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Poslovno planiranje

Pomoć u pripremi velikih infrastrukturnih projekata, od ideje do realizacije

Stručni tim

Ekspertski tim sačinjen od diplomiranih pravnika, ekonomista i inženjera sa dugogodišnjim iskustvom

O NAMA

Obavljanje stručnog nadzora nad realizacijom Ugovora o koncesiji i pružanje konsultantskih usluga u cilju upravljanja infrastrukturnim projektima

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Višegodišnje iskustvo i upravljanje projektom za rekonstrukciju i razvoj beogradskog aerodroma

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This issue of *Ekonomika preduzeća* begins with an extraordinary analysis of the labor market trends in Serbia based on the preliminary data from the 2022 Population Census and the Labor Cost Survey by SORS, presented by a trio of authors, *M. Kovačević*, *V. Pantelić* and *M. Smiljković*, in the *Labor Economics* section. According to MIP (Macroeconomic Imbalance Procedure) indicators, encouraging developments have taken place in the labor market over the past decade, as most of the indicators, including the activity rate, youth unemployment rate, and long-term unemployment rate, improved or remained stable. Still, Serbia is faced with a growing gap between labor market supply and demand due to a broad skills mismatch that could be addressed only by undertaking comprehensive reforms of the educational system.

In the first paper in the *Finance* section, a group of authors, *I. Janković*, *V. Kovačević*, *I. Ljumović* and *S. Popović*, uses multiple panel data models to examine factors that influence bank lending to SMEs in the EU. Despite the fact that SMEs are the major drivers of economic growth, they often encounter problems in attempting to obtain funding. The findings show that SMEs from construction or manufacturing sectors have a greater chance to obtain bank loans than service sector companies. Also, rising inflation hampers SMEs' access to bank loans. In the next paper in this section, *A. Đorđević* analyzes the shifting patterns observed in the real effective exchange rate (REER) movements in the countries of Southeast Europe (SEE) in the period 2001-2020. Following a decomposition approach, the research provides an important insight into the competitiveness profile of these countries and draws attention to wide variations in terms of the obtained results, both across SEE countries and within each country across time.

The first paper in *Management* section, written by *A. Todorović Spasenić*, *J. Erić Nielsen* and *V. Stojanović Aleksić*, looks at the role of organizational culture in fostering the implementation of TQM concept. Based on an empirical study including 64 Serbian manufacturing companies with certified quality management systems, the authors confirmed their hypothesis about a significant impact of organizational culture on the adoption of TQM principles and financial performance of companies. In the second paper in this section *N. Gabriš* points out the importance of including the analysis of the so-called megatrends, such as digitalization, climate change, climate change, resource scarcity, population growth, population aging and urbanization growth, as a part of strategic forecasting of companies in Serbia. The results of her survey show that the megatrend of aging population is a major concern for managers in Serbia and that they mostly have a positive attitude toward investing in strategic forecasting.

In the *Logistics* section, a team of authors, *T. Tica*, *B. Vuković*, *D. Saković* and *D. Jakšić*, explores the impact of COVID-19 pandemic on the profitability of logistics companies in the Western Balkans. Their empirical study includes a considerable sample of 798 companies. As expected, due to its pivotal contribution to supplying household supplies, medicines and medical equipment during the pandemic, the logistics sector proved to be more resilient than other sectors of the economy and even managed to achieve higher profitability in the crisis period.

In the *Tax and Law* section, a duo of authors, *S. Vržina* and *S. Luković*, delves into the role of taxes in reducing income inequality in EU member countries. Overall, taxes have a negative and statistically significant impact on income inequality, while the redistributive power of taxes is highest in the most unequal societies and vice versa. According to the authors, governments should prioritize combating cross-border tax avoidance over measures such as increasing statutory tax rates or progressivity of taxes.

The first paper in the *Economic Growth and Development* section, written by *M. Đaković, M. Pjanić* and *M. Inđić,* deals with the analysis of the impact of macroeconomic indicators such as inflation, interest rates and exchange rates on the share prices of 29 companies listed on the Belgrade Stock Exchange in the period from January 2015 to January 2021. They found out that the exchange rate had no effect on the price of shares in the given period, while there was a positive correlation between changes in interest rates and inflation and changes in share prices. It the second paper in this section, a trio of authors, *M. Leković*, *D. Dimitrovski* and *T. Stanišić*, analyses contemporary literature on the sharing economy indexed in the Web of Science (WoS) and/or Scopus within the fields of economics, business and management. This is the first bibliometric analysis exclusively covering the topic of sharing economy. The comparative analysis of WoS and Scopus databases revealed that Scopus is more comprehensive, but not more significant source of the sharing economy knowledge than WoS database, which could be regarded as an outstanding subset of Scopus.

Prof. Dragan Đuričin, Editor in Chief

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LABOUR FORCE AS A COMPONENT OF THE ECONOMY

Radna snaga kao element ekonomije

Abstract

According to MIP (Macroeconomic Imbalance Procedure) indicators, it can be concluded that there have been positive changes in the labour market over the past decade in Serbia. Most of the indicators, such as the activity rate, youth unemployment rate, and long-term unemployment rate, remained stable during this period. However, these indicators also showed that the situation in the Serbian labour market was considerably less favourable than in EU countries, although more favourable than in Western Balkan countries. The following text will delve into the main characteristics of the labour market in Serbia and the changes that have occurred over the past decade. We will explore the key causes and consequences of imbalances, with the first part of the paper focusing on labour force loss due to emigration and the second part analysing employment trends in Serbia during the second decade of the 21st century. We will also examine the most important characteristics of the labour force in Serbia and how labour market supply and demand are perceived. Finally, we will present the results of the Labor Cost Survey, which enables a comparison of the labour market situations in Serbia and the European Union.

Keywords: *labour market, labour force, emigration, employment, skills mismatch*

Sažetak

Prema MIP indikatorima (Macroeconomic Imbalance Procedure) može se zaključiti da je u Srbiji tokom protekle decenije došlo do pozitivnih promena na tržištu rada. Većina indikatora, kao što su stopa aktivnosti, stopa nezaposlenosti mladih i stopa dugoročne nezaposlenosti, ostali su stabilni tokom ovog perioda. Međutim, ovi pokazatelji su takođe pokazali da je stanje na tržištu rada u Srbiji znatno nepovoljnije nego u zemljama EU, ali povoljnije nego u zemljama Zapadnog Balkana. U nastavku teksta biće reči o osnovnim karakteristikama tržišta rada u Srbiji i promenama koje su se desile u protekloj deceniji. Istražićemo ključne uzroke i posledice neravnoteža, pri čemu će se prvi deo rada fokusirati na gubitak radne snage usled emigracije, a drugi deo analizira trendove zapošljavanja u Srbiji u drugoj deceniji 21. veka. Takođe ćemo ispitati najvažnije karakteristike radne snage u Srbiji i kako se percipira ponuda i potražnja na tržištu rada. Na kraju ćemo predstaviti rezultate Istraživanja o troškovima rada, koje omogućava poređenje stanja na tržištu rada u Srbiji i Evropskoj uniji.

Ključne reči: *tržište rada, radna snaga, emigracija, zaposlenost, neusklađenost veština*

Introduction: Indicators (labour market) for monitoring macroeconomic imbalances

In response to the economic and financial crisis, the European Union introduced the Macroeconomic Imbalance Procedure (MIP) in 2011. The MIP is a surveillance mechanism that aims to identify potential macroeconomic risks early, prevent the emergence of harmful imbalances and correct existing ones. It is a tool for adequate and timely management of macroeconomic policies in EU member states.

The European Commission produces the Macroeconomic Imbalance Procedure (MIP) based on the Alert Mechanism Report (AMR). The AMR uses defined indicators for monitoring macroeconomic imbalances (MIP indicators), presented in a scoreboard called the MIP Scoreboard. There are 14 headline indicators that monitor short-term and long-term macroeconomic imbalances, with each indicator having a defined reference value for evaluating the achievements of EU member countries. The European Commission reviews these indicators to determine if there are excessive macroeconomic imbalances and considers launching the procedure if necessary. The headline MIP indicators[1] cover external imbalance and competitiveness (such as the current account balance, real effective exchange rate, export market share, and nominal unit labour cost), internal imbalances (such as debts, financial market movements, real estate market movements, and unemployment), and employment indicators. Four of the 14 headline indicators are related to the labour market, including the unemployment rate, activity rate, long-term unemployment rate, and youth unemployment rate (aged 15-24). The publication *Trends* analyses recent data on MIP indicator trends for Serbia in depth [9], focusing specifically on MIP indicators related to the labour market.

One of the indicators for measuring internal imbalances is the unemployment rate (aged 15-74)[2], which is monitored as a three-year moving average. The reference value for this indicator is 10%, indicating that the share of unemployed individuals in the labour force should not exceed 10%. This indicator is monitored to assess the mid-term capacities of the labour market adaptation, as high unemployment can signify an unfavourable allocation of resources in the economy and inadequate capacity for the economy to adapt. In Serbia, the unemployment rate (aged 15-74) has considerably improved over the last ten years, with a decrease from 25.0% in 2011 to 11% in 2021, just above the set reference value of 10%. However, the unemployment rate is still higher than in most EU countries, except for Spain and Greece. When compared to other Western Balkans countries, Serbia had the lowest unemployment rate in 2021, with Albania following closely behind with 11.5%, while Bosnia and Herzegovina had the highest rate of 17.4%.

The second indicator is the activity rate (15-64)[3], measured as a three-year change in percentage points (pp.). The reference value for this indicator is a change of -0.2 pp. The activity rate provides insight into labour force dynamics, including employed and unemployed persons leaving the labour force due to retirement or discouragement in finding a job, as well as the integration of new individuals into the labour market. The activity rate reflects how successful the economy is in engaging the population in any form of production of goods or services. The activity rate also has relevance in analysing the impact on potential output or GDP, as low activity implies reduced labour offers and unused production capacity in a country's economy. The activity rate exceeded the reference value during the observed period, and it is far from the set alert

1 MIP indicators are divided into three groups. The first group includes *external imbalance indicators*: Current Account Balance (% of GDP) - three-year moving average, Net International Investment Position (% of GDP) – current year, Real Effective Exchange Rate - 3 year % change, Export Market Share - % change (5 years). The second group consists of *internal imbalance indicators*: Deflated House Prices Index, % change (1 year), Private Sector Credit Flows, consolidated, (% of GDP), Private Sector Debt, consolidated, (% of GDP), Unemployment rate – three-year moving average (%), Total Financial Sector Liabilities, not consolidated - % change (1 year). The third group is made of *employment indicators*: Activity Rate - % of total population aged 15-64 (three-year change in pp.), Long-term Unemployment Rate (three-year change in pp.), Long-term Unemployment Rate - % active population aged 15-74 (three-year change in pp.), Youth Unemployment Rate - % active population age 15–24 (three-year change in pp.).

2 *Unemployment rate* is the share of the unemployed (aged 15-74) in the labour force, i.e. active population (active population consists of employed and unemployed persons) of the same age.

3 *Active population* (*labour force*) is made of all employed and unemployed persons. *Activity rate* is the share of active population in total reference population.

limit. The activity rate for the population aged 15-64 was 59.4% in 2010, rising to 70.3% in 2021.

The long-term unemployment rate is the third indicator monitored as a three-year change, represented as the share of long-term unemployed individuals (more than one year) in the active population aged 15-74. The reference value for this indicator is a change of 0.5 pp. High long-term unemployment rates indicate that the labour market is not functioning well, implying obstacles in the labour market. Long-term unemployment monitoring helps assess employment trends, as longer unemployment durations lead to smaller chances of re-employment. Serbia experienced an imbalanced situation in 2011 and 2012, with this rate recording better results than the reference values afterward. The long-term unemployment rate in Serbia has been constantly decreasing since 2014, although the share of long-term unemployment in the total unemployment (15-74) remained high, amounting to 54.8% in 2020. In comparison, the highest average value of the long-term unemployment share in total unemployment (15-74) in the EU-27 was recorded in 2016 and amounted to 48.5%, while in Serbia the same indicator was 74.1%. Among Western Balkan countries, Serbia had the smallest long-term unemployment share in total unemployment, with Albania coming in slightly under 60% in 2020. Other Western Balkan countries had long-term unemployment accounting for over 70% of total unemployment.

The youth unemployment rate (aged 15-24), expressed as the percentage of young people in the active population of the same age, is measured over a three-year period, with a reference value of 2 percentage points. This indicator is also monitored in order to alert early on the decline in labour market situation and detect decreased potential output due to the deterioration of acquired skills and unrealised salaries in the future, with multiple social consequences and increase of social exclusion. During the entire observed period, Serbia had very good results – moreover, the youth unemployment rate was constantly decreasing. In 2013, this rate amounted to 52% and fell to 26.4% in 2021. However, over the whole observed period this indicator was considerably over the EU average. In 2021, higher youth unemployment rates than that of Serbia were recorded in Greece (35.5%), Spain (34.8%), and Italy (29.7%). Among Western Balkans countries only in Serbia and Albania, the youth unemployment rate was under 30%, and above 35% in the other countries (North Macedonia, Bosnia and Herzegovina, and Montenegro).

When examining labour market-related MIP (Macroeconomic Imbalance Procedure) indicators, it can be concluded that there have been positive changes in the labour market over the past decade. Most of the indicators, such as the activity rate, youth unemployment rate, and long-term unemployment rate, remained stable during this period. However, these indicators also showed that the situation in the Serbian labour market was considerably less favourable than in EU countries, although more favourable than in Western Balkan countries.

