PAPER (**Publication ID***, Paper_DOI, Paper_abstract, Paper_keywords, Paper_pdf, From_page, To_page, *Meeting_ID**, *PE_ID**)
- BOOK (**Publication ID***, **PE ID***, Book_title, Book_ISBN, Book_e-ISBN, Book_type, *Publisher_ID**)

- JOURNAL (**Journal ID**, Jrnl_title, Jrnl_e-ISSN, Jrnl_print-ISSN, Jrnl_website)
- JRNL_ISSUE (**PE ID***, **Journal ID***, **Volume**, **Issue**, *Editor in Chief ID**, *Publisher ID**)
- PROCEEDINGS (**PE ID***, Proc_title, Proc_ISBN, Proc_e-ISSN, Proc_e-ISSN, Proc_print-ISSN, *Meeting ID**, *Publisher ID**)
- ORGANIZES (**Institution ID***, **Meeting ID***, Is_coorganizer)
- IS_KEYNOTE_SPEAKER (**Researcher ID***, **Meeting ID***, Presentation_title)
- IS_AUTHOR_OF (**Researcher ID***, **Publication ID***, Res_e-Mail, Res_bio, Res_acad_degree, Res_title, Sequence_number, *Institution ID**)
- IS_MEMBER_OF (**Researcher ID***, **Meeting ID***, **Comm ID***, Is_president, Is_vice_president)
- IS_INDEXED_IN (**PE ID***, **Database ID***, **Year indexed**, JCR_IF)
- IS_EDITOR_OF (**Researcher ID***, **PE ID***)
- IS_CITED_BY (**Publication ID***, **Citing publication ID***)

In the above relational database schema, primary keys are bolded and underlined with a solid line. Primary keys, which are also foreign keys or are parts of a foreign key, are denoted by an asterisk (*). Pure foreign keys are written in italics, underlined with a dotted line, and denoted by an asterisk (*). All the relations are already in a Third Normal Form (3NF).

Definition of research-related KPIs using SQL scripts

Table 2 contains definitions and standard SQL specifications of some of the most prospective research-oriented KPIs that can be yielded from the proposed logical database design.

Table 2: Specification of SQL scripts for addressing research-oriented KPIs

1.	KPI Description	Total number of researchers from <institution_name> that were members of academic meetings' <committee_type> (c.comm_type = 'Organizing committee' 'Program committee'), held in the period from <year1> to <year2>
	SQL Specification	<pre> SELECT COUNT(*) AS Membership_in_academic_meeting_committees FROM Is_member_of imo, Researcher r, Academic_meeting am, Committee c, Institution i WHERE (imo.researcher_ID = r.researcher_ID) AND (imo.meeting_ID = am.meeting_ID) AND (imo.meeting_ID = c.meeting_ID) AND (imo.comm_ID = c.comm_ID) AND (r.institution_ID = i.institution_ID) AND (c.comm_type = '<committee_type>') AND (i.inst_name = '<institution_name>') AND (am.meet_year >= <year1> AND am.meet_year <= <year2>); </pre>
2.	KPI Description	Total number of academic meetings organized/co-organized (o.is_coorganizer = 'False' 'True') by <institution_name> in the period from <year1> to <year2>
	SQL Specification	<pre> SELECT COUNT(*) AS Number_of_academic_meetings FROM Organizes o, Institution i, Academic_meeting am WHERE o.institution_ID = i.institution_ID AND o.meeting_ID = am.meeting_ID AND i.inst_name = '<institution_name>' AND o.is_coorganizer = 'False' 'True' AND (am.meet_year >= <year1> AND am.meet_year <= <year2>); </pre>
3.	KPI Description	Total number of researchers from <institution_name> who were keynote speakers at academic meetings held in the period from <year1> to <year2>
	SQL Specification	<pre> SELECT COUNT(*) AS Number_of_keynote_speakers FROM Is_keynote_speaker iks, Researcher r, Institution i, Academic_meeting am WHERE (iks.researcher_ID = r.researcher_ID) AND (iks.meeting_ID = am.meeting_ID) AND (r.institution_ID = i.institution_ID) AND (i.inst_name = '<institution_name>') AND (am.meet_year >= <year1> AND am.meet_year <= <year2>); </pre>

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4.	KPI Description	Total number of researchers from <institution_name> who were editor-in-chief of a scientific journal in the period from <year1> to <year2>
	SQL Specification	<pre>SELECT COUNT(DISTINCT ji.editor_in_chief_ID) AS Number_of_Editors_in_Chief FROM Jrnl_issue ji, Journal j, Researcher r, Institution i, Printed_edition pe WHERE (ji.journal_ID = j.journal_ID) AND (ji.editor_in_chief_ID = r.researcher_ID) AND (r.institution_ID = i.institution_ID) AND (ji.PE_ID = pe.PE_ID) AND (i.inst_name = '<institution_name>') AND (pe.PE_pub_year >= <year1> AND pe.PE_pub_year <= <year2>);</pre>
5.	KPI Description	Total number of researchers from <institution_name> who published a research paper in a book, i.e. a book chapter (pe_type = 'Book'), in a proceedings (pe_type = 'Proceedings'), or in a journal (pe_type = 'Journal') in the period from <year1> to <year2>, and were listed as <seq_number> author.
	SQL Specification	<pre>SELECT COUNT(DISTINCT(iao.researcher_ID)) AS Number_of_researchers_who_published_a_paper FROM Is_author_of iao, Researcher r, Publication pub, Institution i, Paper p, Printed_edition pe WHERE (iao.researcher_ID = r.researcher_ID) AND (iao.publication_ID = pub.publication_ID) AND (iao.institution_ID = i.institution_ID) AND (pub.publication_ID = p.publication_ID) AND (p.PE_ID = pe.PE_ID) AND (pe.pe_type = '<pe_type>') AND (iao.sequence_number = <seq_number>) AND (i.inst_name = '<institution_name>') AND (pe.PE_pub_year >= <year1> AND pe.PE_pub_year <= <year2>);</pre>
6.	KPI Description	Total number of researchers from <institution_name> who published a book in the period from <year1> to <year2>
	SQL Specification	<pre>SELECT COUNT(DISTINCT iao.researcher_ID) AS Number_of_researchers_who_published_a_book FROM Is_author_of iao, Researcher r, Publication pub, Institution i, Book b, Printed_edition pe WHERE (iao.researcher_ID = r.researcher_ID) AND (iao.publication_ID = pub.publication_ID) AND (iao.institution_ID = i.institution_ID) AND (pub.publication_ID = b.publication_ID) AND (b.PE_ID = pe.PE_ID) AND (pub.pub_type = 'Book') AND (i.inst_name = '<institution_name>') AND (pe.PE_pub_year >= <year1> AND pe.PE_pub_year <= <year2>);</pre>

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7.	KPI Description	Total number of authorships of research papers, written by researchers from <institution_name> in the period from <year1> to <year2>
	SQL Specification	<pre> SELECT COUNT(DISTINCT iao.researcher_ID + iao.publication_ID) AS Number_of_authorships_of_papers FROM Is_author_of iao, Researcher r, Publication pub, Institution i, Paper p, Printed_edition pe WHERE (iao.researcher_ID = r.researcher_ID) AND (iao.publication_ID = pub.publication_ID) AND (iao.institution_ID = i.institution_ID) AND (pub.publication_ID = p.publication_ID) AND (p.PE_ID = pe.PE_ID) AND (pub.pub_type = 'Paper') AND (i.inst_name = '<institution_name>') AND (pe.PE_pub_year >= <year1> AND pe.PE_pub_year <= <year2>); </pre>
8.	KPI Description	Total number of distinct research paper titles, written by researchers from <institution_name> in the period from <year1> to <year2>
	SQL Specification	<pre> SELECT COUNT(DISTINCT iao.publication_ID) AS Number_of_distinct_paper_titles FROM Is_author_of iao, Publication pub, Institution i, Paper p, Printed_edition pe WHERE (iao.publication_ID = pub.publication_ID) AND (iao.institution_ID = i.institution_ID) AND (pub.publication_ID = p.publication_ID) AND (p.PE_ID = pe.PE_ID) AND (pub.pub_type = 'Paper') AND (i.inst_name = '<institution_name>') AND (pe.PE_pub_year >= <year1> AND pe.PE_pub_year <= <year2>); </pre>
9.	KPI Description	Total number of distinct book titles, written by researchers from <institution_name> in the period from <year1> to <year2>
	SQL Specification	<pre> SELECT COUNT(DISTINCT iao.publication_ID) AS Number_of_distinct_book_titles FROM Is_author_of iao, Researcher r, Publication pub, Institution i, Book b, Printed_edition pe WHERE (iao.researcher_ID = r.researcher_ID) AND (iao.publication_ID = pub.publication_ID) AND (iao.institution_ID = i.institution_ID) AND (pub.publication_ID = b.publication_ID) AND (b.PE_ID = pe.PE_ID) AND (pub.pub_type = 'Book') AND (i.inst_name = '<institution_name>') AND (pe.PE_pub_year >= <year1> AND pe.PE_pub_year <= <year2>); </pre>