The following text will delve into the main characteristics of the labour market in Serbia and the changes that have occurred over the past decade. We will explore the key causes and consequences of imbalances, with the first part of the paper focusing on labour force loss due to emigration and the second part analysing employment trends in Serbia during the second decade of the 21st century. We will also examine the most important characteristics of the labour force in Serbia and how labour market supply and demand are perceived. Finally, we will present the results of the Labor Cost Survey, which enables a comparison of the labour market situations in Serbia and the European Union.

Emigration-induced labour force loss

The issue of emigration has been a phenomenon for several decades, and measuring its volume and effects has always posed significant challenges. The lack of an efficient legal mechanism to compel citizens leaving the country to deregister their place of residence has made it impossible to establish official statistics on external migrations. Therefore, only estimations, using different approaches and data sources, can be made with varying degrees of accuracy.

One way to understand migration volume is through the population census and comparing census data with available immigration statistics in destination countries (known as mirror statistics). Immigration is subject to stricter regulation as destination countries require

individuals to apply for a residence visa, working permit, and other documentation.

Starting from the conclusion that Serbia "mostly exports workers, and much less people" [1] and that employment-related migration became the dominant category of migration flows, as shown by the data on abrupt gross outflow of emigrants from Serbia towards European Union countries in the second half of last decade, we will deal here with the analysis of data from the Eurostat database on residence permits issued for the first time to Serbian citizens by EU member countries. While we recognize the limitations of Eurostat statistics in capturing the full scope of Serbian emigration, these statistics offer harmonization and uniform methodological principles. The data will be useful in assessing the minimum labour force loss over the past decade.

Eurostat statistics on residence permits pertain to third-country citizens, or individuals who are not EU citizens, who have received a residence permit or authorization to reside in one of the EU member countries or EFTA countries. The data are based on administrative sources and are primarily provided by ministries of internal affairs or related immigration agencies. EU member countries are required to transmit data on residence permits to Eurostat in accordance with the Regulation adopted by the European Parliament and Council on Community statistics on migration and international protection. A *residence permit* is any authorization valid for at least three months issued by the authorities of a member country that allows a third-country citizen to legally reside in its territory. The first residence permit is a permit issued to a person for the first time, and it is considered a first permit even if the time gap between the expiry of the old permit and the start of validity of the new permit issued for the same reason is at least six months, regardless of the year of issuance of the permit. Therefore, the data analysed in this study only pertains to EU countries.

Data on first residence permits for the EU-27 have been available since 2013. According to Table 1, the number of first residence permits has been increasing consistently and rapidly from 2013 to 2019, reaching its peak in 2019. However, in 2020, due to the pandemic, the number fell considerably, but still remained high at over 40,000 a year. Family-related permits were dominant until 2016, although this type of permit did not prevent emigrants from working abroad. Working permits have dominated since 2017. Employment-related emigration peaked in 2019, with a minimum of 32,000 Serbian citizens finding employment in EU countries. The coronavirus pandemic and border closures slowed down this trend, and in 2021 slightly more than 17,000 persons received a residence permit for employment reasons, while the number of residence permits for family reasons was approximately the same.

Table 1: First residence permits to Serbian citizens* in EU-27 by reasons for issuing residence permits

GEO (Labels)	European Union - 27 countries (from 2020)				
TIME	Total	Family reasons	Education reasons	Employment reasons	Other reason
2010	:	:	:	:	:
2011	:	:	:	:	:
2012	:	:	:	:	:
2013	23,770	10,685	2,252	5,293	5,540
2014	24,367	10,762	2,086	5,760	5,759
2015	26,603	13,013	2,222	6,367	5,001
2016	30,572	12,663	2,249	9,212	6,448
2017	39,707	13,534	2,342	17,215	6,616
2018	51,056	15,293	2,359	26,925	6,479
2019	62,373	15,667	2,336	32,639	11,731
2020	41,008	13,644	1,462	16,246	9,656
2021	44,182	17,349	2,014	17,258	7,561
Total in the period	**343,638**	**122,610**	**19,322**	**136,915**	**64,791**
Special value:	not available				

* Due to the possibility of having dual citizenship and to the fact that inhabitants of Kosovo and Metohija can have the citizenship of the Republic of Serbia, this number may include persons who are not usual population of the Republic of Serbia.

Source: Eurostat, First permits by reason, length of validity and citizenship [4]

During the observed period, first permits for education reasons showed extreme stability, with slightly more than 2,000 persons going to study in the European Union every year, except during the pandemic year when less than 1,500 Serbian citizens had the possibility to leave the country for education reasons.

Residence permits are classified into three groups based on validity length: 3-5 months, 6-11 months, and 12 months and more. Looking at the structure of total residence permits by validity length in Figure 1, permits issued for one year and longer prevail throughout the observed period, with their share in total issued permits not falling below 60% since 2015.

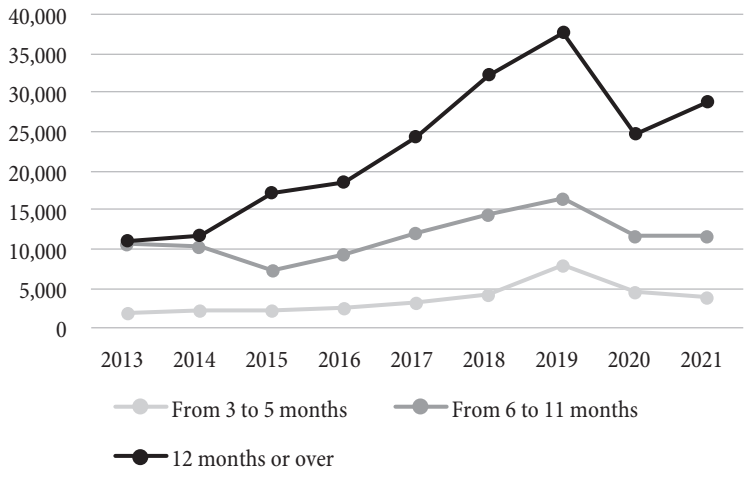
However, as far as residence permits for employment reasons are concerned (Table 2), permits issued for a period of 6 to 11 months were dominant until 2015. In 2013 and 2014, their share in the total issued residence permits based on employment accounted for 58% and 56%, respectively, while the number of residence permits issued for a period exceeding one year accounted for 26% and 27% of the total issued residence permits for employment reasons.

In 2015, the situation overturned, and the number of residence permits issued for employment reasons with a validity period longer than a year increased and became equal to the number of permits issued for a period of 6 to 11 months. In 2016, the share of permits with a validity period longer than a year reached 55% of the total residence permits issued for employment reasons, while those with a validity period of 6-11 months fell to 35%. This trend continued until the end of the observed period in 2021, with permits for a period longer than a year accounting for more than 50% (in 2018 even 60%) and those with a validity period of 6-11 months up to 35%. The proportion of residence permits issued for employment reasons with a validity period of 3-5 months accounted for 16% of the total residence permits issued for employment reasons in 2013, and it fell to 12% in 2021.

Unfortunately, data on first residence permits by age of emigrants are not available for the EU-27 as a whole but are available for most of the observed countries during the period. Available data indicate that more than 70% of Serbian citizens who received first residence permits for any reason were in the age group of 20-64 years and this age group accounted for approximately 85% of total residence permits issued in 2018 and 2019.

When examining the age structure of emigrants by reason for the residence permit, it can be observed that in the group of individuals who received a residence permit for family reasons, there were approximately 65% of individuals aged between 20 and 64 during the period from 2013-2021. The group of individuals with the first residence permit for other reasons consisted of 49% of individuals aged between 20 and 64. Hence, it is evident that a substantial number of individuals who did not declare that the reason for their stay abroad was employment belong to the working-age group. As for individuals who received a residence permit for the reason of employment, it is not necessary to establish whether they are in the usual

Figure 1: First residence permits issued to Serbian citizens in EU-27 according to length of validity



Source: Eurostat, First permits by reason, length of validity and citizenship [4]

working-age group, having in mind that they declare that the reason for resident permit is work.

Table 2: First residence permits to Serbian citizens in EU-27 by reason and length of validity

TIME	Total	From 3 to 5 months	From 6 to 11 months	12 months or over
Employment reasons				
2013	5,293	828	3,091	1,374
2014	5,760	974	3,211	1,575
2015	6,367	1,039	2,641	2,687
2016	9,212	931	3,248	5,033
2017	17,215	1,622	5,713	9,880
2018	26,925	2,691	8,062	16,172
2019	32,639	4,917	10,435	17,287
2020	16,246	2,016	5,627	8,603
2021	17,258	1,559	5,655	10,044
Total in the period (employment reasons)	**136,915**	**16,577**	**47,683**	**72,655**
Education reasons				
2013	2,252	192	1,353	707
2014	2,086	163	1,245	678
2015	2,222	185	835	1,202
2016	2,249	307	1,042	900
2017	2,342	375	1,026	941
2018	2,359	335	1,052	972
2019	2,336	322	933	1,081
2020	1,462	156	731	575
2021	2,014	193	682	1,139
Total in the period (education reasons)	**19,322**	**2,228**	**8,899**	**8,195**
Family reasons				
2013	10,685	262	3,730	6,390
2014	10,762	331	3,500	6,551
2015	13,013	372	2,450	10,191
2016	12,663	308	3,147	9,208
2017	13,534	279	3,133	10,082
2018	15,293	365	3,204	11,696
2019	15,667	623	2,611	12,320
2020	13,644	640	2,924	10,064
2021	17,349	933	3,817	12,599
Total in the period (family reasons)	**122,610**	**4,113**	**28,516**	**89,101**
Other reason				
2013	5,540	605	2,399	2,536
2014	5,759	608	2,307	2,844
2015	5,001	531	1,242	3,228
2016	6,448	837	2,071	3,540
2017	6,616	797	2,266	3,553
2018	6,479	913	2,090	3,476
2019	11,731	2,185	2,657	6,889
2020	9,656	1,782	2,413	5,461
2021	7,561	1,262	1,474	4,825
Total in the period (other reasons)	**64,791**	**9,520**	**18,919**	**36,352**

Source: Eurostat, First permits by reason, length of validity and citizenship [4]

If we allow ourselves to sum up the number of first working permits issued to Serbian citizens for a period longer than a year[4] in the territory of the EU-27 from 2013 to 2020 for the purpose of calculating the lowest limit of labour force loss in the previous period, we come to the number of 72,600 (Table 2). *Therefore, over the period 2013-2021, 72,600 Serbian citizens found employment in the EU.*

It would not be unreasonable to add to this figure the estimated number of individuals within the usual working age range of 20-64 years who received a residence permit for a period longer than a year for reasons other than employment (such as family or other unspecified reasons). Between 2013 and 2021, the total number of residence permits issued for family reasons for a period longer than a year was 89,000, and assuming that 65% of these permits were granted to individuals aged 20-64 years, the number of such individuals would be 58,000. Similarly, there were 18,000 individuals within the same age group who received a residence permit for other unspecified reasons during the same period.

By summing up the aforementioned categories of individuals (i.e. all individuals with a residence permit for employment regardless of age, those aged 20-64 with a residence permit for family reasons, and those aged 20-64 with a residence permit for other reasons) who received their first residence permit for a period longer than a year, we come to the number of *148,000 that we will now consider as a minimum labour force loss in the period 2013-2021.*

Based on preliminary data from the 2022 Population Census, 6,690,000 persons live in the Republic of Serbia (of whom 6,470,000 were enumerated in a traditional way, by direct enumeration, and 218,000 who did not participate in the census for any reason were added to the Census database from administrative sources). In the 2011 Census, the number of inhabitants was 7,187,000, but due to non-coverage, this number needs to be adjusted. After adding an estimated non-enumerated population of 220,000 and non-enumerated Albanians in the municipalities of

4 We start from the assumption that persons who received a residence permit in EU countries for a period longer than a year emigrate for a long period, that there is a number of duplications among them, i.e. there are those who apply again for a first residence permit (in EU-27 countries) 6 months after they returned from work abroad, is reduced to a minimum.

Bujanovac and Presevo (approximately 47,000), knowing that, unlike in 2011, in 2022 Albanians did not boycott the census, the adjusted number of inhabitants in 2011 was 7,470,000. Therefore, the number of inhabitants decreased by approximately 780,000 between the two censuses.

If we compare only the data from the traditional census (excluding imputations from administrative sources in 2022 and without the estimation of non-coverage from the same sources in 2011), the difference in the number of inhabitants between the two censuses was about 760,000. After subtracting the negative natural increase of approximately 470,000, the negative migration balance is approximately 300,000 inhabitants. When we add to this number the number of persons who immigrate to Serbia from abroad in the inter-census period, we obtain the estimation of emigration in the previous decade. The number of persons who moved in the current place of residence from abroad in the period between the two censuses amounted 82 000[5].

Therefore, the number of emigrants from Serbia in the period between Census 2011 and Census 2022 was slightly more than 380,000, which can be considered as an approximate upper limit of emigration in the period from 2011 to 2022.

In the mirror of the upper limit of emigration, based on the preliminary data of the Population Census, the sum of all residence permits issued for the first time to citizens of Serbia in the EU-27 from 2013 to 2021, which amounts to 343,000, seems quite reasonable (Table 1).

Population census collects data on absent household members, length, and reason of their absence. These data, besides numerous limitations concerning data coverage, still represent an important source of data on the emigration structure. The limitation referring to the coverage is that data on persons working abroad can be collected only for those persons having household members in Serbia who could provide data for them. Therefore, if an entire family has emigrated and there is no one to provide data about them during the census in Serbia, those persons are not covered.

The preliminary data of 2022 Census on absent persons abroad confirm that EU countries are the prevailing countries of emigration among Serbian citizens, irrespective of the length of work, i.e. stay abroad. Namely, more than 50% of those persons working/residing abroad go to three European countries: Germany, Switzerland and Austria, and only slightly more than 11% of absent persons work/reside in non-European countries, i.e. 13% outside the EU+EFTA territory.

In this phase of census data processing, only data on the educational structure of absent persons are available, while data on occupations of the absent persons will be available later on, after the coding phase.

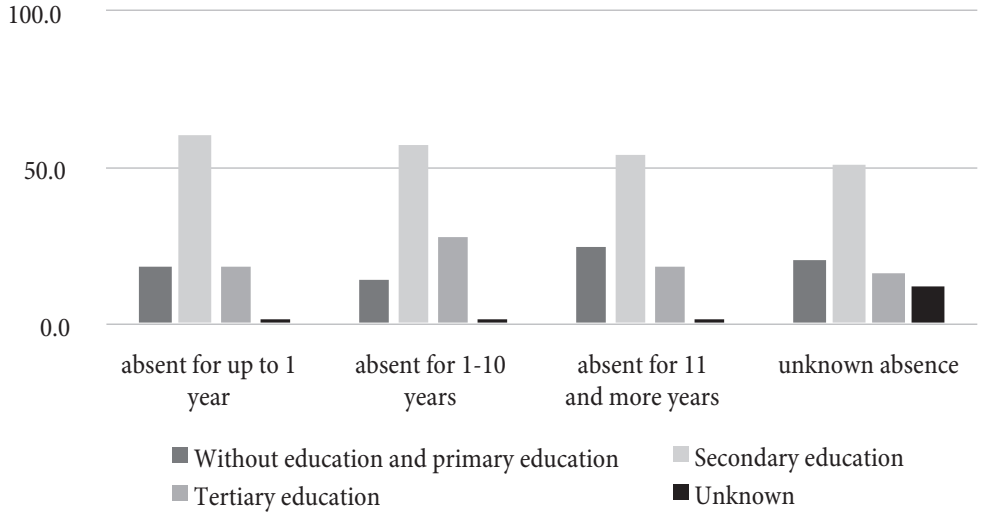
For the needs of this analysis, the absence length of persons abroad is divided into three groups: less than a year, 1-10 years and 11 and more years, and we will observe the persons who are absent from their place of enumeration for less than 11 years in order to eliminate those who emigrated before 2011.

The preliminary Census 2022 data (Figure 2) indicate that, irrespective of the absence length among persons working/residing abroad, the predominant group is made of persons with secondary educational level, with a growing tendency of their share in the last 11 years. The share of those with tertiary educational level in the last 12 months is considerably smaller when compared to the period 2011-2021, when they accounted for almost 30% of absent persons. Unlike persons with tertiary educational level, the share of those with lower educational level or without it started to rise again after a period of decrease (2011-2021).

The trend of finding employment outside Serbian borders has not stopped, it has started accelerating again after the two pandemic years (2020 and 2021), which is proved by the data of the recent census on the number of persons being absent from the usual place of residence less than a year. At the critical moment of the census (September 30, 2022), almost 45,000 persons were absent from their place of residence for less than a year due to work abroad, and slightly more than 18,000 resided abroad for less than a year as a household member of a person

5 The question in the census refers to the last emigration – from where the person has immigrated in the place where she/he is enumerated (place of usual residence). This means that a person could have immigrated from abroad, i.e. in Novi Sad in 2012, and move to Belgrade in 2015, where she/he was enumerated. In such a case one cannot see whether a person immigrated from abroad.

Figure 2: Structure of absent household members aged 15-64, by the highest completed educational level and absence length, in %



Source: 2022 Population Census (preliminary data)

working abroad. These data refer primarily to 2022 and it remains to wait what Eurostat statistics on first residence permits issued for 2022 will show when it is released at the end of 2023.

Employment trend in Serbia

There are two sources of data that can be used to monitor employment trends in Serbia. The first is the Labour Force Survey (LFS), which adheres to the standards and recommendations of the International Labour Organisation and regulations of the European Statistical Office (Eurostat). The LFS provides information on three main population groups – employed, unemployed, and persons outside the labour force – as well as their demographic, socio-economic, educational, and other characteristics. It is conducted on a random sample of households and includes both formal and informal employment. The survey covers all individuals who have performed paid work for an employer, are self-employed, or as contributing family member, as well as persons who have an employment from which they are absent, and for whom there is a guarantee that they will return.

The second source is the Survey on Registered Employment, which uses records from the Central Register of Compulsory Social Insurance (CRCSI) and Statistical Business Register (SBR). Registered employment is survey that covers only formally employed individuals. It includes individuals with a status of employee (for a definite or indefinite period), those who work on a service contract or temporary/occasional jobs, those insured for self-employment activities, founders of enterprises or entrepreneur shops, and individual agricultural producers aged up to 65.

According to the Labour Force Survey, there were over 2.8 million employed persons in 2021, representing an increase of 418,400 or 17.1% compared to 2010. The years with the highest record of employment growth were 2014 and 2016, with a year-on-year increase of 112,000 and 139,000, respectively.

Between 2010 and 2021, the employment structure experienced both positive and negative changes.

When examining the types of employment among individuals aged 15-64, including permanent, fixed-term, seasonal, and occasional, there were not such positive changes from 2010 to 2021. The proportion of permanent employment, which remains the predominant type of employment, decreased from 88.5% in 2010 to 77.4% in 2021. Conversely, there was an increase in fixed-term employment, rising from 8.7% in 2010 to 19.1% in 2021, as well as a growth in temporary and occasional employment, from 1.3% in 2010 to 2.0% in 2021. The percentage of seasonal workers remained at around 1.5%.

One of the positive trends in employment is the decrease of informal employment, which is an important

characteristic in the world labour market with millions of workers, earning a living in circumstances of informality. Sustainable Development Goals (SDGs), which measure progress towards inclusive, sustainable economic growth, full and proactive employment, and decent work for all, include the share of informal employment in total employment as an indicator.

While data on formal and informal employment is only available for a shorter period than that observed, it is enough to demonstrate the trend of decreasing informal employment and increasing formal employment. Between 2015 and 2020, formal employment increased by just over 404,000, with most of the increase occurring outside agriculture (357,000). In contrast, informal employment decreased by nearly 69,000, with 67,000 of the decrease occurring in agriculture. Informal employment rates decreased from 20.4% in 2015 to 16.4% in 2020. Informality in employment is primarily concentrated in agriculture and disproportionately affects female workers. The informal employment rate in agriculture was 61.0% in 2015, decreasing to 57.4% in 2020. Among males, the informal employment rate decreased from 47.8% to 43.4% over the five-year period, while among females, the informal employment rate was 83.4% in 2015 and decreased to 77.7% in 2020.

The volume of informal employment outside agriculture is considerably smaller than that of informal employment in agriculture and affects mostly the male population. Informal employment rate outside agriculture in 2015 amounted to 9.3% and up to 2020 to 6.8%. In 2020, informal employment rate outside agriculture in male population was 8.5%, and in female population 4.7%, and when compared to 2015 they decreased by 2.3 pp. and 2.6 pp., respectively.

Formal employment can be measured from another data source as well. The data of the Survey on Registered Employment, based on CRCSI data, allow more precise monitoring of employment trend at lower levels of activities and, unlike with the Labour Force Survey, a longer comparable time series is available. Registered employment (without registered individual agricultural producers) increased by 311,400, i.e. 16.4% over the period 2010-2021. In this case, 2018 stands out as a key year, when a year-on-year increase in registered employment of more than 75,000 was recorded. The largest employment growth in the period starting from 2010 was recorded in Manufacturing (88,405) which employed almost half a million people in 2021, i.e. accounted for more than 20% of total registered employment. Almost half of the growth of employment in Manufacturing in the last eleven years was concentrated in the division Manufacture of motor vehicles, trailers and semi-trailers, which employed 18,000 persons in 2010, and more than 57,000 in 2021. The section of activity where employment doubled in the previous decade is Administrative and support service activities which employed less than 50,000 persons in 2010 and more than 105,000 in 2021. This section includes activities such as temporary employment, security and investigation activities, services to buildings and landscape activities, office administrative, office support and other business support activities, etc. When referring to employment increase in this section of activities we refer to the increase in the short-term, to lowly qualified, insecure, and poorly paid employment. This is not only typical of Serbia. In European countries, this type of employment gained momentum quite earlier.

On the other side, expansive growth of employment was recorded in the activity Computer programming, consultancy and related activities, where highly qualified labour force with well paid jobs is employed. In 2010, slightly more than 6,000 employees were engaged in computer programming and a little bit more than 42,000 in 2021. The sections of Trade and Accommodation and food service activities saw growth of more than 30,000 employees each in the same period. The largest employment decrease was recorded in the section Agriculture, -15 000 in the period from 2010 to 2021 in enterprises dealing with agricultural activities. The number of registered individual agricultural producers in the period from 2015 to 2021, (since the day when those data became available from the CRCSI database) decreased by more than 30,000. The other source, Labour Force Survey, indicates that the number of employed in agriculture[6] went down considerably. A

6 The activity of agriculture covers the entire section Agriculture, forestry and fishing, as well as a part of the section Activities of households as employers referring to agricultural work.

comparable data series by activity is available for the period 2016-2020 when, according to the Labour Force Survey, employment in agriculture decreased by almost 90,000, i.e. 13%, which suggests that there are fewer and fewer people and business subjects seeing economic interest to be engaged in agriculture.

Labour force characteristics

Unfavourable demographic movements, whether natural or mechanical, influenced population ageing in Serbia. The average population age was 41.4 in 2010 and 43.5 in 2021. Not all economic activities are equally affected by population ageing. Based on the 2021 Labour Force Survey bulletin, when examining the age distribution of employees across different sections of activity, it is observed that Information and Communications is the section with the largest share of young employees (age up to 34), 44.2%, and the smallest share of elderly age employees (aged over 55), 8.9%. The Arts, Entertainment and Recreation section is the only section where the percentage of employees aged under 34 exceeds 40%. Conversely, Agriculture, Forestry and Fishing is the "oldest" section of activity, where the share of employees aged over 55 amounts to 45.1%, while the share of younger employees in this section is the smallest, amounting to 16.3%.

In contrast to the age structure, there has been significant improvement in the educational structure of the Serbian population from 2010 to 2021, according to the Labour Force Survey. Among individuals aged 15-64, the percentage of highly educated population increased from 14.1% to 21.6%, while the proportion of people with low levels of education decreased from 27.4% to 20.4% during this period. The proportion of the population with secondary education remained constant at 57% throughout the entire period. This trend is also reflected in the employed population, where the number of highly qualified employees (aged 15-64) increased by over 200,000 from 2010 to 2021, accounting for 28.6% of total employment in 2021, a rise of 6 pp. compared to 2010. The number of employees with lower levels of education decreased by almost 90,000, and their share of total employment fell from 17.3% in 2010 to 12.2% in 2021. The relative proportion of employees with a secondary education level in total employment remained constant at 60% throughout the entire observed period, despite an increase of 170,000.

Higher levels of education among the population can have negative consequences on the labour market. The growth of education can result in real mismatches between the skills required by the labour market and the skills employees possess, which can cause emigration. According to a recent survey by the European Training Foundation (ETF) [2], the skills mismatch has increased from 2016 to 2019. The survey found that highly educated workers' skills mismatch rose from 21.2% in 2016 to 26% in 2019, while the skills mismatch of medium-skilled workers grew from 7.7% to 8.9% during the same period. Compared to other Western Balkan countries, Turkey had the highest skills mismatch of highly educated[7] workers at 33.2%, while Montenegro had the lowest at 15% in 2019. The highest skills mismatch of medium-skilled workers in 2019 was recorded in Bosnia and Herzegovina (10.7%), while North Macedonia had the lowest at 8%. Serbia was the only country to experience growth in the skills mismatch of medium-skilled workers, despite having the most favourable initial position.

Official statistics and indicators for measuring skills mismatch are not available. As an answer to the growing need for this type of statistics, Eurostat has produced experimental statistics by using existing data sources, e.g. [3]. The Over-qualification rate[8] is one such indicator used to measure the vertical gaps between the labour market supply and demand and is derived from data obtained from the Labour Force Survey for the age group 20-64. Serbia has recorded one of the fastest growth rates in the over-qualification rate, with an increase of 6.4 percentage points from 2013-2020. Eurostat's experimental statistics indicate that Serbia's over-qualification rate stood at 26.7% in 2020. Only North Macedonia (6.9 pp.) and Lithuania (6.6 pp.) have recorded faster growth rates in this period. On the EU-27 level, the over-qualification rate grew by 1.1 pp., reaching 21.5% in 2020. Estonia had the largest

7 *Skills mismatch of highly educated* (ETF) – percentage of highly educated employees performing jobs requiring lower qualification.

8 *Over-qualification rate* (Eurostat) – The over-qualification rate shows the percentage of highly educated persons performing a job demanding low or secondary qualification.

decrease in over-qualification rate, with a reduction of 4.5 pp. from 2013-2020. However, the over-qualification rate in Estonia was still higher than the EU-27 average, standing at 22.8% in 2020. Spain had the highest over-qualification rate of over 35% in the entire observed period in the European Union, while Luxembourg had the smallest one (3.9% in 2020), being the only EU country with an over-qualification rate under 10% over the whole observed period. Structural imbalances in the labour market exist not only in Serbia, but also in other EU member countries and European countries. However, the open EU labour market has managed to control the gap between the labour supply and demand, whereas in Serbia, emigration, the gap between the labour market supply and demand and lack of sufficient information about labour force supply and demand have contributed to the overall growth of the mismatch.

Labour market supply and demand

Due to population emigration, negative natural increase, technological revolution, global economic trends, limited labour force mobility, insufficient investment of employers in employees' training, obsolete knowledge and skills, which are the result of the prolonged period of transition from school to employment, i.e. from the end of education to the first stable or satisfying employment, *Serbia has been recently facing a growing gap between labour market supply and demand.* As it is a serious obstacle to foreign direct investments and further acceleration of economic growth, the necessity to better understand labour market needs and to match the skills has been recently higher positioned on the political agenda.