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10.	KPI Description	Total number of distinct paper titles written by the researchers from <institution_name>, which were published in publications indexed in <sci_database> in the period from <year1> to <year2>
	SQL Specification	<pre> SELECT COUNT(DISTINCT iao.publication_ID) AS Total_number_of_papers_indexed_in_a_database FROM Is_author_of iao, Researcher r, Publication pub, Institution i, Paper p, Printed_edition pe, Is_indexed_in iii, DatabaseSci d WHERE (iao.researcher_ID = r.researcher_ID) AND (iao.publication_ID = pub.publication_ID) AND (iao.institution_ID = i.institution_ID) AND (pub.publication_ID = p.publication_ID) AND (p.PE_ID = pe.PE_ID) AND (pe.PE_ID = iii.PE_ID) AND (iii.database_ID = d.database_ID) AND (pub.pub_type = 'Paper') AND (i.inst_name = '<institution_name>') AND (d.dbase_name = '<sci_database>') AND (pe.PE_pub_year >= <year1> AND pe.PE_pub_year <= <year2>); </pre>
11.	KPI Description	Total number of researchers from <institution_name> who were chairmen of academic meetings in the period from <date1> to <date2>
	SQL Specification	<pre> SELECT COUNT(*) AS Number_of_chairmen FROM Academic_meeting am, Researcher r, Organizes o, Institution i WHERE (am.chairman_ID = r.researcher_ID) AND (o.institution_ID = i.institution_ID) AND (o.meeting_ID = am.meeting_ID) AND (i.inst_name = '<institution_name>') AND (am.meet_year >= <year1> AND am.meet_year <= <year2>); </pre>
12.	KPI Description	Total number of researchers from <institution_name> who were members of editorial board of <publication_type> (pe.PE_type = 'Book' 'Proceedings' 'Journal') in the period from <year1> to <year2>
	SQL Specification	<pre> SELECT COUNT(*) AS Members_of_editorial_board FROM Is_editor_of ieo, Researcher r, Printed_edition pe, Institution i WHERE (ieo.researcher_ID = r.researcher_ID) AND (ieo.PE_ID = pe.PE_ID) AND (r.institution_ID = i.institution_ID) AND (pe.PE_type = '<publication_type>') AND (i.inst_name = '<institution_name>') AND (pe.PE_pub_year >= <year1> AND pe.PE_pub_year <= <year2>); </pre>

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13.	KPI Description	Total number of citations of publications (papers and/or books), written by researchers from <institution_name>, in papers published in the period from <year1> to <year2>
	SQL Specification	<pre> SELECT COUNT(*) AS Citations_of_papers_and_books_in_papers FROM Is_cited_by icb, Publication pub, Publication cpub, Is_author_of iao, Researcher r, Institution i, Paper p, Printed_edition pe WHERE (icb.publication_ID = pub.Publication_ID) AND (icb.citing_publication_ID = cpub.Publication_ID) AND (icb.publication_ID = iao.publication_ID) AND (iao.researcher_ID = r.researcher_ID) AND (iao.institution_ID = i.institution_ID) AND (icb.citing_publication_ID = p.publication_ID) AND (p.PE_ID = pe.PE_ID) AND (i.inst_name = '<institution_name>') AND (pe.PE_pub_year >= <year1> AND pe.PE_pub_year <= <year2>); </pre>

Conclusion

In today's highly competitive world, all research-oriented institutions (universities, faculties, colleges, research institutes, research laboratories, and other organizations focused on scientific research) must maintain track of their real performance updates to lead the organization in the appropriate direction. The main substance in the process of human resource management in all research-oriented institutions is performance evaluation related to scientific research. The most successful ones have a performance measuring system already in place, based on the utilization of relevant KPIs, to have control over and enhance research processes. Building an assessment system based on KPIs to develop academic staff's competencies may encourage the continual development of university professors' performance and assure institutions' sustainability, stability, and competitiveness in a long run. Research-oriented institutions should define and always monitor those KPIs, as they represent metrics that should be defined, monitored, reported, and controlled for such organizations to be perceived as successful by their competitors, as well as by the overall scientific audience, in general. Those KPIs are established to ensure that organizations pay close attention to outcomes, responsibilities, and objectives because scientific research has recently been put under pressure. The stakes become quite high in terms of

delivering eminence, worth, quality, excellence, innovation, and financial results. Higher expectations from scientific research in research-oriented institutions imposed the use of KPIs as the main criterion for measuring both the success of academic staff and the overall organization's progress in achieving their targets/goals/objectives to be in line with their predefined mission and vision.

In this paper, a performance evaluation framework regarding research publications has been proposed, based on a relational database design methodology. After proposing a conceptual design of a relational database in a form of an EE-R diagram, a total of 13 representative research-related KPIs have been specified, along with the corresponding SQL queries against the proposed relational database schema. All of them utilize the COUNT(.) aggregation function to yield summary results; however, SQL queries can be easily modified to retrieve particular records, i.e. tabular data from the physical database.

The benefits of the hereby described approach are multiple: (1) the conceptual design allows quick and easy modifications in terms of adding new entity types, attributes, and relations, as well as updating or deleting the existing ones in the EE-R diagram, to meet the specific KPI requirements of any type of research-oriented institution, exactly and consistently; (2) any modifications in the conceptual design can be easily mapped into a corresponding logical design, which allows for quick and easy adaptation of the SQL scripts implementing the hereby addressed KPIs; (3) the logical design allows for specifying a range of additional research-oriented KPIs, based on the same data; (4) the hereby described relational database approach can serve as a solid foundation to develop and implement KPIs, other than research-oriented ones, to satisfy the needs of research-oriented institutions; (5) since the described approach and all resulting SQL scripts are platform-independent, they can be successfully implemented in various relational DBMSs; (6) the proposed approach can serve as a basis for building up either a stand-alone software application, a software module as an integral part of a previously deployed management information system, or a cloud-based software solution.

As per the limitations of this research, it should be notified that several research-oriented KPI categories and their corresponding sub-categories are not taken into account, such as the income from research calculated at the institutional level (e.g. average research income per Full-Time Equivalent (FTE) for academic and research staff; research income from the industry; the proportion of research grants and contracts awarded per proportion of academic staff costs; and total research income); KPIs related to adequate research facilities; membership in national academies of arts and sciences; tenured faculty staff; the M.Sc./MA and Ph.D./D.Sc. theses completed;

projects and their funding; national and international awards gained by researchers; membership of researchers in professional scientific bodies; patents' ownership; researchers' participation in projects; the number of spin-out companies; etc. Nonetheless, all of these shortcomings can be successfully addressed by simply expanding the hereby proposed conceptual and logical design.

When it comes to the performance of SQL queries' execution, which is a purely technical aspect, it should be pointed out that the intensive usage of INNER JOINS is likely to lead to its significant degradation, an issue that can be possibly resolved by the appliance of any denormalization techniques.

The hereby presented approach can be equally effectively applied in addressing KPIs in other spheres, such as business and economy, industry, education, etc. In the future, this research (particularly the proposed EE-R diagram) is going to be extended (a) to include several new supplementary entity types and relationships so that an additional set of research-oriented KPIs can be fully addressed, and (b) to enrich the existing entity types by adding extra attributes.

References

1. Alomary, F. O. (2020). Evaluation of Scientific Research Based on Key Performance Indicators (KPIs): A Case Study in Al-Imam Mohammad Ibn Saud Islamic University. *Computer and Information Science*, 13(1): 34–40.
2. Al-Turki, Y. A., Bilgrami, A. L., & Said, A.-E. (2015). A Case Study of Key Performance Indicators in Scientific Research in a Middle Eastern University. *International Journal of Latest Research in Science and Technology*, 4(6): 21–28.
3. Anuradha, K., Subasri, B., & Vignesh, S. (2018). A Study on the Academic Performance of College Teachers based on Key Performance Indicators. *International Journal of Trend in Scientific Research and Development (IJTSRD)*, 2(3): 259–261.
4. Azma, F. (2010). Qualitative Indicators for the Evaluation of Universities performance. *Procedia Social and Behavioral Sciences*, 2 (2010), 5408–5411. DOI: 10.1016/j.sbspro.2010.03.882
5. Bagui, S. S. & Earp, R. W. (2011). *Database Design Using Entity-Relationship Diagrams (Foundations of Database Design)*, 2nd Edition. CRC Press/Auerbach Publications, Boca Raton, FL, USA.

6. Cadez, S., Dimovski, V., & Groff, M. Z. (2017). Research, Teaching and Performance Evaluation in Academia: the Salience of Quality. *Studies in Higher Education*, 42(8): 1455–1473. DOI: 10.1080/03075079.2015.1104659
7. Chang, Z. (2019). Exploration on the Performance Evaluation Reform of Private University Teachers Based on the “KPI Plus Competency” Dual-Track System. *Advances in Economics, Business and Management Research Vol. 110 (Proceedings of the 5th International Conference on Economics, Management, Law and Education (EMLE 2019), Krasnodar, Russia)*, 640–645.
8. EPrints (-). EPrints UKLO Repository. “St. Kliment Ohridski” University – Bitola, Bitola, North Macedonia, <http://eprints.uklo.edu.mk/>
9. Harris, H., Brewster, C., & Sparrow, P. (2003). *International Human Resource Management*. CIPD Publishing, London, England. ISBN-13: 978-0852929834.
10. InsightSoftware (2021). 27 of the Best University KPIs and Metric Examples for Reporting, <https://insightsoftware.com/blog/27-of-the-best-university-kpis-and-metric-examples-for-reporting/>
11. Kongsmak, K., Pungpit, P., Kano, M., Komai, S., Piyawattanametha, W., Phanraksa, O. (2013). Perceptions of Research Excellence in Thailand and Japan. *STI Policy Review*, 4(2): 113–135. DOI: 10.22675/STIPR.2013.4.2.113
12. NEIU (2022). KPI Progress Report. Northeastern Illinois University, Chicago, IL, USA, <https://www.neiu.edu/about/strategic-plan/key-performance-indicators/kpi-progress-report>
13. OECD (2015). *Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities*, OECD Publishing, Paris, France. DOI: 10.1787/9789264239012-en.
14. Ordenes, P. (2021). Higher Education KPIs - Most Commonly Used KPIs in 2021. <https://www.cascade.app/blog/higher-education-kpis>
15. Petrov, P. K. & Kamenova-Timareva, M. (2014). A Key Performance Indicators a Framework for Higher Education Institutions. *Vanguard Scientific Instruments in Management*, 1(8), 108–121.
16. Rajkaran, S. & Mammen, K. J. (2014). Identifying Key Performance Indicators for Academic Departments in a Comprehensive University through a Consensus-based Approach: A South African Case Study. *Journal of Sociology and Social Anthropology*, 5(3):283–294. DOI: 10.1080/09766634.2014.11885632

17. SER (2015). Self-Evaluation Report 2012/2013 – 2014/2015. Self-evaluation Committee, “St. Kliment Ohridski” University – Bitola, Bitola, North Macedonia, <https://uklo.edu.mk/wp-content/uploads/2021/11/Izvestaj-za-samoevaluacija.pdf>
18. SER (2018). Self-Evaluation Report 2015/2016 – 2017/2018. Self-evaluation Committee, “St. Kliment Ohridski” University – Bitola, Bitola, North Macedonia, <https://uklo.edu.mk/wp-content/uploads/2021/11/Izvestaj-za-samoevaluacija-1.pdf>
19. SER (2021). Self-Evaluation Report 2018/2019 – 2020/2021. Self-evaluation Committee, “St. Kliment Ohridski” University – Bitola, Bitola, North Macedonia
20. Spear, E. (2019). 29 Key Performance Indicators (KPIs) for Colleges & Universities, <https://precisioncampus.com/blog/education-kpis/>
21. SQU (2018). Key Performance Indicators, Third Issue (2016-2013). Sultan Qaboos University, Muscat, Oman, [https://www.squ.edu.om/Portals/0/DNNGallery/uploads/2018/5/28/KPI\(3\)%20-English.pdf](https://www.squ.edu.om/Portals/0/DNNGallery/uploads/2018/5/28/KPI(3)%20-English.pdf)
22. Teorey, T., Lightstone, S., Nadeau, T., & Jagadish, H. V. (2011). Database Modeling and Design: Logical Design, 5th Edition, Elsevier/Morgan Kaufmann Publishers, Burlington, MA, USA.
23. Terkla, D. (2011). The Most Common Performance Indicators for Institutions and Their Boards, <https://agb.org/trusteeship-article/the-most-common-performance-indicators-for-institutions-and-their-boards/>
24. UCC (2020). University KPI Dashboard 2020. University College Cork, Ireland, <https://www.ucc.ie/en/media/support/strategicplanning/UniversityKPI2020.pdf>
25. UoE (2019). University Strategy 2019-25: Key Performance Indicators. University of Essex, Essex, England, United Kingdom, <https://www.essex.ac.uk/governance-and-strategy/university-strategy/kpis>
26. UoT (–). Performance Indicators: Research & Innovation. University of Toronto, Toronto, ON, Canada, <https://data.utoronto.ca/performance-indicators/research-innovation/>
27. Wang, X. (2010). Performance Measurement in Universities: Managerial Perspective. Master’s Thesis. The University of Twente, Faculty of Management and Governance, Enschede, The Netherlands, https://essay.utwente.nl/60180/1/MA_thesis_X_Wang.pdf

28. Zhu, C. (2015). An Empirical Analysis of Performance Evaluation of University Teachers Based on KPI. SHS Web of Conferences 14, 01004, 1–5. DOI: 10.1051/shsconf/20151401004

THE RELATIONSHIP BETWEEN CAPITAL MARKET DEVELOPMENT AND ECONOMIC GROWTH: A MACEDONIAN OUTLOOK

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Abstract

The capital market is the driving force of the market economies. A developed capital market ensures efficient financial resources allocation, by channeling the savings of the economy from the business entities with a monetary surplus to the ones with a monetary deficit. In this way, the capital market offers an alternative way of financing the business sector's investments, which in turn facilitate economic growth. Hence, the main objective of this study is to examine the relationship between capital market development and economic growth in the Republic of North Macedonia. Therefore, as a proxy for capital market development, we used the number of listed companies, the market capitalization of listed companies, stock market turnover to GDP ratio, and share price index (MBI 10). On the other side, the annual growth rates of the gross domestic product are taken as indicators of economic growth. The empirical study is based on correlative and regressive analysis of time series to explore the impact of the capital market development on the economic growth in North Macedonia during the period 2010 up to 2020. The results of the study have shown that capital market development is positively correlated with the economic growth in North Macedonia. Therefore, the performed regression analysis indicates that there is a very strong link between gross domestic product (GDP) and the market capitalization to GDP ratio (MC), stock market turnover to GDP ratio (SMT), the average value of MBI10, and the number of listed companies on the Macedonian Stock Exchange (NLC).