There are no complete data on demand in the Serbian labour market, after the cancellation of employers' obligation to report to the National Employment Service demands for labour force in 2009. Also, information about skills that are available and required in the labour market is not available. In addition, there are also other systemic problems, such as slow implementation of the Law on Records in the Field of Labour, more precisely of the Decision on Uniform Codes for entering and coding data in labour evidence, which entered into force in 2019. The essence of these documents is the implementation of the new coding of occupations that is harmonised with the International ISCO-08 Code List, and Code List of the Level and Type of Qualification, which has replaced the Code List of the Level of Acquired Qualification because the adopted Law on the National Qualifications Framework of the Republic of Serbia established a new system of regulating qualification levels and types.

All the above resulted in a vague situation that does not allow to correctly understand the situation in the Serbian labour market to be able to react adequately.

As an example, according to the data of the National Employment Service (NES), in January 2021 there were almost 9,000 persons on the list of unemployed person within the group of occupations related to road transport, and 140 registered job vacancies for employment in this group of occupations. In the same period, in the group of occupations Computer engineers and statisticians there were slightly more than 2,000 unemployed persons and 12 registered job vacancies. In 2011, there were 15,042 unemployed persons within the group of occupation related to road transport, and 57 registered job vacancies, while in the group Computer engineers and statisticians there were 3,816 unemployed persons and 13 registered job vacancies for this profile.

Therefore, based on the NES records it can be concluded that supply is rather higher than demand in the labour market

On the other hand, there are data from the Employers Survey [10], also carried out by the National Employment Service. The latest available data from this survey refer to 2019 and indicate that 36.7% of the total number of enterprises that provided answers to the question concerning the issues in employing labour force pointed out they had trouble finding persons with adequate qualifications. When looking at the reasons presented for each occupation, mentioned by the employers as to recruitment and frequency of their presence, the most frequent ones were: occupational deficit (35.4%), lack of knowledge and skills (24.1%), and lack of professional experience (17.1%). In the group of occupations Drivers and operators of mobile machinery there were by far the largest number of problems related to finding workers for

the occupation Driver of heavy trucks and lorry drivers, and the reason was occupational deficit; then for the occupation Car, taxi drivers and delivery drivers, also due to occupational deficit, as well as Bus drivers for reasons of both occupational deficit and lack of knowledge and skills. Therefore, the Employers Survey indicates a lack of labour force.

It is clear that it is impossible to conclude from the cited data whether an occupation is deficient or surplus, as it requires precise and more comprehensive data on supply and demand in the labour market.

As an example, it can be concluded from the mentioned NES data that there is a surplus of labour force in the group Computer engineers and statisticians, which is the opposite to the conclusion drawn from the statistics on registered employment that indicates that there is an expansive growth of employment in Information and communications over the last ten years. Figures 3 and 4 show how the expansive employment growth in the mentioned activity is followed by an increase in salaries and wages, where in 2021 this section occupied the first place as far as salaries and wages are concerned. From this example we can see how the market has reacted to restricted qualified resources.

Naturally, IT specialists are not employed only in this section of activity and we do not try to equalize occupation and activity where the occupation is performed, but due to a lack of data on salaries and wages by occupation and according to the logic of the connection of activities and occupations for which employment is found in certain activities, we can draw some indicative conclusions from these substitute indicators.

Behind the section Information and communications, the largest increase in salaries and wages was recorded in Professional, scientific and technical activities, which also employs mainly highly qualified labour force.

Demand for labour force in Manufacturing, generally requiring secondary and lower qualifications, influenced the growth of salaries and wages in the previous decade to be above the average.

Figure 3: Rank of activities according to the level of salaries and wages to the average of RS, in 2010 and 2021

Source: Survey on Salaries and Wages, Statistical Office of the Republic of Serbia

On the other hand, in the sections of activity Education and Human health, also employing highly qualified labour force, market rules do not apply, and it is not possible to establish through salaries and wages the real need for employment.

Based on the over-average growth of salaries and wages in the section Administrative and support service activities, where so-called rented workers are mostly employed to perform generally less complex tasks that do not require specific knowledge and skills and have poor working conditions, it can be concluded that there might have been a lack of labour force if salaries and wages had not been raised.

The trends noticed in average salaries and wages in selected sections of activity make us conclude that one of the methods for resolving the problem of labour force shortage is higher salaries and wages, even for jobs that do not require specific or professional knowledge and skills.

Labour force in Europe and Serbia: Labour costs

Based on the data presented in the above sections, we can conclude that the labour market in the Republic of Serbia was marked in the second decade of the 21st century by strong employment growth, followed by a significant increase in the wages and salaries but there is an obvious enormous loss of labour force due to emigration.

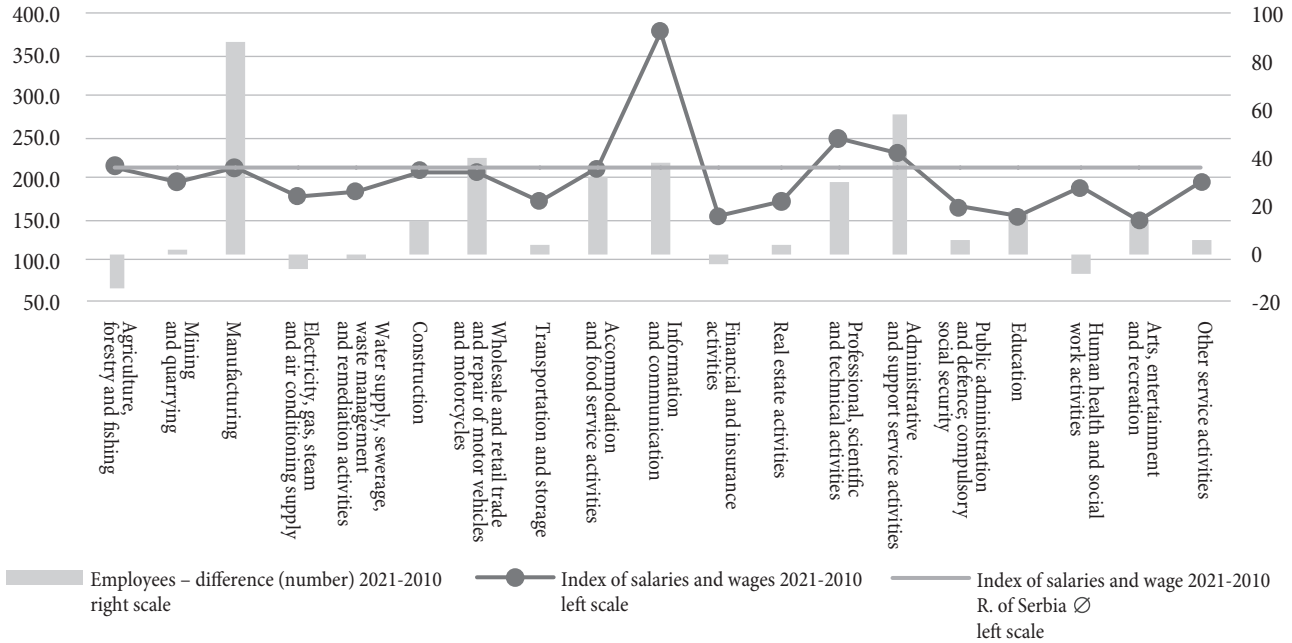
Using the Labour Cost Survey, we will show the differences of labour costs levels borne by employers for employing labour force in Europe and Serbia. The Labour Cost Survey is carried out every four years, according to the uniform Eurostat methodology. The last reference year is 2020 (Figure 5).

Labour costs are defined as the total expenditure borne by employers in order to employ workers. Labour costs include remunerations for workers, generally made of gross salaries and wages, in cash and in kind, social contributions borne by employers, vocational training costs, and other costs, such as for the recruitment of new workers, and costs for occupational safety linked to the purchase of protective clothing, less received subsidies.

Labour costs, including social contributions borne by employees, have the largest share in total labour costs (75.6% for the whole EU), then social contributions borne by employers (23.4%). The remaining portion (1.0%) is absorbed by vocational training costs and other expenditure and taxes less subsidies.

In 2020, the largest share of wage costs (direct remuneration, *bonuses and allowances paid in each pay period)* in total labour costs was recorded in Malta (98.6%), Lithuania (96.3%) and Romania (94.6%), while the smallest was noted in France (67.9%) and Sweden (69%). In Serbia, wage costs that imply taxes and contributions borne by

Figure 4: Trend of salaries and wages and registered employment, 2010-2021, by section of activity

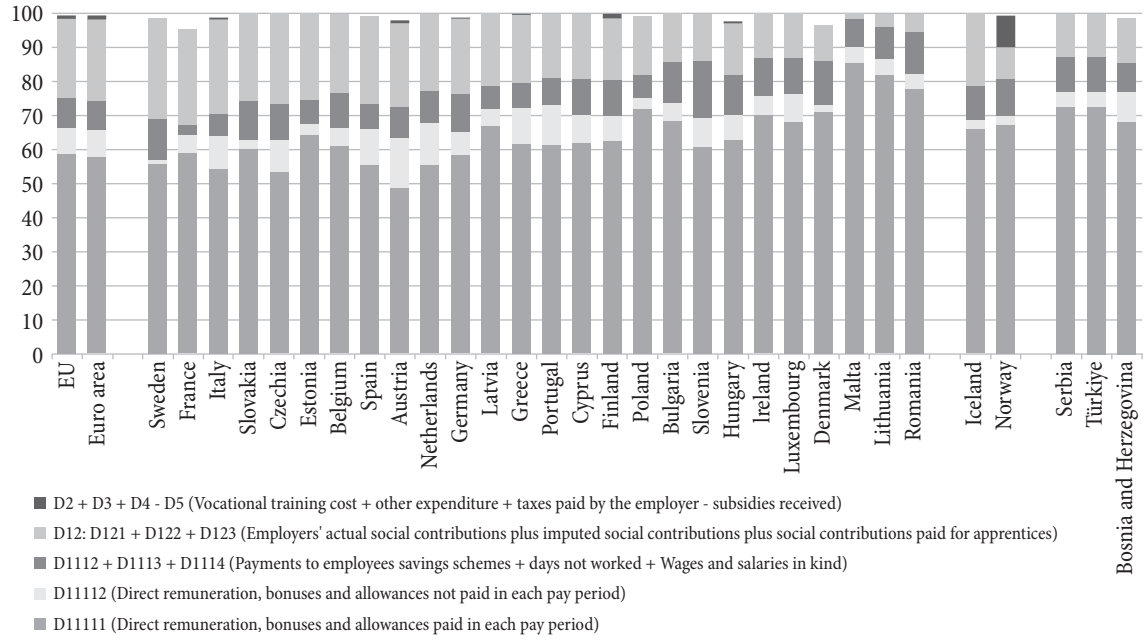


Source: Survey on Salaries and Wages, Survey on Registered Employment, Statistical Office of the Republic of Serbia

employees, but not also by employers, accounted for 87.5% of total labour costs. There are no specific features in the structure of labour costs in Serbia that drastically deviate from other European countries. Contrary to the structure, the level of labour costs in Serbia differs considerably from the average of the European Union.

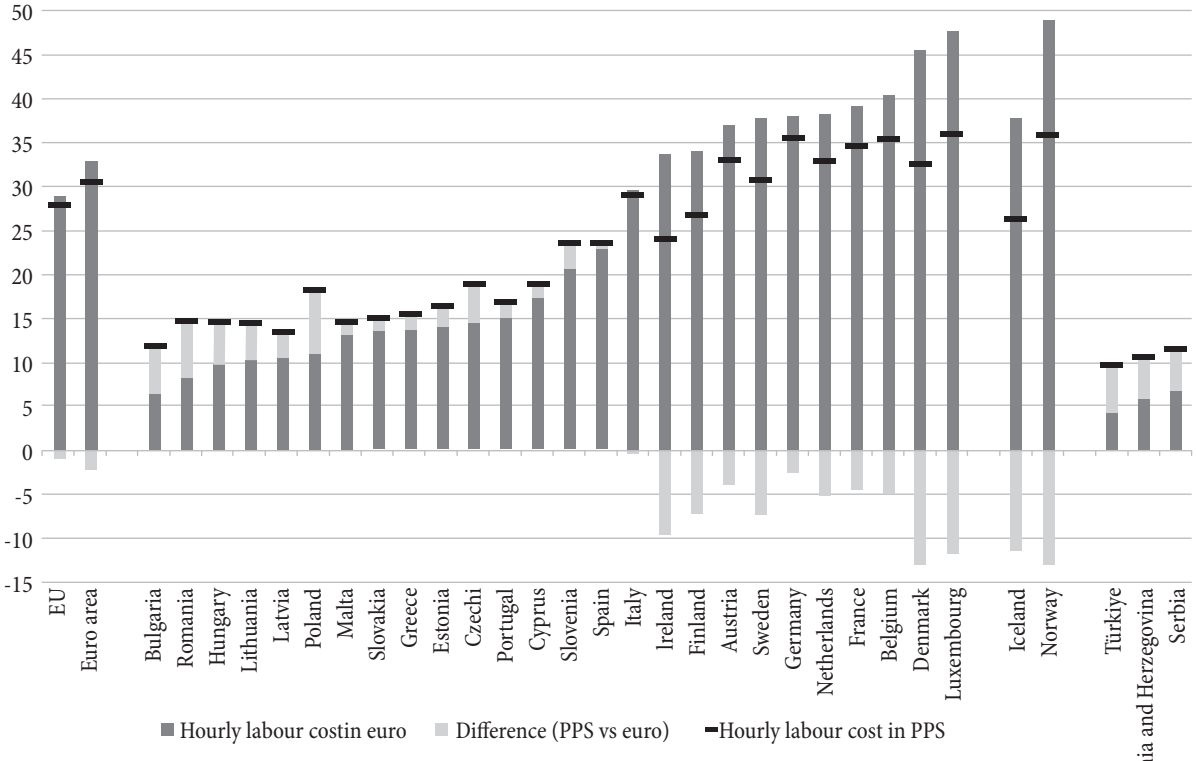
In 2020, the largest hourly labour costs (see Figure 6), expressed in euros, were recorded in Norway (€49), and

Figure 5: Structure of wage and non-wage costs - LCS 2020 (regular and non-regular wage costs, by country)



Source: Eurostat [8]

Figure 6: Hourly labour cost levels in euro and in PPS in 2020



Data for Croatia, Switzerland, Nort Macedonia and Montenegro sre not available.
Data for Albania is confidential.