Keywords: capital market, economic growth, North Macedonia

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Introduction

The capital market, as an important component of the financial market, plays a significant role in the economic growth of each country and also contributes to the health and efficiency of an economy. It is designed to enable companies to raise funds at lower costs and achieve financial flexibility, and, at the same time, it provides an opportunity to investors. Namely, through the financial instruments that are offered on the capital market, domestic savings are stimulated, and also they satisfy the needs of both individual and institutional investors. Therefore, the capital market provides a link between saving and investment that meets the financial needs of both the households and the corporate sector. In this way, it helps to direct the flow of savings and investment in the economy in ways that facilitate the accumulation of capital and the production of goods and services. So, the capital market serves as a veritable tool in the mobilization and allocation of savings among competing uses which are critical to the growth and efficiency of the economy (Alile, 1984), and no doubt developed capital market has a positive impact on the economic growth.

Regarding all these above, our study is aimed at investigating the relationship between capital market development and economic growth in North Macedonia. The focus has been put on the investigation of one dependent variable, gross domestic product rate as a parameter resembling the economic growth, and how it depends on the number of listed companies, the market capitalization of listed companies, stock market turnover to GDP ratio and share price index (MBI 10) as proxies for capital market development. To achieve the main goal of the study, correlative and regressive analysis of time series has been applied. The study indicates that capital market development has a positive impact on economic growth in North Macedonia.

The rest of the paper is organized as follows. Section 2 deals with some previous work on the effect of capital market development on economic growth in different countries worldwide. Section 3 briefly introduces the reader to the capital market in North Macedonia. Section 4 provides insights into the data, methodology, and results of the analysis, and explains the economic significance and messages of the obtained results. The last section concludes and recommends.

Literature review

Capital market development has assumed a developmental role in global economics and finance following the impact they have exerted on corporate finance and economic activity. It has been associated with economic growth through its role as a source of new private capital. Paudel (2005) states that stock markets, due to their liquidity, enable firms to acquire much-needed capital quickly, hence facilitating capital allocation, investment, and growth. Stock market activity is thus rapidly playing an important role in helping to determine the level of economic activities in most economies. So, stock market activities play a major role in determining the level of economic activities in both emerging and developed economies, by providing and efficiently allocating capital for investment, providing an appropriate platform to engender best corporate practices that will result in growing investment and further growth of the economy (Osamwonyi & Kasimu, 2013).

Extensive studies have been examining the nature of the causality between capital market development and economic growth. Numerical empirical evidence shows the existence of a strong positive correlation between stock market development and economic growth.

Notable among them is the study conducted by Sin Yu Ho (2019). In his study, he examined the macroeconomic determinants of stock market development in South Africa during the period 1975 to 2015 and the results indicate that banking sector development and economic growth promote stock market development. In a similar study, Sin Yu Ho & Odhiambo, N. (2020) analyzing the macroeconomic drivers of stock market development in Hong Kong revealed that banking sector development and economic growth have positive impacts on stock market development, whereas the inflation rate and the exchange rate have negative impacts on stock market development both in the long and short run. In addition, the results show that trade openness has a positive long-run impact but a negative short-run impact on stock market development. Similar results were gained through the research of D. K. Twerefou *et al.* (2019) who investigated the extent to which stock market developments have impacted economic growth in selected Sub-Saharan African Countries. Their findings confirmed that market capitalization as a percentage of GDP and turnover ratio of domestic shares positively impacts economic growth, even though the impact is minimal. Also, Wanaset (2018) in his study revealed that the stock market supported economic growth in Thailand via funds allocation to private investment leading to the enlargement of the manufacturing sector and employment. Qamruzzaman & Wei (2018) confirmed the existence of a

long-run association between financial innovation, stock market development, and economic growth in Bangladesh.

Further elaborating on the impacts of capital markets on economic development, Flaviabarna and Mura (2010) confirmed a positive relationship between capital market development and economic growth in Romania. Concerning Romania, the same results were confirmed in the study of Brasoveanu *et al.* (2008). Moreover, Lenee & Oki (2017) examined how capital market development has directly translated to the economic growth of the MINT region (Mexico, Indonesia, Nigeria, and Turkey). Their results revealed that the number of listed securities has negative and significantly related to GDP, but positive and significantly related to gross domestic savings and gross fixed capital formation ratios to GDP of the MINT as a group.

Furthermore, Osamwonyi & Kasimu (2013) in their study examine the causal relationship and the direction of causality between stock market development and economic growth in Ghana, Kenya, and Nigeria. The empirical findings of the study have shown that there is no causal relationship between stock market development and economic growth in Ghana and Nigeria but revealed a bidirectional causal relationship between stock market development and economic growth in Kenya. Also, Idenyi *et al.* (2017) confirmed that there is a stable long-run relationship between the economic growth and capital market indicators in Nigeria. The results of their study revealed that market capitalization has a positive and significant relationship with economic growth in the short-run, while market capitalization percent of GDP and Stock Traded Total Value percent of GDP exhibited a negative insignificant link with economic growth in the long run. Similar empirical results are confirmed by the study conducted by Charles O. Manasseh *et al.* (2018). Their findings suggest that there is bidirectional causality between stock market developments and the economy which means that the development of the Nigerian stock market would lead to economic growth vis-à-vis, high sustainable economic growth also promotes stock market development. Also, Hondroyiannis, Lolos, and Papapetrou (2005) studied the case of Greece (1986–1999); they found out that the relationship between economic growth and capital market development is bidirectional.

Yılmaz Bayar, Abdulkadir Kaya, and Murat Yıldırım (2014) in their research implemented the Johansen-Juselius cointegration test and Granger causality test to analyze the relationship between stock market development and economic growth in Turkey during the period 1999–2013. Their empirical results indicate that there is a long-run relationship between economic growth and stock market capitalization, the total value of stocks traded, turnover ratio of stocks traded, and also there is unidirectional

causality between stock market capitalization, the total value of stocks traded, and turnover ratio of stocks traded to economic growth.

Sabariah Nordin and Norhafiza Nordin (2016) explored the influence of the stock market and the debt market on the Malaysian economy. The Johansen-Juselius cointegration test reveals the existence of a cointegrating relationship between real growth domestic product per capita, stock market, and debt market. The vector error correction model long-run results show that both the stock market and the debt market have a positive and significant influence on the Malaysian economy, but the stock market is found to exert greater influence on the Malaysian economy compared to the debt market.

However, there exist some authors who could not establish any significant link between stock market development and growth such as Bencivenga & Smith (1991), Naceur & Ghazouani (2007), and Adjasi & Biekpe (2006), who looked at developing countries. The results of their study confirmed that the establishment and development of capital markets in developing countries have not contributed positively to the economic growth of those countries. Unfortunately, many emerging markets and developing economies enjoy only a small portion of the benefits offered by capital markets (World Bank Group, 2020). Excluding China, only about 11% of equity and debt issuances were placed by companies located in emerging markets in 2019. Also, Caporale *et al.* (2009) review the relationship between financial development and economic growth in ten EU countries for the period 1994 to 2007. They concluded that stock and credit markets are not mature enough and their participation in economic growth is minimal. Furthermore, Lei and Mishra (2016) emphasized that they do not find any evidence of a relationship between the stock market and the real economy in China.

In addition to these findings is the study conducted by Abdulaziz Hamad Algaeed (2021) who tested the effects of capital market development on the per-capita GDP growth in the Saudi Arabian economy covering the period of 1985 to 2018. The results of his study confirmed that the role of the Saudi capital market in achieving and promoting economic development is still not encouraging. Similarly, Artor R. Nuhui & Arbër H. Hoti (2011) investigated the effects of capital markets development on the economic growth of Western Balkan countries and found positive and negative arguments. They argued that capital markets in the Western Balkan countries are characterized as small and fragmented, with a marginal role in their financial system which is dominated by banks. This shows that the capital markets of these countries are far from comparing with the capital markets of other European countries.

Based on the results of the conducted research it can be concluded that many studies confirmed the positive relationship between capital market development and economic growth. Regarding all this above, the purpose of our research is to analyze the impact of the capital market development on economic growth in the Republic of North Macedonia.

An Overview of the Macedonian Capital Market

The modern history of the Macedonian capital market is associated with the structural changes in the 1990s of the 20th century when the process of country transition started. The process of privatization resulted in the formation of a larger number of shareholding companies, which posed a need of creating a suitable market infrastructure for the transfer of newly-created securities.

So, the creation and development of the Macedonian Stock Exchange happened as a need to provide a successful transition and process of privatization of state ownership in the Macedonian economy as well as the need for the national economy to have an efficient and stable financial market. Besides transition, the creation of the Macedonian Stock Exchange (MSE) de facto means a change of the former system and the development of the national economy on market principles - as a market economy (N. Ivanovska, Z. Ivanovski, 2011).

The Macedonian Stock Exchange is an important institution, which establishing should have brought capital market development to North Macedonia. The basic aim of the Macedonian stock exchange was to provide effective, transparent, and safe functioning of the organized secondary securities market in North Macedonia, through the permanent effort of all investors to provide entrance, i.e. exit of financial instruments for trading in the different stock markets at fair market price, to help trade companies to attract new capital for financing their development and to contribute for building confidence into the Macedonian securities market.

The Macedonian Stock Exchange AD is the first organized securities stock exchange in the history of North Macedonia. Normative conditions for its establishment had been created by bringing the Rules for working conditions of the effective stock exchange in March 1995 by the Securities Commission, after which the Founding Committee was established, which took over necessary activities for the stock forming and up to the middle of 1995, the Elaborate for establishing and work of the Stock Exchange, the Statute and the Agreement for founding, were prepared. On 13.09.1995, the Founding meeting of the Stock exchange was held, on which it was founded as a shareholding company on a non-profit base, with a founding capital of 1

million Deutsch marks. Starting from 20.01.2001, the Macedonian Stock Exchange began working on a profit base with a founding capital of 500.000 EUR. Shareholders on the Stock Exchange can be domestic and foreign legal and natural persons. The ownership of an individual shareholder is limited to 10% of the basic stock exchange principal (Spaseska *et al.*, 2016).

Table 1: Macedonian Capital Market during the period 2003-2021 through numbers

Year	Number of listed companies	Market Capitalization of listed companies (in MKD)	Stock Market Turnover (in MKD)	MBI10
2003	98	17.744.320.962	7.559.802.195	1.178,71
2004	68	18.616.063.852	8.315.853.226	1.351,63
2005	57	33.171.013.757	8.889.567.513	2.291,04
2006	43	51.021.283.559	31.017.933.488	3.702,54
2007	38	113.499.105.893	41.702.320.447	7.740,79
2008	38	35.254.828.180	12.378.962.326	2.096,16
2009	36	38.885.764.303	6.732.333.490	2.751,88
2010	34	30.442.607.676	5.842.963.073	2.278,92
2011	32	27.300.260.205	13.655.857.674	1.974,86
2012	32	25.917.759.876	5.600.304.948	1.731,18
2013	116	97.755.772.716	3.234.557.987	1.738,86
2014	115	101.759.108.987	8.704.057.897	1.844,20
2015	114	99.359.059.424	2.660.494.514	1.833,26
2016	109	112.313.643.687	3.023.394.172	2.134,91
2017	107	132.942.125.248	4.738.444.919	2.538,86
2018	105	158.772.531.030	10.414.067.246	3.469,03
2019	100	181.279.391.212	7.700.625.682	4.648,89
2020	100	179.008.903.436	8.195.475.839	4.704,85
2021 ¹⁰	96	214.324.456.127	9.854.021.517	6.153,48

Source: Annual reports of Macedonian Stock Exchange, 2003–2021

According to the legislation that was in force in 1996 only eligible found of the MSE were banks and other financial institutions (saving houses and insurance companies) MSE had initially 19 members: 13 banks, 3 saving houses, and 3 insurance companies. Since 1997, according to the new Law on Issuance and Trading in Securities MSE members could only have been

¹⁰ Up to third quarter of 2021

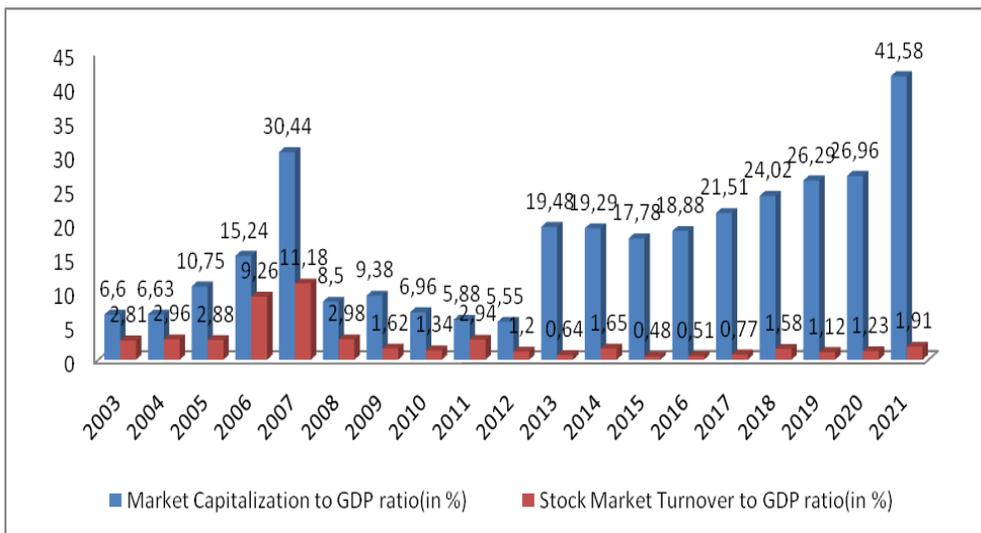
legal entities whose sole activity is trading in security 9 brokerage houses). Due to these changes, the number of MSE members decreased to 7. The new Securities Law from 2000 introduced again the possibility of banks being MSE members (starting from 2002). The current number of the MSE members is 10, of which 5 brokerage houses and 5 banks.

In the first several years of the Stock Exchange's functioning, (in the period from 1996 to 1998), the Stock Exchange was in the so-called "baby" development stage, which was characterized by very low activity. Namely, the Stock Exchange was first formed within the early reform processes in the 1990s, because it was thought that part of the privatization models would be realized and was realized through the stock exchange. Then follows the second stage, according to many features, a very specific development stage (in the period from 1999 to 2004), in which the Stock Exchange primarily performed the function of indispensable market infrastructure for finishing privatization of public and state capital and consolidation of proprietary structures created by the privatization. That was manifested in a form of domination of block transactions and state auctions into the realized Stock Exchange turnover and the absence of companies' voluntary quotations on the stock market. Starting from 2005, a new Stock Exchange life cycle has been recognized, in which, although the processes of property consolidation in companies have not been finished yet, a component that should be the top aim can be seen - the Macedonian stock exchange AD Skopje to be a place where with a moderate risk, free money of domestic and foreign investors, will be invested and fructified.

In the last ten years, it can be seen that the capacity of the secondary capital market, of the Macedonian stock, has been moving annually as a turnover in all aspects between 100-200 million EUR. The exceptions are those good years, 2006 and 2007, when the Macedonian Stock Exchange was euphoric and the turnover was 500-600 million EUR, causing an extreme and irrational high growth of the MBI index in 2007 (7.740,79). Concerning price movements on the stock within a longer statistical period, in the last decade, we can see that there are several cycles - upward aggressive movements from 2005 to 2007, then from 2008 up to 2012, there was negative price performance in continuity, while in 2013 and 2014 a small improvement and two annual pluses in succession were seen, but it was far away from the previous record levels.