Source: Eurostat [5]

among EU member countries in Luxembourg (€47.7), then in Denmark (€45.7), Belgium (€40.5) and France (€39.2). The lowest hourly labour costs were noted in Bulgaria (€6.6), Romania (€8.2) and Hungary (€9.8). At EU-27 level, the highest labour costs were in Luxembourg, 7.3 times higher than the lowest labour costs registered in Bulgaria. In Serbia, hourly labour costs were far under the average of the European Union, amounting to €6.8.

If we observe labour costs, and indirectly wage costs (as they make up the largest part of labour costs), expressed in Purchasing Power Standard – PPS, the situation in Serbia is somehow more favourable than when observed in euros, but Serbia is also in this case at the bottom of the list of European countries. Average hourly labour costs expressed in PPS at the level of the European Union amount to 27.9, and in Serbia to 11.6. This means that labour costs in Serbia are almost 2.5 lower than the EU-27 average, even though it was the fifth country, over 2016-2020, in terms of increase in salaries and wages, according to the same survey (Table 3).

As long as there are better prospects for employment and higher earnings that function as the main *pull* factors of emigration, emigration will be inevitable. It is clear that reducing the difference of earnings between host countries and countries of origin is the key factor that should lessen the motive for emigration and augment the motive for return migration. However, as the current differences in earnings are very large between Serbia and European countries, their harmonization requires time and is only possible in the medium or long term.

Conclusion

In spite of the large labour force loss triggered by emigration and significant employment growth in the second decade of the 21st century, according to the administrative evidence of the National Employment Service at the end of 2021, Serbia still has 470,000 unemployed persons, i.e. 316,000 according to the Labour Force Survey, of whom almost a half consists of long-term unemployed persons, while employers at the same time have more and more trouble to find adequate labour force, which confirms structural imbalance that cannot be remediated in the short term.

Table 3: Wage costs, by hour worked, 2016-2020, in euros

TIME	2016	2020	Change 2020-2016, in %
GEO (Labels)			
European Union - 27 countries (from 2020)	**19.33**	**21.79**	**12.7**
Lithuania	5.31	9.9	86.4
Romania	4.29	7.78	81.4
Bulgaria	3.75	5.66	50.9
Czechia	7.51	10.70	42.5
Serbia	**4.19**	**5.96**	**42.2**
Latvia	6.06	8.39	38.4
Hungary	5.88	8.05	36.9
Slovakia	7.54	10.20	35.3
Estonia	7.98	10.50	31.6
Slovenia	14.13	17.92	26.8
Poland	7.13	8.99	26.1
Luxembourg	34.04	41.60	22.2
Bosnia and Herzegovina	4.80	5.54	15.4
Ireland	25.94	29.59	14.1
France	23.41	26.60	13.6
Portugal	10.90	12.35	13.3
Netherlands	26.82	30.13	12.3
Austria	24.32	27.28	12.2
Germany (until 1990 former territory of the FRG)	26.35	29.54	12.1
Denmark	36.53	39.85	9.1
Cyprus	12.94	14.05	8.6
Spain	15.83	16.96	7.1
Belgium	29.27	31.15	6.4
Finland	26.09	27.63	5.9
Italy	20.09	21.22	5.6
Iceland	28.92	29.80	3.0
Sweden	25.63	26.20	2.2
Norway	40.59	40.04	-1.4
Malta	13.35	12.98	-2.8
Greece	12.17	10.98	-9.8
Türkiye	5.47	3.77	-31.1
Croatia	8.09	:	:
Switzerland	45.23	:	:
United Kingdom	23.27	:	:
Montenegro	4.93	:	:
North Macedonia	3.55	:	:
Albania	2.15	:	:

Currency	Euro
Unit of measure	Per employee in full-time equivalents, per hour
Size classes in number of employees	10 employees or more
Statistical classification of economic activities in the European Community (NACE Rev. 2)	Industry, construction and services (except public administration, defense, compulsory social security)
Labour costs structure	Wages and salaries (excluding apprentices)

Source: Eurostat, Labour Cost Survey [6]

Without contemplating whether emigration is permanent or temporary, and without any pretence to establish the exact volume of emigration, we can notice that Serbia has been facing a great outflow of labour force, and there are indications that in the future this outflow will be even more massive. Starting from the standard classification of education, data confirm that there is no place for fear of brain drain "as the departure of highly qualified persons do not disturb considerably the educational structure of the population that remains". However, what does it mean "favourable educational structure" when what we conclude is based on the classic "socialist" triad (division into primary, secondary and tertiary education), which does not take into consideration the profile and reputation of schools, universities, etc., i.e. the learning outcomes that can realise a certain value in the labour market? The lack of transferable skills such as the focus on resolving problems, analytical thinking, critical opinion, adaptability, teamwork, readiness to acquire new knowledge, especially in IT, can be considered as the main shortages in the labour market. When these aspects are taken into account as the key elements of the circumstances of working age individuals in the current labour market, then the question of maintaining a favourable qualification structure in the domestic labour market has a different picture and perspective. Eurostat experimental statistics suggest that the gap between skills required in the labour market and skills acquired in the educational system in Serbia is growing wider.

One comes to the conclusion that the educational system takes time to adapt to fast and changeable skills required in the labour market, but that it also creates by itself structural imbalances. Even without precise data and surveys many weaknesses can be enumerated, both for the private and state education, but this paper is not dedicated to that topic, although education is the main factor in establishing balance between supply and demand in the labour market and creating more favourable economic climate that would slow down emigration.

In the next period, in order to support the educational system, it is necessary to set a mechanism for monitoring labour market supply and demand, based on precise and updated administrative and statistical data.

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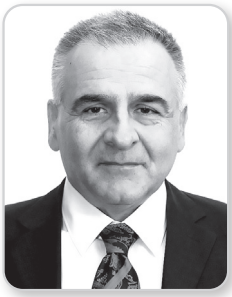

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DETERMINANTS OF BANK LENDING TO SMEs IN THE EU

Determinante bankarskog kreditiranja malih i srednjih preduzeća u EU

Abstract

This study examines factors that influence bank lending to SMEs in the EU. We employ relevant firm-, industry-, and macro-level variables to confirm the significance of bank lending process determinants through multiple panel data models. We find that increase in GDP p.c., number of bank branches, banking market concentration, support measures, repayment in event of bankruptcy and shorter resolving time positively impact SMEs access to loans. SMEs with higher turnover and working in construction or manufacturing sectors have a better chance to obtain bank loans, while access to bank financing is negatively affected by increase in inflation rate and operations in service sector.

Keywords: *bank lending, financing constraints, small and medium-sized enterprises, SAFE, EU*

Sažetak

Ova studija istražuje faktore koji utiču na bankarsko kreditiranje malih i srednjih preduzeća u EU. U istraživanju se koriste relevantne promenljive na nivou preduzeća, sektora privrede i na makro nivou kako bi se potvrdio značaj determinanti procesa bankarskog kreditiranja primenom više modela panela. Nalazi analize ukazuju na to da porast BDP p.c., broja bankarskih filijala, koncentracije na bankarskom tržištu, mera podrške kreditiranju, plaćanja u slučaju nesolventnosti, kao i kraće vreme razrešavanja sporova u slučaju nesolventnosti imaju pozitivan uticaj na pristup malih i srednjih preduzeća bankarskim zajmovima. Mala i srednja preduzeća koja odlikuje veći obim prometa i koja posluju u sektoru građevinarstava i industrije imaju veću šansu da dobiju bankarski zajam, dok je bankarsko finansiranje pod negativnim uticajem povećanja stope inflacije i smanjuje se ukoliko preduzeća posluju u sektoru usluga.

Ključne reči: *bankarsko kreditiranje, ograničenja u finansiranju, mala i srednja preduzeća, SAFE, EU*

Introduction

The aim of this paper is to determine firm-level, industry-level, and macro-level factors that influence small and medium-sized enterprises' (SMEs) bank lending behavior in the EU. SMEs financing is of special importance as these enterprises form the backbone of economic development in contemporary business surroundings. A vibrant SMEs sector is crucial for economic growth, job creation, entrepreneurial activity, and innovations. SMEs are essential for the EU economy, accounting for 66.6% of the overall employment (95 million people). They make up the most of non-financial firms (99.8%) and generate 56.8% of total value added [31].

Our primary source of information was Survey on the access to finance of enterprises (SAFE) [45]. The SAFE is organized on an annual basis from 2009 through a survey of all size firms in the EU. SAFE is conducted on behalf of the European Commission (DG Internal Market, Industry, Entrepreneurship and SMEs) and the ECB [22]. SAFE public reports contain data for all firm sizes and are not suitable for in-depth SMEs research. Thanks to the courtesy of the ECB, we used SAFE anonymous microdata reports to extract data on SMEs.

All businesses rely on access to finance to survive, grow and expand. While SMEs find it challenging to gain a foothold in obtaining financing, including bank loans, big companies are often offered ease of access due to their prior inclusion in the financial market and, as a result, they have more funding options. Numerous authors see obtaining of bank loans as one of the most prominent obstacles for SMEs [3], [19], [13]. The informational opacity of SMEs and the difficulties banks have in evaluating their business skills have been suggested as factors for SMEs' bank funding challenges [21]. Consequently, SMEs with viable projects are unable to obtain funds. This phenomenon, known in the literature as the financing gap, refers to situations where market cannot provide external financing to SMEs.

The financial gap SMEs are facing emerges in the presence of asymmetric information problems, leading to an adverse selection of low-quality borrowers or moral hazard issues [1], [44], [10], [9], [3]. Bridging the financial gap strives to remove barriers within the financial sector to drive SME's growth and overall economic development. Even though the academic literature on small business financing is extensive and growing, it is still unclear which factors are crucial for improving their access to finance.

Although SMEs' bank lending is an essential vehicle for economic growth, empirical studies of SMEs funding factors are limited. We intend to close this research gap by incorporating more variables at the firm, industry, and macro levels. Contemporary research uses different variables to assess the financial gap. Erdogan investigated country-level debt financing gap determinants [20], whereas Beck and Cull used firm-level variables to assess funding constraints for African SMEs [6]. Yudaruddin explores bank-specific and macroeconomic drivers for SMEs bank loans in Indonesia [50]. Hashi and Toçi used firm-level data to investigate funding barriers in South-Eastern Europe [28]. While most existing papers explore one approach to identifying SMEs financing determinants, we tested multiple variables on the firm, industry, and macro levels to confirm the validity of gained results and ran several panel regressions as specific robustness check. In contrast to Wang et al., who explored bank market power impacts on SMEs' finance for 19 EU member states [47], we included all EU Member States to increase the validity of the results.

Specifically, we address the following main research question: What factors – firm-, industry-, and macro-level – might affect bank lending to SMEs in the EU? As a result, the practical impact of this research is providing the ground for an evidence-based policy that can help boost bank lending to SMEs.

This paper is structured as follows. After the introduction, we proceed with the literature review, followed by the methodology section. Section 4 contains the findings and discussion. The last section provides concluding remarks and wraps up with the discussion on the policy implications.

Literature review

The academic literature on SMEs' access to finance is extensive and growing. The traditional literature on

financing [34], [16], sets the foundation that the lender-borrower information asymmetry is the source of external financing market imperfections. Classic research considers that credit rationing can take two forms. Stiglitz and Weiss emphasize borrower limitation (type 1), meaning that even if a company has a viable project, it could be restricted from loans [44], while Jaffee and Russell argue on loan size rationing (type 2), pointing out that some firms partially received external finance [29]. It is a widely spread standpoint that SMEs are dependent on bank financing due to limits on broader external financing because of their small size, lack of collateral, information asymmetry, and weaker financial structure. SMEs are more constrained by external financing than large companies [7], and more likely to use internal financing instruments [35]. SMEs rank lack of finance as a major limiting factor in the growth of their firms [6], [18]. The importance of information asymmetry for SMEs' external financing was well proven by Trovato and Alfò. The authors found that SMEs' owners thoroughly understood their company's financial status, investment project potential, and payback risk [46]. They also have more information about their company than the lenders, resulting in information asymmetries. Smaller firms have fewer financial diversification options and are more likely to rely on short-term debt, such as credit lines and bank overdrafts [35], or trade credit and bank loans [2], [15], [38], while market-based finance remains unexploited [11].

According to previous research, SMEs' access to bank loans is influenced by macro-, industry-level, and firm-specific factors. Winker conducted early research on a panel of SMEs in Germany, concluding that macroeconomic conditions and firm age are the most relevant determinants affecting access to finance [48]. SMEs access to bank credits depends on macro factors, such as gross domestic product and inflation [17], [2], [50]. The increased number of banks' branch offices can positively influence bank lending to SMEs [2]. Mc Namara et al. investigated 13,957 SMEs from eleven EU countries and found that SMEs in countries with more efficient judicial systems, efficient bankruptcy systems and greater levels of trust are less likely to be credit rationed [36].