The development of the Macedonian Stock Exchange is based on two projects of mandatory listing, the first in 2002, and the second in 2013. As a result of the mandatory listing, the number of listed companies increased to 78 companies at the end of 2002, and 116 companies in 2013. This means that the market capitalization in 2013 reached 97.76 billion MKD (about 1.6 billion EUR) and saw a rise of 277.18% as a result of the new 84 companies

listed in the sub-segment mandatory listing (Spaseska *et al.*, 2019, p. 827). As a consequence, the market capitalization concerning GDP increased up to 19.48%. The average indicator for this in the EU is 65%, while in USA, UK, and Switzerland the figures go even above 100%. This is an indicator that shows what kind of enterprises structure and what kind of structure of the financial market, have been created in these 25 years of market economy in the country. It is obvious that there are not many big and quality shareholding companies on the stock exchange, or, there is no appropriate validation of the listed shareholding companies on the levels as is the average in the EU.



Source: Authors' compilation from the Annual reports of Macedonian Stock Exchange and State Statistical Office of the Republic of North Macedonia, 2003 – 2021

Figure 1: Development of the Macedonian Capital Market expressed through its size (Market Capitalization to GDP ratio) and depth (Stock Market Turnover to GDP ratio)

In that context, of special importance is the fact that on the level of the European Union, the issue of how to put more efficiently the capital markets into the function of companies' development is becoming more actual, with an accent on the small and medium enterprises. So, in Europe, opinions that the capital market should be strengthened are predominant, and the links between capital markets, economic growth increasing, jobs creation, etc. are more underlined.

Data, methodology, and results

Data

To reach the goals of the research, the study is restricted to investigating the dependency of a single dependent variable from four independent variables, as follows:

- *Dependent variable*
 - Real Gross Domestic Product at current prices (*GDP*), as a measure of the economic growth in North Macedonia;
- *Independent variables*
 - Market Capitalization to GDP ratio (*MC*), as a measure of the Macedonian capital market size;
 - Stock Market Turnover to GDP ratio (*SMT*), as a measure of the depth (liquidity) of the Macedonian capital market;
 - Number of Listed Companies on the Macedonian Stock Exchange;
 - The average value of the share price index (*MBI 10*).

All the data used in this research have been exploited from secondary sources only, i.e. the data for the dependent variable GDP can be found on State Statistical Office web pages (MAKStat Database, –), while the data for all the independent variables are taken from the Macedonian Stock Exchange web page (MSE, –).

Methodology

The study uses time-series data on important parameters of Macedonian Capital market development and their impact on the economic growth in North Macedonia. The data set of the study consists of 11 annual observations covering the period from 2010 to 2020. Annual data on stock exchange performance indicators, such as market capitalization, share index, the value of transactions, the number of listed companies, and GDP as an indicator of growth rate were used for the analysis.

Statistical methods such as correlative and regressive analysis of time series and tests of statistical hypotheses have been applied. These statistical methods examine the direction and intensity of the connection of the watched factors/phenomena, their trend during the time course with an appropriate forecast, as a statistical conclusion for prior defined hypotheses.

Results and discussion

Based on the goal of the research in this paper, e.g. investigation of the relationship between capital market development and economic growth in North Macedonia, the empirical study is based on a correlative and regressive analysis of time series. Therefore, Gross Domestic Product (GDP) e.g. the annual rate of GDP is used as a dependent variable in the regressive model as an indicator of economic growth. On the other side, the capital market development is measured by the following (independent) variables: Market Capitalization Ratio as a proxy of Macedonian capital markets' size, which is calculated by dividing the market capitalization of listed companies on Macedonian Stock; Stock Market Turnover to GDP ratio as a proxy of Macedonian capital markets' depth which is calculated by dividing the turnover of the Macedonian Stock Exchange by the GDP; Number of Listed Companies on the Macedonian Stock Exchange and Average value of share price index (MBI 10).

Table 2 shows the indicators of economic growth and performances on the Macedonian Stock exchange in North Macedonia in the period from 2010 to 2020.

Table 2: Indicators of economic growth and performances on the Macedonian Stock exchange in North Macedonia in the period from 2010 to 2020

Year	GDP (in million MKD)	Stock Market Turnover to GDP ratio (in %)	Market Capitalization to GDP ratio (in %)	MBI 10	Number of listed companies
2010	437296	1,336	6,96	2278,92	34
2011	464186	2,942	5,88	1974,86	32
2012	466703	1,2	5,55	1731,18	32
2013	501891	0,644	19,48	1738,86	116
2014	527631	1,65	19,29	1844,2	115
2015	558954	0,476	17,78	1833,26	114
2016	594795	0,508	18,88	2134,91	109
2017	618106	0,767	21,51	2538,86	107
2018	660878	0,576	24,02	3469,03	105
2019	689425	1,117	26,29	4648,89	100
2020	664010	1,234	26,96	4704,85	100

Descriptive statistics

Table 3: Statistics for the indicators of economic growth and performances on the Macedonian Stock exchange in the observed period

Variable	Minimum	Maximum	Mean	Median	Standard Deviation	Confidence Level (95,0%)	Coefficient of variation
GDP	437296	689425	562171	558954	89245,11	±59955,68	15,88%
SMT	0,476	2,942	1,1318	1,117	0,7142	±0,4798	63,11%
MC	5,55	26,96	17,5091	19,29	7,8954	± 5,3042	45,09%
MBI10	1731,18	4704,85	2627,08	2134,9 1	1128,936	±758,4296	42,97%
NLC	32	116	87,64	105	35,7135	± 23,9927	40,75%

From the above table, we got information for average values (arithmetic mean and median), average variability, confidence intervals, and variation coefficient, of which values it can be concluded that the highest variability in the observed period has Stock Market Turnover to GDP ratio (SMT) (63,11%), while the lowest is Gross domestic product GDP (15,88%).

Coefficients of correlation that present partial links among the watched phenomena are shown in the following table:

Table 4: Matrix of partial coefficients of correlation

	GDP	SMT	MC	MBI 10	NLC
GDP	1				
SMT	-0,4437492	1			
MC	0,90947432	-0,520182144	1		
MBI10	0,80102313	-0,088176478	0,678262	1	
NLC	0,66036616	-0,632600384	0,863624	0,224078	1

From the above table it can be concluded that there are:

- weak negative correlation between gross domestic product GDP and Stock Market Turnover to GDP ratio (SMT);
- very strong positive correlation between gross domestic product GDP and market capitalization to GDP ratio (MC);

- strong positive correlation between gross domestic product GDP and the average value of (MBI10);
- significant positive correlation between gross domestic product GDP and the number of listed companies (NLC).

Partial links of the performances of the Macedonian stock exchange: Stock Market Turnover to GDP ratio (SMT), market capitalization to GDP ratio (MC), the average value of MBI10, the number of listed companies (NLC), and the indicator of the economic growth of Gross domestic product (GDP), can be seen on the following dispersion diagrams:

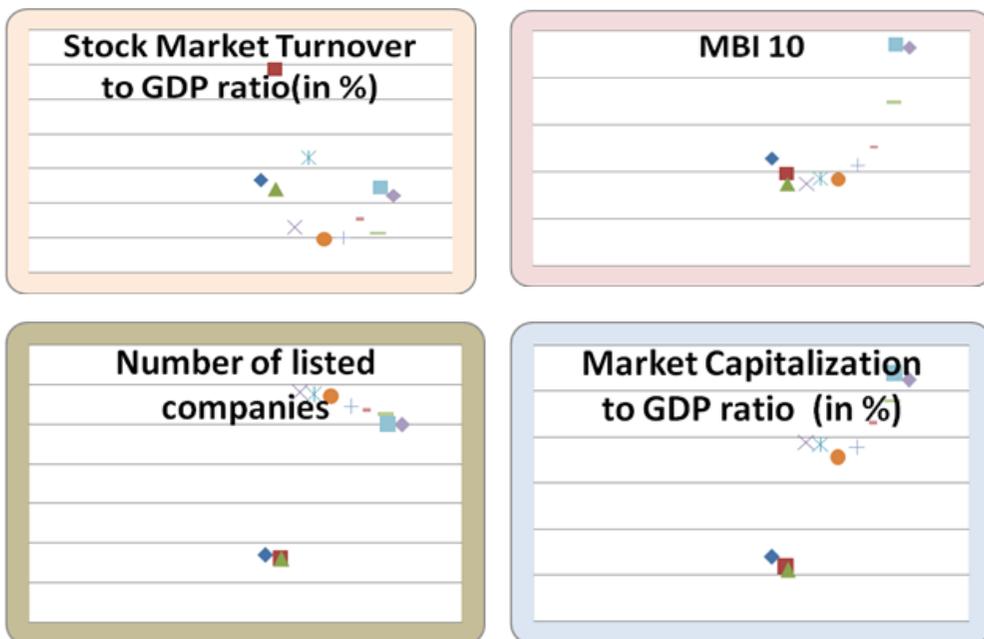


Figure 2: Dispersion diagrams for partial links of the performances of the Macedonian stock exchange and the indicator of the economic growth Gross domestic product (GDP)