At the industry level, bank concentration and consolidation are the key determinants of SMEs bank loan access [28], [5]. Access to financing is harmed by high banking sector concentration, whereas a higher share of domestic credit offered to the private sector alleviates the perception of financial restriction among SMEs [39]. The size of the banks is also an important bank-specific factor. Literature shows mixed results related to this factor. Certain studies have found that bank size has a significant positive impact [30], whereas others confirm a considerable negative effect on bank lending to SMEs [27], [26], [41]. The structure of bank ownership could be an important industry-level determinant. Micco and Panizza revealed that state-owned banks are more resilient to macroeconomic crises than privately-owned ones [37]. Yudaruddin came to a similar conclusion investigating state-owned Indonesian banks [50]. Several research studies underline the importance of government support schemes for EU SMEs [4], [40]. In line with this, Brault and Signore investigated the economic impact of over 360,000 guaranteed loans under the EU programs between 2002 and 2016. They compared the performance of beneficiaries to that of a control group of similar non-subsidized businesses. They conclude that beneficiaries faced the growth of their overall assets, sales and employment faster than non-beneficiaries, with a lower chance of default [12].

Mainstream literature shows that the firm size, accounting information transparency, age, and ownership type are all firm-specific variables that influence access to external finance [18], [33], [42], [2]. Using the SAFE dataset from 2009 to 2014, Andrieu et al. found that firm age and size positively impact SMEs' access to bank loans [2]. Lawless et al. tested whether the increase in firms' turnover influences the probability of obtaining a bank loan [33], while Bongini et al. analyzed its influence on a firms' decision to raise market-based finance [11]. Erdogan, based on semi-structured interviews with 25 Turkish banks, concluded that, among other things, access to bank credits is influenced by the firm's industry, the length of the bank and firm's relationship, the firm's age and the impression of on-site visits [20]. Because of decreased information asymmetries, industrial enterprises use more bank loan

funding and get long-term debt more easily [32]; [42]. Industrial firms also have a more comprehensive range of financing options [33]. SMEs in the service sector in South-Eastern Europe are more constrained by bank credits, concluded Nizaeva and Coskun (2019) by using data from the Business Environment and Enterprise Survey (BEEPS V) [39]. Another strand of literature documented that certainty regarding the law and legal rights enforcement has a favorable impact on firms' access to external finance [8].

Methodology

Data

The primary data source for this study was micro data set for the EU Member States SMEs from the SAFE anonymous microdata reports for the period 2015-2020. Firm and industry level data were collected from SAFE and further amended with macro-level data from the World Bank, Eurostat, and ECB Statistical data warehouse [45], [49], [23], [24].

Variables

We used SME access to bank loans as our dependent variable. To calculate the dependent variable, we used SAFE question q4d. *Bank loan – Have you taken out a new loan or renewed such a loan in the past six months?* Only the fraction (percentage) of answers stating "yes" was considered as successful in obtaining bank loans.

Following relevant academic literature, we tested the following macro factors' importance – the GDP *per capita*, inflation, the share of non-performing loans in total gross loans in the economy, indicators of bankruptcy repayment in the situation of bankruptcy and bankruptcy resolving time. Sector-specific variables included the number of commercial bank branches available and the Herfindahl-Hirschman index of banking sector concentration. SMEs' specific variables included turnover increase, interest rates for used loans, grants and subsidized loans used and belonging to a particular sector of activity – industry, construction, trade or services.

The descriptive statistics and data sources are presented in Table 1.

Methodology

First, we extracted the data on SMEs from SAFE anonymous microdata. After collecting all relevant explanatory variables, we applied panel data analysis to quantify factors affecting bank lending to SMEs in the EU.

We estimate the random effect model of the following form:

$$Y_{it} = \alpha + \beta_{k,it} X_{k,it} + u_{it} + \varepsilon_{it} \quad (1)$$

where:

- i stands for the entity (country), and t stands for time
- Y_{it} is the dependent variable
- α is the intercept
- $X_{k,it}$ represents the k independent and control variables
- β_k is the coefficient for respective independent and control variables
- u_{it} is between-entity error, the individual impact of *ith* entity
- ε_{it} is a within-entity error

The rationale behind the random effect model is that variations across countries are assumed to be random and uncorrelated with the independent variables in the model. If we assume that differences across countries affect the dependent variable, we can use the random effect model. In this model form, we can include time-invariant variables while they are captured by the intercept in the fixed-effect model.

Results and discussion

After investigating the characteristics of the explanatory and dependent variables and confirming that they are asymptotically normally distributed, that there is no multicollinearity in the data set, nor heteroskedasticity problem, we organized data in the balanced panel form and prolonged with the appropriate panel model specifications.

We implemented Wooldridge test for autocorrelation in panel data that indicated the presence of autocorrelation at 5% significance level ($F(1, 26) = 7.764$, $p > F = 0.0098$). We found no significant cross-sectional independence

(Friedman's test of cross-sectional independence = 4.503, p = 1.0000) that was additionally checked by Pesaran's and Frees' test. Modified Wald test for groupwise heteroskedasticity in fixed effect regression model indicated the presence of heteroskedasticity at a 5% significance level (chi2 (27) = 799.06, p>chi2 = 0.0000). After estimating fixed and random effect specifications, we proceeded with the Hausman test. The results of the test indicated that the proper choice would be random effect specification (chi2(8) = 14.63, p>chi2 = 0.0667).

Table 1: Definition of the variables and descriptive statistics

Variable	Descriptive statistics	Definition	Source	
		%		
bank_loans	Mean	0.214587	q4d. Bank loan – Have you taken out a new loan or renewed such a loan in the past six months? Fraction (percentage) of answers stating "yes"	SAFE anonymous microdata
	Std. Dev.	0.066982		
log_gdp_ca	Mean	4.44029	Log of Gross domestic product *per capita*	EUROSTAT
	Std. Dev.	0.266876		
inflation	Mean	1.002278	Annual inflation rate	EUROSTAT
	Std. Dev.	1.21612		
interest_rate_safe	Mean	3.120675	q8B What interest rate was charged for the credit line or bank overdraft for which you applied? The mean interest rate used.	SAFE anonymous microdata
	Std. Dev.	1.326592		
npl_to_tgl	Mean	6.967803	NPL to total gross loans	EUROSTAT
	Std. Dev.	8.824873		
bankruptcy_repayment	Mean	67.0849	Bankruptcy repayment rate	EUROSTAT
	Std. Dev.	22.2612		
resolving_time	Mean	2.0519	Resolving insolvency time	World Bank
	Std. Dev.	0.9673		
grants_subsidized_loans	Mean	31.31203	q4b. Grants or subsidized bank loans – Have you obtained new financing of this type in the past six months? Fraction (percentage) of answers stating "yes" was included.	SAFE anonymous microdata
	Std. Dev.	12.96642		
cbb	Mean	27.27074	Commercial bank branches per 10 km	World Bank
	Std. Dev.	15.66939		
hhindex	Mean	0.122378	Herfindahl-Hirschman index	European Central Bank – Statistical Data Warehouse
	Std. Dev.	0.065937		
turnover_increase	Mean	0.385916	q2a. Have the following company indicators decreased, remained unchanged, or increased over the past six months? Turnover. Fraction (percentage) of answers stating "increased" was included.	SAFE anonymous microdata
	Std. Dev.	0.116818		
Industry	Mean	0.3046	d3 What is the main activity of your enterprise? Dummy variable – If Industry then 1, otherwise 0.	SAFE anonymous microdata
	Std. Dev.	0.0914		
Construction	Mean	0.1221	d3 What is the main activity of your enterprise? Dummy variable – If Construction, then 1, otherwise 0.	SAFE anonymous microdata
	Std. Dev.	0.0435		
Trade	Mean	0.2207	d3 What is the main activity of your enterprise? Dummy variable – If Trade then 1, otherwise 0.	SAFE anonymous microdata
	Std. Dev.	0.0591		
Services	Mean	0.3526	d3 What is the main activity of your enterprise? Dummy variable – If Services then 1, otherwise 0.	SAFE anonymous microdata
	Std. Dev.	0.0657		

Source: Authors' presentation

Table 2 presents the results of the estimation of several random effect specifications, and in addition, the population-averaged model that takes care of autocorrelation and the maximum-likelihood random-effects model. Table 3 is devoted to the robustness check of the analysis.

Table 2: Estimated models – variables affecting bank loans used by SMEs in the EU

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	PA	**MLE**	**RE**	**RE_rob_1**	**RE_rob_2**	**RE_rob_3**	**RE_rob_4**	**RE_rob_5**
log_gdp_ca	0.0152	0.0122	0.00998	0.00998				
	(0.0403)	(0.0366)	(0.0352)	(0.0424)				
inflation	-0.00556	-0.00280	-0.00280	-0.00280				
	(0.00419)	(0.00297)	(0.00308)	(0.00370)				
npl_to_tgl	0.00000751	0.000372	0.000296	0.000296				
	(0.000690)	(0.000857)	(0.000857)	(0.000681)				
turnover_increase	0.0699	0.0835*	0.0838*	0.0838*	0.0809**	0.0825**	0.0812**	0.0841**
	(0.0386)	(0.0353)	(0.0364)	(0.0363)	(0.0286)	(0.0285)	(0.0308)	(0.0306)
interest_rate_safe	-0.00430	-0.00418	-0.00427	-0.00427	-0.00378	-0.00405	-0.00347	-0.00422
	(0.00223)	(0.00266)	(0.00276)	(0.00222)	(0.00234)	(0.00227)	(0.00235)	(0.00231)
grants_subsidized_loans	0.00147*	0.00125*	0.00129*	0.00129*	0.00142*	0.00135*	0.00132*	0.00136**
	(0.000628)	(0.000532)	(0.000535)	(0.000630)	(0.000609)	(0.000631)	(0.000534)	(0.000515)
cbb	0.00112	0.00104	0.00105	0.00105	0.00125*	0.00116*	0.00109*	0.00112*
	(0.000601)	(0.000554)	(0.000547)	(0.000539)	(0.000569)	(0.000574)	(0.000436)	(0.000489)
hhindex	0.0317	0.126	0.120	0.120	0.129	0.111	0.200*	0.222*
	(0.105)	(0.129)	(0.128)	(0.103)	(0.123)	(0.116)	(0.0892)	(0.0885)
bankruptcy_repayment					0.000434			
					(0.000427)			
resolving_time						-0.00345		
						(0.00939)		
industry							0.309***	
							(0.0718)	
construction							0.103	
							(0.110)	
trade								-0.295**
								(0.0962)
services								-0.247***
								(0.0707)
constant	0.0561	0.0585	0.0681	0.0681	0.0718	0.115**	-0.00793	0.247***
	(0.192)	(0.170)`	(0.164)	(0.199)	(0.0516)	(0.0365)	(0.0464)	(0.0439)
sigma_u								
_cons		0.0483***						
		(0.00743)						
sigma_e								
_cons		0.0359***						
		(0.0022)						
N	162	162	162	162	162	162	162	162
r2								
r2_o			0.196	0.196	0.244	0.207	0.272	0.245
r2_b			0.240	0.240	0.315	0.261	0.298	0.263
r2_w			0.0770	0.0770	0.0580	0.0645	0.202	0.193
sigma_u		0.0483	0.0448	0.0448	0.0394	0.0437	0.0441	0.0437
sigma_e		0.0359	0.0366	0.0366	0.0368	0.0369	0.0339	0.0342
rho		0.644	0.599	0.599	0.534	0.584	0.628	0.621
Standard errors in parentheses								
* p<0.05, ** p<0.01, *** p<0.001								

Source: Authors' calculation

To provide a comprehensive robustness check and address completely the identified specificities in the data sample analyzed, we run additional regressions: OLS regression, fixed-effect model and GLS estimations. Since the Hausman test *p-value* was close to 5%, we also presented the results of the fixed effect model with robust standard errors addressing the heteroskedasticity problem. To address heteroskedasticity and autocorrelation issues identified in the panel data set, we run GLS specifications that take care of these issues. The findings from these models confirmed our previous findings on the effect of analyzed macro, sector and firm specific variables on bank loans used by SMEs in the EU.

According to the findings, SMEs in developed countries with greater per capita GDP are expected to have easier access to bank loans. Although we did not find a statistically significant relationship between GDP per capita and the bank loans used by SMEs the estimated

Table 3: Robustness check – estimated models

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Regress	**FE_rob**	**GLS 1**	**GLS 2**	**GLS 3**	**GLS 4**	**GLS 5**
log_gdp_ca	0.0000992	0.1460	0.0194				
	(0.0417)	(0.1790)	(0.0217)				
inflation	-0.00386	-0.00581	-0.00228				
	(0.00540)	(0.00666)	(0.00247)				
npl_to_tgl	-0.000715	0.00154					
	(0.000917)	(0.000817)					
turnover_increase	0.0443	0.0887	0.0626*	0.0447*	0.0519*	0.0611**	0.0567**
	(0.0414)	(0.0500)	(0.0262)	(0.0206)	(0.0235)	(0.0213)	(0.0217)
interest_rate_safe	-0.00858	-0.00449	-0.00431*	-0.00431**	-0.00382*	-0.00199	-0.00259
	(0.00437)	(0.00265)	(0.00168)	(0.00141)	(0.00165)	(0.00168)	(0.00179)
grants_subsidized_loans	0.00204**	0.000788	0.00175***	0.00169***	0.00168***	0.00184***	0.00196***
	(0.000620)	(0.000805)	(0.000304)	(0.000276)	(0.000288)	(0.000251)	(0.000258)
cbb	0.00102	0.000772	0.00100*	0.00142***	0.00125***	0.000451	0.000527
	(0.000685)	(0.000909)	(0.000419)	(0.000283)	(0.000373)	(0.000234)	(0.000290)
hhindex	0.128	0.290*	0.128**	0.134***	0.136***	0.0479	0.0760
	(0.118)	(0.134)	(0.045)	(0.033)	(0.041)	(0.038)	(0.040)
bankrupt_repayment				0.000544**			
				(0.000180)			
resolving_time					-0.00922*		
					(0.00448)		
industry						0.270***	
						(0.0302)	
construction						0.00955	
						(0.0594)	
trade							-0.207***
							(0.0510)
services							-0.238***
							(0.0482)
constant	0.125	-0.541	0.0293	0.0749**	0.131***	0.0333	0.245***
	(0.194)	(0.812)	(0.104)	(0.0254)	(0.0200)	(0.0214)	(0.0275)
N	162	162	162	162	162	162	162
r2	0.239	0.0965					
r2_o		0.0301					
r2_b		0.0264					
r2_w		0.0965					
sigma_u		0.0672					
sigma_e		0.0366					
rho		0.771					
Standard errors in parentheses							
* p<0.05, ** p<0.01, ***p<0.001							

Source: Authors' calculation

coefficients have a positive sign in all estimated models indicating a positive impact. In this sense, the results are consistent with previous research, such as Micco and Panizza, who found positive effect of the GDP growth on bank lending to SMEs [37], and with Dinç [17], Stepanyan and Guo [43], and Jeon et al. [30], who showed a similar real GDP growth effect. This conclusion is in line with Beck and Demirguc-Kunt [7] and Fowowe [25], who assert that economies with a more developed institutional, legal, and financial system report lower financing obstacles than less developed economies.

As we expected, inflation hurts SMEs' access to bank loans. Banks are reluctant to lend in circumstances of instability. In line with our findings, Carlson and Lackman found that countries with higher inflation have smaller banking and equity markets, where banks generally restrict credit activity, particularly in the private sector [14]. We did not find consistent and significant impact of the NPLs to total gross loans in the broader financial sector on the bank loans SMEs use.

While macro factors create ambient for business operations, of even higher significance are industry and firm level variables that affect SMEs everyday operation more profoundly.

Grants and subsidized loans are effective policy tools for improving SMEs external financing. We found their statistically significant positive effects on bank loans used by SMEs. Research results coincide with those of Polishchuk et al. who came to a similar conclusion analyzing SMEs government support schemes in the Southern EU [40].

The density of banks' offices, measured by the number of bank branches per square kilometer and banking sector market concentration represented by the H-H index, are two statistically significant variables that have positively affected SMEs bank loan access. The greater the number of bank branches, the easier it is for SMEs to apply for loans and use bank services. The more concentrated the banking industry is, the more bank loans appear to be used by SMEs. When only a few highly specialized banks operate in the banking sector, the possibility for economies of scale, lower transaction costs, and more confidence leads to a concentration of lending applications in those banks. Investigating data from 19 European nations, Wang et al. came to a similar conclusion [47].

A higher interest rate makes the borrowing process more expensive, which crowds specific SME borrowers out of the loan market. Our findings are consistent with those of Ayyagari et al. who found high-interest rates as one of the most common limiting factors for SMEs' access to bank loans [3].

In addition, we wanted to test how repayment in the event of bankruptcy affects bank lending to SMEs. According to our findings, this variable has a positive effect on bank loan access. The higher the repaid amount in the case of bankruptcy it improves bank lending to SMEs. The longer resolving time in case of a default, on the other hand, rations bank loans to SMEs.

Among SME-specific determinants, an increase in SMEs' turnover positively affects the borrowing process. It was expected as improvement of business operations leads to higher demand for additional external financial resources required for the company's further expansion, as well as banks' confidence in a borrower. The results corroborate Lawless et al. [33] and Bongini et al. [11], who found that firms that are growing in turnover are more likely to have a broader range of SMEs' financing options.

While investigating firm-level determinants, we also found that operating in the manufacturing and construction sectors had a positive effect on SME bank loan access, whereas being in the trade or service industries had a negative impact on bank financing. Our findings are consistent with Andrieu et al. [2] and Nizaeva and Coskun [39], who found that manufacturing SMEs had much better access to bank loans than SMEs in the service sector.

Conclusion

SMEs are the most important drivers of the economic growth of both developed and developing economies. Despite their importance, they frequently confront various obstacles to obtaining funding. We employed relevant firm-level, industry-level, and macro-level factors to comprehensively analyze the determinants of bank lending to SMEs in the EU. We used multiple panel data models to confirm the importance of the studied

variables' effect on bank loans used by SMEs. Compared to similar studies, this one has a greater scope in terms of the sample used, the methodology exploited, and the data source – SAFE anonymous microdata, as well as geographical coverage. SMEs in wealthy economies with low inflation and efficient legal framework are less credit rationed. Developed bank infrastructure and lower interest rates are important determinants of successful SMEs financing. At the firm level, being in the manufacturing sector and having better business results positively affect SMEs' access to bank lending.

Our results shed new light on certain areas of SMEs funding, laying the groundwork for future comparable studies by using SAFE microdata within the EU. It can, in addition, be recommended to continue similar comparable research studies in other regions and on an international level.

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WHAT DRIVES MOVEMENTS IN THE REER OF THE SEE COUNTRIES? A DECOMPOSITION APPROACH

Šta pokreće promene realnog efektivnog deviznog kursa zemalja jugoistočne Evrope? Pristup dekompozicije

Abstract

The real effective exchange rate (REER) is an important indicator for researchers and policymakers that contains valuable information about a country's competitiveness and economic performance. Despite the numerous literature that deals with the analysis of exchange rates, there are very few analyzes of the main drivers of REER changes, especially when it comes to transition economies. To fill this gap, we analyze the shifting patterns observed in the REER movement in the countries of Southeast Europe (SEE). By using a new approach in the literature that enables the decomposition of REER changes, we aim to explore the underlying driving forces behind REER changes, which is particularly significant in the light of current global instability. The results show large variations across eight countries from the SEE region and through time since the beginning of the 21st century. The entire observed period can be generally characterized as a period of real appreciation of the currencies of most of the analyzed countries, which indicates the deterioration of their international competitiveness in the period from January 2001 to December 2020. Analysis of the drivers of the REER changes, using two approaches, showed that short-run REER changes are dominated by the nominal effective exchange rate (NEER) changes, in most of the analyzed countries. Although the contribution of price changes (domestic and foreign) is lower than the contribution of the NEER changes, it cannot be concluded that the inflation differential contributes little, and by no means negligible, to the REER changes. This result indicates the necessary caution of the SEE countries in the context of current price instabilities.

Keywords: *real effective exchange rate, nominal effective exchange rate, inflation differential, SEE countries, drivers of changes, competitiveness*

Sažetak

Realni efektivni devizni kurs (engl. Real Effective Exchange Rate - REER) je važan indikator za istraživače i kreatore ekonomske politike koji sadrži vredne informacije o konkurentnosti i ekonomskim performansama zemlje. Uprkos brojnoj literaturi koja se bavi analizom deviznih kurseva, vrlo je malo istraživanja glavnih pokretača promena REER-a, posebno kada je reč o zemljama u tranziciji. Da bismo popunili ovu prazninu, u ovom radu analiziramo uočene obrasce promena u kretanju REER-a u zemljama jugoistočne Evrope (engl. Southeast Europe – SEE). Koristeći novi pristup koji je razvijen u literaturi, a koji omogućava dekompoziciju promena REER-a, cilj nam je da istražimo osnovne pokretače promena REER-a, što je posebno značajno u svetlu trenutne globalne nestabilnosti. Rezultati pokazuju da postoje velike razlike kako između osam zemalja SEE regiona, tako i kroz vreme od početka 21. veka. Ceo posmatrani period se generalno može okarakterisati kao period realne apresijacije valuta većine analiziranih zemalja, što ukazuje na pogoršanje njihove međunarodne konkurentnosti u periodu od januara 2001. do decembra 2020. godine. Analiza pokretača promena REER-a, korišćenjem dva pristupa, pokazala je da su kratkoročne promene REER-a dominantno vođene promenama nominalnog efektivnog kursa (engl. Nominal Effective Exchange Rate – NEER), u većini analiziranih zemalja. Iako je doprinos promena cena (domaćih i inostranih) manji od doprinosa promena NEER, ne može se zaključiti da inflacioni diferencijal malo doprinosi, a nikako zanemarljivo, promenama REER. Ovaj rezultat ukazuje na neophodan oprez zemalja jugoistočne Evrope u kontekstu trenutnih cenovnih nestabilnosti.

Ključne reči: *realni efektivni devizni kurs, nominalni efektivni devizni kurs, inflacioni diferencijal, zemlje Jugoistočne Evrope, pokretači promena, konkurentnost*

Introduction

Analysis of exchange rate movements is often in the focus of debates on the international macroeconomic environment. The importance of this topic is actualized in current circumstances characterized by global imbalances, i.e. the spread and persistence of current account imbalances at the international level, as well as increasing instability in markets around the world. Monitoring the movement of exchange rates is also important in the context of the country's competitiveness, which affects the overall economic performance of the economy. Currency depreciation increases a country's competitiveness, while appreciation has the opposite effect. Bearing in mind that insufficient competitiveness leads to an economic slowdown, unemployment, the backwardness of the tradable goods sector, slowing down of long-term growth and unsustainable economic position, while excessive competitiveness, on the other hand, can result in overheating, inflation, underdeveloped non-tradable goods sector and accumulation of reserves, it is very important to monitor the movement of exchange rates in order to analyze the cyclical position of the economy, as well as its competitive position. For these needs, it is most adequate to monitor the movement of the effective exchange rate.

The effective exchange rate (EER) is the most comprehensive indicator of global export competitiveness that provides a clear picture of the value of the currency, and thus the competitiveness of the economy [20, p. 131]. Although the EER can be nominal and real, the preference in the analysis is given to the real effective exchange rate. The real effective exchange rate (REER) measures the development of the price, or cost, level adjusted value of a country's currency against a basket of currencies of the country's most important trading partners. For this reason, it is a frequently used indicator in theoretical and empirical economic research and policy analysis, for a wide variety of purposes. For example, it is used for the determination of the equilibrium value of a currency, the analysis of the changes in a country's competitive position, the drivers of trade flows, reasons for reallocation of production between the tradable and non-tradable sectors, etc. [8, p. 2].

Research related to exchange rates is widely represented in the literature, bearing in mind their important role in the economy. Two groups of these studies can be distinguished. On the one hand, there are many studies that analyze the impact of exchange rates on various macroeconomic variables. On the other hand, there are studies that examine whether and to what extent the exchange rates are affected and determined by a variety of macroeconomic fundamentals. It is about research that seeks to identify the basic determinants of exchange rate movements, that is, the basic drivers of its changes. Despite the extensive literature dealing with these issues, in one of the more recent studies conducted in 2019 by the European Bank for Reconstruction and Development (EBRD), it was emphasized that the analysis of exchange rate changes is a neglected issue in the literature when it comes to countries in transition [23, p. 1]. To fill this gap, we analyze the shifting patterns observed in the REER movements in the countries of Southeast Europe (SEE). Given their openness to trade, high importance of exchange rates for their export growth, and the various exchange rate regimes applied in these countries, this type of analysis provides valuable information for researchers and policymakers and sheds new light on the underlying driving forces behind REER changes, which is particularly significant in the light of current global instability.

Previous research on exchange rates of SEE region countries has mostly examined their relationship with other key macroeconomic factors, that is, their impact on various macroeconomic variables. The trade impact of exchange rates was analyzed by [2] and [26], the relationship between exchange rates and prices was examined by [11] and [21], while the implications of exchange rate volatility on international investments, i.e. foreign capital flows, were analyzed by [14]. Another part of the literature was focused on analyzes related to the exchange rate regimes of SEE countries, in a broader or narrower sense ([3], [9], [19] and [30]). On the other hand, the analysis of the determinants of exchange rates of SEE countries is very modest in the literature ([4] and [24]). Based on the literature review, it can be established that, to the best of our knowledge, a more comprehensive analysis of the REER movements over time in this region, with the aim of determining the

basic short-run drivers of its changes, has not yet been conducted. Our paper seeks to fill this gap in the literature by analyzing the REER behavior in eight SEE countries between 2001 and 2020. According to the classification in [22, p. 188], these eight countries are Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Montenegro, North Macedonia, Romania, and Serbia. In other words, this paper examines the evolution and recent dynamics of the REER of SEE countries, which serves as an indicator of price competitiveness, which determines the relative position of domestic producers in foreign markets in the period before, during, and after the global financial crisis, but also including the period of instability caused by the Covid-19 pandemic.

The research conducted in this paper is additionally motivated by the new approach presented by Darvas in 2021 [8], which enables the decomposition of REER changes into nominal effective exchange rate (NEER) changes and changes in the inflation differential. The application of this approach to analyze short-term drivers of REER changes is a novelty in the literature, while research that applies this approach is just emerging. Thus, the research carried out in this paper provides a contribution to the previous literature not only by analyzing the REER trends of countries in the SEE region, for which this type of analysis has not been carried out to the best of our knowledge, but also by applying a new approach for the decomposition of REER changes, which enables the identification of basic drivers of the REER changes, that provides important information given the current price instabilities.

For a comprehensive and detailed analysis, the movement of the EERs of the aforementioned countries is analyzed based on data collected from several different available databases that contain exchange rates calculated using different approaches. This represents a step forward from the usual approach in the literature. The collected data were analyzed in several different ways, which is a comprehensive approach that, to the best of our knowledge, is not present in the literature so far when it comes to selected SEE countries and represents another contribution of this paper.