Regression analysis

By using a linear regression model (see Table 5), many conclusions can be drawn, that refer to the links of the watched phenomena, i.e.:

- there is a very strong link between gross domestic product (GDP) and the development indicators of the Macedonian capital market: stock

market turnover to GDP ratio (SMT), market capitalization to GDP ratio (MC), the average value of (MBI10) and number of listed companies (NLC) (Multiple R=0.947);

Table 5. Regression analysis of the economic growth indicator: gross domestic product (GDP) and performances of the Macedonian Stock Exchange: stock market turnover to GDP ratio (SMT), market capitalization to GDP ratio (MC), the average value of (MBI10,) and number of listed companies (NLC)

SUMMARY OUTPUT	
<i>Regression Statistics</i>	
Multiple R	0,946892
R Square	0,896605
Adjusted R Square	0,827675
Standard Error	37047,48
Observations	11

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	4	71411791126	17852947782	13,00745945	0,004078535
Residual	6	8235096721	1372516120		
Total	10	79646887847			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	397949,2841	128901,073	3,087246	0,021463	82539,72152	713358,8
Stock Market Turnover to GDP ratio (in %)	-12943,2589	21236,0641	-0,60949	0,564548	-64906,0357	39019,52
Market Capitalization to GDP ratio (in %)	9613,5637	18054,94822	0,532461	0,613539	-34565,3029	53792,43
MBI 10	20,50215361	65,33650967	0,313793	0,764301	-139,370525	180,3748
Number of listed companies	-494,256710	3016,901135	-0,16383	0,875245	-7876,34783	6887,834

RESIDUAL OUTPUT			
<i>Observation</i>	<i>Predicted GDP</i>	<i>Residuals</i>	<i>Standard Residuals</i>
1	477485,5334	-40189,5	-1,400485485
2	441070,6394	23115,36	0,80550144
3	455449,3556	11253,64	0,392155975
4	555202,6431	-53311,6	-1,857751906
5	543009,1011	-15378,1	-0,535880999
6	543957,969	14996,03	0,522566997
7	562774,463	32020,54	1,115820303
8	593976,1899	24129,81	0,840851983
9	640637,3989	20240,6	0,705324637
10	682118,84	7306,16	0,254597906
11	688192,8669	-24182,9	-0,842700852

PROBABILITY OUTPUT	
<i>Percentile</i>	<i>GDP</i>
4,545455	437296
13,63636	464186
22,72727	466703
31,81818	501891
40,90909	527631
50	558954
59,09091	594795
68,18182	618106
77,27273	660878
86,36364	664010
95,45455	689425

- 82,77% variability of the values of Gross Domestic Product is explained by the link with the performances of the Macedonian stock exchange, while 17,23% of the variability is a result of other factors which are not comprised by the regression model;
- Partial regression coefficients are not equal, and that means that the analyzed proxies of the Macedonian capital market development have different influences on the gross domestic product (GDP) as an indicator of economic growth. That can be seen from the table ANOVA ($F_{pr} = 13,007 > F_t = 6,16$ or $p_{pr} = 0.004078535 < p_t = 0.05$);
- P – values referring to independent variables, i.e. to the performances of the Macedonian stock exchange, in the regression model for the basic set, are significant, i.e. different from zero.

The partial regression coefficient $b_1 = -12943.25891$ shows that with each increase of the market capitalization to GDP ratio by 1%, the gross domestic product (GDP), on average, decreases by 12943.26 million MKD, provided the values of stock market turnover in relation to GDP (SMT), the average value of (MBI10) and the number of listed companies (NLK) to remain unchanged, i.e. constant.

The partial correlation coefficient $b_2 = 9613.563722$ shows that with each increase in the value of the market capitalization to GDP ratio (MC) by 1%, the gross domestic product (GDP) on average increases by 9613.563722 million MKD, provided that the values of stock market turnover in relation to GDP (SMT), the average value of (MBI10) and the number of listed companies (NLC) to remain unchanged, i.e. constant.

The partial correlation coefficient $b_3 = 20.50215361$ shows that with each increase in the value of the average value of (MBI10) by one single

measure, the gross domestic product (GDP) on average increases by 20.50215361 million MKD, provided that the values of the stock market turnover in relation to GDP (SMT), market capitalization to GDP ratio (MC) and the number of listed companies (NLC) to remain unchanged, i.e. constant.

The partial correlation coefficient $b_4 = -494.2567101$ shows that with each increase in the number of listed companies (NLC) by one company, the gross domestic product (GDP) on average decreases by 494.2567101 million MKD, provided that the values of stock market turnover in relation to GDP (SMT), market capitalization to GDP ratio (MC) and the average value of (MBI10) to remain unchanged, i.e. constant.

Additional information on other indicators of the regression analysis is shown in the following table:

Table 6: Partial and standard coefficients of elasticity

Variable	Partial coefficients of elasticity	Standard coefficients of elasticity
SMT	-0,0261	-0,1036
MC	0,4217	0,4244
MBI10	0,0958	0,2593
NLC	-0,077	-0,1978

- By increasing the market capitalization of the listed companies by 1%, gross domestic product is increased by a value of 0.4217%.
- By increasing the stock market turnover in relation to GDP (SMT) by 1%, gross domestic product decreases by a value of 0.0261%.
- The market capitalization of the listed companies has the highest participation in the gross domestic product; and
- The market capitalization of the listed companies has the largest growth reserve.

The trends for the development of the market capitalization to GDP ratio (MC), the average value of (MBI10), the number of listed companies (NLC), and stock exchange turnover in relation to GDP (SMT), are important as parameters of the performances of the Macedonian stock exchange and gross domestic product (GDP), as indicators for economic

growth. Namely, their developing tendency is approximated best on a cube trend (Figures 3-7) according to the highest value of the determination coefficient, and on that basis, their values can be forecasted in the following period.

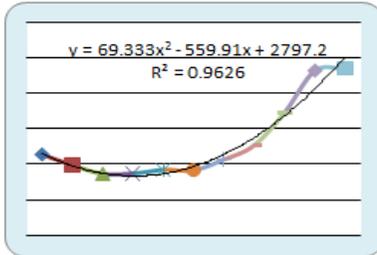


Figure 3: Square trend for developing tendency of average value of MBI10 (MBI10)

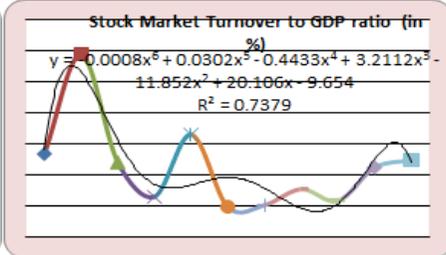


Figure 4: Polynomial trend for developing tendency of stockmarket turnover to GDP ratio (SMT)

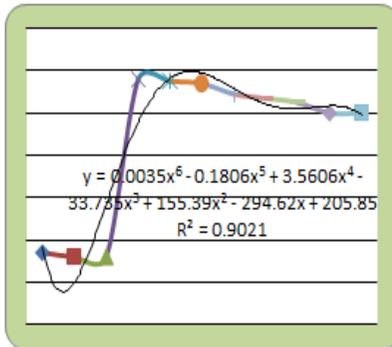


Figure 5: Polynomial trend of developing tendency of the number of listed companies (NLC)

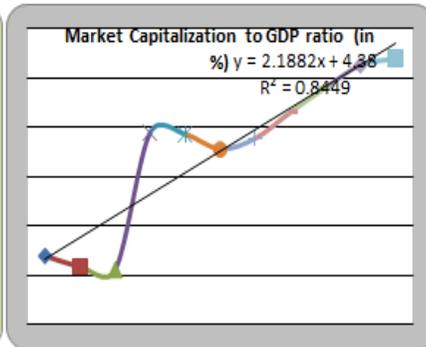


Figure 6: Linear trend for developing tendency of the market capitalization of the listed companies (MC)

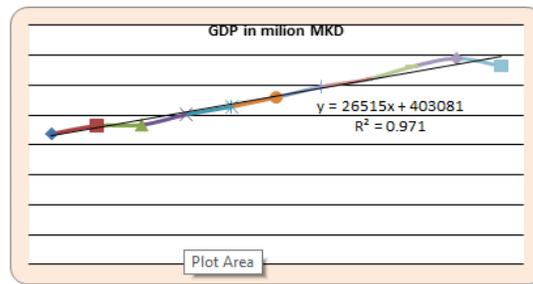


Figure 7: Linear trend for developing tendency of the gross domestic product (GDP)

Conclusion

This paper has examined the relationship between capital market development and economic growth in North Macedonia during the period from 2010 to 2020. The focus has been put on the investigation of one dependent variable, Gross Domestic Product (GDP) as a parameter resembling economic growth, and how it depends on the indicators of capital market development: the market capitalization to GDP ratio (MC), stock market turnover to GDP ratio (SMT), the average value of MBI10 and the number of listed companies on the Macedonian Stock Exchange (NLC). The empirical study is based on the utilization of the correlative and regressive analysis of time series to explore the impact of the capital market development on the economic growth in North Macedonia.

The findings of the study indicated that there is a very strong link between gross domestic product (GDP) and the performances of the Macedonian stock exchange: stock market turnover to GDP ratio (SMT), market capitalization to GDP ratio (MC), the average value of (MBI10), and the number of listed companies (NLC) (Multiple R = 0.947). Namely, it is evident very strong positive correlation between gross domestic product GDP and market capitalization to GDP ratio, a strong positive correlation between gross domestic product (GDP) and the average value of (MBI10), such as a significant positive correlation between gross domestic product GDP and the number of listed companies (NLC). Consequently, the findings confirmed that by increasing the market capitalization to GDP ratio by 1%, the gross domestic product is increased by a value of 0.4217%. So, the market capitalization of the listed companies has the highest participation in the gross domestic product and also has the largest growth reserve. Such results confirmed that a well-developed capital market promotes economic growth, especially in developing countries like North Macedonia. This

suggests that policy-makers in North Macedonia should place greater emphasis on capital market development to accelerate the economic growth of the country.

Since the results of our study have shown that a positive relationship between capital market development and the economic growth in North Macedonia is evident, a special challenge for our next research will be to study the determinants of capital market development.

References

1. Algaeed, A. H. (2021). Capital Market Development and Economic growth: An ARDL Approach for Saudi Arabia, 1985–2018
2. Alile, H. I., (1984). The Nigeria Stock Exchange: Historical perspective, operation, and contributions to economic development. *Central Bank of Nigeria Bullion*. 11(65- 69).
3. Artor, R., Nuhiu, A., and Hoti, H. (2011). Effects of Capital Markets Development on Economic Growth of Western Balkan Countries. *European Journal of Economics, Finance and Administrative Sciences*. ISSN 1450-2275 Issue 43
4. Brasoveanu, L., Dragota, V., Catarama, D., and Semenescu, A. (2008). Correlations between capital market development and economic growth: The case of Romania. *Journal of Applied Quantitative Methods*. 3(1), 64–75.
5. Caporale, G., Rault, C., Sova, R., and Sova, A. (2009). Financial development and economic growth: Evidence from ten new EU members. Economic and Finance Working Papers Series No. 09-37. Brunel University and CESifo & DIW Berlin. <https://doi.org/10.2139/ssrn.1499786>
6. Ho, S. and Odhiambo, N. (2020). The macroeconomic drivers of stock market development: Evidence from Hong Kong. *Journal of Financial Economic Policy*. 12(2), 185–207. <https://doi.org/10.1108/JFEP-11-2018-0163>
7. Ho, S.-Y. (2019). Macroeconomic determinants of stock market development in South Africa, *International Journal of Emerging Markets*, 14(2), 322-342. <https://doi.org/10.1108/IJoEM-09-2017-0341>
8. Hondroyannis, G., Lolos, S., and Papapetrou, E. (2005). Financial market and economic growth in Greece, 1986-1999, *Journal of International Financial Markets, Institutions and Money*, 15, 173–188.

9. Ivanovska, N. and Ivanovski, Z. (2011). Macedonian Stock Exchange: Development of investment banking. *UTMS Journal of Economics*, 2(2), 221–225.
10. Lei, P. and Mishra, V. (2016). Stock market development and economic growth: Empirical evidence from China (Department of Economics Discussion Paper 16/16). *Monash Business School*.
11. Lenee, T. and Oki, J. (2017). Capital market development and economic growth: Evidence from MINT countries. *Journal of Economics and Sustainable Development*. 8(2), 68–107.
12. Manasseh, C. O., Ogbuabor, J. E., Anumudu, C. N., Abada, F. C., Okolie, M. A., and Okoro, O. E. (2018). The Causal Effect of Stock Market Development, Financial Sector Reforms and Economic Growth: The Application of Vector Autoregressive and Error Correction Model. *International Journal of Economics and Financial Issues*, 8(2), 357–369.
13. Nordin, S. and Nordin, N. (2016). The Impact of Capital Market on Economic Growth: A Malaysian Outlook. *International Journal of Economics and Financial Issues*. 2016, 6(S7) 259–265.
14. Odo, S. I., Anoke, C. I., Onyeisi, O. S., and Chukwu, B. C. (2017). Capital Market Indicators and Economic Growth in Nigeria; An Autoregressive Distributed Lag (ARDL) Model. *Asian Journal of Economics Business and Accounting*. 2(3): 1–16, Article no. AJEBA.32549
15. Osamwonyi, I. O. and Abudu, K. (2013). Stock Market and Economic Growth in Ghana, Kenya and Nigeria. *International Journal of Financial Research*, 4(2)
16. Paudel, N. P. (2005). Financial System and Economic Development. *Nepal Rastra Bank in Fifty Years*, Part –II, Financial System. Kathmandu: NRB.
17. Qamruzzaman, M. and Wei, J. (2018). Financial Innovation, Stock Market Development, and Economic Growth: An Application of ARDL Model. *Int. J. Financial Stud.* 6, 69; doi:10.3390/ijfs6030069
18. Spaseska, T., Hristoski, I., Odzaklieska, D., and Risteska, J. A. (2019). Macroeconomic Determinants of Stock Market Development: Evidence from the Macedonian Stock Exchange. *6th Scientific Conference with International Participation “Economy of Integration”*. ICEI 2019, (E)migrations and Competitiveness of South-Eastern European Countries, Tuzla
19. Spaseska, T., Vitanova, G., Odzaklieska, D., Risteska, J. A., and Risteska, F. (2016). The Impact of Macedonian Stock Exchange Performance on Economic Growth in Republic of Macedonia.

International Balkan and Near Eastern Social Sciences Conference Series (IBANESS). Macedonia

20. Twerefou, D. K., Abbey, E., Codjoe, E. A., and Ngotho, P. S. (2019). Impact of Stock Market Development on Economic Growth: Evidence from Selected Sub-Saharan African Countries. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, 67(4), 1071–1083.
21. Wanaset, A. (2018). The relationship between stock market and economic growth in Thailand. *Journal of Economics and Management Strategy*. 5(1), 25–38.
22. World Bank Group (2020) Capital Markets Development: A Primer for Policymakers
23. Yılmaz, B., Abdulkadir, K., and Muratm, Y. (2014). Effects of Stock Market Development on Economic Growth: Evidence from Turkey. *International Journal of Financial Research*, 5(1)

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