The rest of the paper is organized as follows. After theoretical background presented in the second section, the third section of this paper brings the evolution of the effective exchange rates in countries from the SEE region. The analysis of the NEER and REER behavior in the period from 2001 to 2020 in the first subsection of the third part of the paper enables the analysis of changes in the international competitiveness of countries in the SEE region and provides a first insight into the drivers of the REER changes. A more detailed and reliable analysis of the drivers of the REER changes is conducted in the next subsection and implies the decomposition of changes in the REER, that is, analysis of the contribution of inflation and the NEER to changes in the REER. The fourth section brings concluding remarks.

Theoretical background

The effective exchange rate shows the value of the domestic currency in relation to a basket of currencies, from which comes its comprehensiveness in measuring the global competitiveness of the economy. In this sense, when calculating EER, whether nominal or real, it is necessary to make several choices [20, p. 128]. First, it is necessary to select a basket of currencies in relation to whose values the value of the domestic currency is measured. These are the currencies of the most important trading partners of the country. Second, bearing in mind that the effective exchange rate is calculated as a weighted average of bilateral exchange rates, it is necessary to determine the weights and weighting structure. Usually, the relevant weights involve trade weights, which can be import and export. Import weights are calculated as the relative importance of each of the partner countries *j*, in total imports of country *i*, and, therefore, it is very easy to compute it. On the other hand, calculating export weights is not straightforward because various procedures exist including bilateral and double export weighting schemes. The advantages of the approach based on bilateral export weights are its simplicity and transparency. However, bearing in mind that this approach is based only on bilateral exports, it considers only competition between the domestic country and its direct trading partners, ignoring the possible indirect competition on the third markets, which is its disadvantage. On the other hand, the application of an approach based on

the calculation of a double export weight captures third-market effects and contains additional information on the competition faced by the country *i's* exporters. However, the way these weights are calculated tends to restrict the number of countries that can be considered, which together with limitations in the availability of necessary data leads to less flexibility and smaller area and time coverage [7, pp. 9-10]. Considering the presented advantages and disadvantages of both approaches, it is important to mention that there are no significant differences between the weights calculated using the previous two approaches, so they can be considered broadly equivalent [7, p. 10]. In addition to the selection of the basket of currencies and weights, which was previously discussed, it is necessary to make an appropriate selection of the base year, i.e. year to which exchange rate changes are measured. When it comes to the REER, in addition to the above, it is necessary to decide how to adjust NEER, which will be discussed in more detail in the second section of this paper.

Due to the importance of the EER in economic research and policy analysis, several multilateral institutions publish EER indicators. Bearing in mind the above-discussed choices that need to be made when calculating the EER, differences in the data published by different institutions are possible. The International Monetary Fund within the International Financial Statistics (IFS) database [15], the World Bank [29], the Bank for International Settlements (BIS) [1], Bruegel [5], the Institute for International Economic Research (Centre d'Etudes Prospectives et d'Informations Internationales - CEPII) [6], Eurostat [10], OECD [25] are some of the institutions that publish data on exchange rate movements. The databases of the mentioned institutions differ in coverage (both in terms of countries and in time coverage), in the applied weighting system (fixed or time-varying weights; a period for determining weight structures; a number of trading partners in the basket for calculating weights) and the frequency of data publication. Some of these databases contain several different series of the EER data, generated by applying different methodologies, i.e. different weighting systems.

Based on the above and with the aim of a comprehensive and detailed analysis of the exchange rate movements of the SEE countries in this paper, we have collected monthly data on the NEER and REER from several different sources. To the best of our knowledge, the comparison of the SEE countries' exchange rate data from different databases has not been conducted in the literature so far, which represents another contribution of this paper. Based on an exhaustive review of the available databases, the NEER and REER data from the IMF-IFS, CEPII and BIS databases were collected for this research. These are the exchange rates presented in Table 1.

Although different methodologies were applied when calculating EER listed in Table 1, the use of the same base year enables comparison of data. Data available from databases published by other institutions (such as the World Bank, Bruegel, etc.) will not be used in this research

Table 1: Comparison of various EERs available in different databases

Effective exchange rate (EER)	Database	Number of trading partners in the basket	Weighting system (fixed or time-varying weights)	Period for determining weight structures	Base year
IFS_EER	IMF-IFS	31	Time-varying	2004-2006, 2007-2009, 2010-2012, 2013-2015	2010
CEPII_f1_30_EER	CEPII	30	Fixed	2008-2012	2010
CEPII_bar_30_EER	CEPII	30	Fixed	1973-2016	2010
CEPII_TV_30_EER	CEPII	30	Time-varying	1973-1979, 1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004 2005-2009, 2010-2016	2010
CEPII_f1_186_EER	CEPII	186	Fixed	2008-2012	2010
CEPII_bar_186_EER	CEPII	186	Fixed	1973-2016	2010
CEPII_TV_186_EER	CEPII	186	Time-varying	1973-1979, 1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004 2005-2009, 2010-2016	2010
BIS_broad_EER	BIS	60	Fixed	2014-2016	2010

Source: Author based on [1], [6] and [15] databases.

due to the different base year and/or the absence of data for the sample countries.

NEER

Unlike bilateral nominal exchange rates that send conflicting messages about the nominal value of a country's currency, the nominal effective exchange rate is an aggregate measure that provides a clearer picture of currency value developments.

The NEER measures the value of the currency relative to the adjusted average of the currency values of a number of trading partners contained in the currency basket for calculating values, which can be presented as follows [7, p. 209]:

$$NEER_{i,t} = \prod_{j=1}^{N} NER_{ij,t}^{W_{ij,t}} \quad (1)$$

where $NEER_{i,t}$ represents the nominal effective exchange rate of the country *i* in the period *t* calculated as a weighted average of the index of nominal bilateral exchange rates between the currency of the country *i* and each of the N trading partners *j* in the period *t* ($NER_{ij,t}$), and $W_{ij,t}$ is the trade-based weight associated with the partner *j*. It is important to note that in most databases that publish data on exchange rates, the nominal exchange rate is expressed in an indirect notation, i.e. expressed as the number of foreign currency units per domestic currency. Therefore, an increase in the NEER represents the appreciation of domestic currency against foreign currency, while the opposite is for depreciation, which is an important note for interpreting the figures that will be presented later.

As presented in Table 1, the number of trading partners in the basket for calculating the value of the currency, as well as the weighting structure, differ between databases, resulting in different index values. To compare the data collected from different databases, we conducted a correlation analysis. The results are presented in Table 2.

Based on Table 2, we can conclude that, in most cases, there is a strong correlation between the different databases' NEER, i.e. there is a high correlation between the NEER calculated using different methodologies.

Although the analysis of the NEER movement enables monitoring the changes in the value of the domestic currency in relation to the value of the currencies of the main trading partners, which, as previously discussed, is an indicator of the global competitiveness of the economy, it should be borne in mind that the NEER is an indicator based on nominal values. In this sense, the literature often points out that movements of the NEER can be used only for preliminary conclusions about changes in the country's trade competitiveness. A more reliable indicator of competitiveness should also consider the movement of prices and costs, given that their changes can neutralize changes in the NEER. Thus, nominal depreciation that tends to increase the competitiveness of the economy may be matched with a positive inflation differential (in favor of the home country) or a rising cost differential, which reduces the positive effects of nominal depreciation. In this sense, the analysis of the trend of the global competitiveness of the economy should be based on the analysis of the trend of the REER, which we consider in the next section.

Table 2: Correlation matrix (NEER)

	IFS	CEPII_f1_30	CEPII_bar_30	CEPII_TV_30	CEPII_f1_186	CEPII_bar_186	CEPII_TV_186	BIS_60
IFS	1.0000							
CEPII_f1_30	0.8428	1.0000						
CEPII_bar_30	0.7551	0.9886	1.0000					
CEPII_TV_30	0.7547	0.9886	0.9999	1.0000				
CEPII_f1_186	0.8365	0.9863	0.9833	0.9833	1.0000			
CEPII_bar_186	0.7340	0.9717	0.9887	0.9888	0.9812	1.0000		
CEPII_TV_186	0.8938	0.9641	0.9618	0.9618	0.9817	0.9715	1.0000	
BIS_60	0.9972	0.8489	0.7501	0.7505	0.8503	0.7476	0.9128	1.0000

Note: correlations based on 13152 observations.
Source: Author's calculations using data from [1], [6] and [15].

REER

The REER measures the real value of the currency in relation to the weighted average of the value of the currencies of a certain number of trading partners that are in the currency basket for value calculation. As such, this indicator is often used for theoretical and empirical research, as well as when analyzing economic policy measures. In addition to being used to measure the country's competitiveness, this indicator is also used for determining the equilibrium value of the currency, determining the drivers of trade flows, analyzing incentives for the redistribution of production between the tradable and non-tradable sectors, etc.

The REER is obtained by adjusting the NEER by the movement of relative prices or costs of the domestic country and selected foreign countries, i.e. the most important trade partners of the home country. Consequently, in addition to all previously mentioned choices that have to be made when calculating the NEER, for the REER calculation it is necessary to choose the price or cost deflator to obtain the real value of the NEER. The most widely used is the Consumer Price Index (CPI) because of its wide availability and appropriability for the comparison of prices in different countries [12, p. 4]. However, the CPI has some limitations. It includes only consumer goods and services, incorporates prices of both tradable and non-tradable goods, is affected by taxes, subsidies and price controls, does not measure production costs, includes different basket weights across countries, etc. [12, p. 4], [13, p. 28]. One of the criticisms about the CPI is that it does not measure production costs. Hence, it is possible to use the Producer Price Index (PPI) instead of CPI, to deflate the NEER. Also, it is possible to use Unit Labor Costs (ULC) as the price deflator because the real appreciation based on this measure would match an increase in local production costs [23, p. 2]. Nevertheless, PPIs and ULCs also have disadvantages. PPIs and ULCs are generally available for developed economies. So, one of the main problems with these NEER deflators is missing data for many countries. Consequently, data on the REER calculated using PPI and ULC are mostly available just for industrially developed countries. For this reason, we will focus on CPI as a measure of price deflator, as it is common in most studies.

In that case, the REER of country i in period t is calculated as follows [7, p. 2]:

$$REER_{i,t} = \frac{NEER_{i,t} * P_{i,t}}{P_{j,t}} \quad (2)$$

where NEERi,t is the NEER from the equation (1). Pi,t and Pj,t are consumer price indexes of country i and country j, respectively.

Alternatively, the following equation can also be used [12, p.3]:

$$REER_{i,t} = \prod_{j=1}^{N} \left(\frac{P_{i,t} * NER_{ij,t}}{P_{j,t}} \right)^{W_{ij,t}} \quad (3)$$

In addition to the previously explained symbols, $NER_{ij,t}$ is the nominal exchange rate between currencies of country i and country j in period t, and $W_{ij,t}$ is the weight of country j in the country's i's effective rate index.

The method of calculating the REER presented by equations (2) and (3) implies that the exchange rate is expressed as the number of units of foreign currency for a unit of the domestic currency. This means that a drop in the value of the index indicates depreciation and, therefore, an increase in the country's trade competitiveness, and vice versa in the case of growth of index values. This way of notation is also applied in the databases of EER published by the previously mentioned institutions, meaning that the REER movements presented in the third section of this paper should be interpreted in this way.

Data on the REER for eight previously mentioned countries of the SEE region were collected from different sources (see Table 1) and compared using correlation analysis, as previously done for the NEER. The results are presented in Table 3 and suggest that the correlation between the REER calculated using different methodologies is extremely high, higher than in the case of the NEER. This result suggests that the choice of the database used to collect the REER data does not affect the research results, which is an important conclusion of this analysis for future research.

Table 3: Correlation matrix (REER)

	IFS	CEPII_f1_30	CEPII_bar_30	CEPII_TV_30	CEPII_f1_186	CEPII_bar_186	CEPII_TV_186	BIS_60
IFS	1.0000							
CEPII_f1_30	0.9328	1.0000						
CEPII_bar_30	0.9265	0.9848	1.0000					
CEPII_TV_30	0.9253	0.9844	0.9999	1.0000				
CEPII_f1_186	0.9274	0.9813	0.9770	0.9771	1.0000			
CEPII_bar_186	0.9249	0.9566	0.9801	0.9804	0.9754	1.0000		
CEPII_TV_186	0.9395	0.9603	0.9655	0.9660	0.9848	0.9709	1.0000	
BIS_60	0.9969	0.9596	0.9496	0.9494	0.9736	0.9579	0.9880	1.0000

Note: correlations based on 12576 observations.
Source: Author's calculations using data from [1], [6] and [15].

Drivers of the REER changes. In theory, the REER changes are often associated with differences in productivity between countries, based on the Balassa-Samuelson effect, i.e. the distinction between the sector of tradable and non-tradable goods. In addition to this much-studied factor of the REER changes in the literature, there are other factors that drive the REER changes. Some of them are trade openness, capital inflow, government consumption, net foreign assets, terms of trade, etc. These factors may be relevant for determining the REER of a country, but for most of them, the direction of the impact is unclear *a priori* and requires a deeper analysis in each specific case. One of the more recent studies dealing with the impact of the mentioned factors on the REER changes was conducted within the [11]. This study pointed out that the research on the drivers of the REER changes is a topic that has not been sufficiently addressed in the literature so far when it comes to countries in transition. Consequently, we seek to analyze the main drivers of the REER changes in the SEE countries in this paper. In other words, we analyze the contribution of the NEER and inflation to changes in the REER. This type of analysis reveals different roles played by price and the NEER movements in driving the changes of the REER which is very important having in mind current price instabilities.

Starting from relation (2), we can conclude that changes in the REER can be the result of two factors:

1) Change in the nominal effective exchange rate, and
2) Change in the inflation differential,

which allows the decomposition of changes in the REER into these two components. This approach provides valuable conclusions about the drivers of changes in the REER as an indicator of global competitiveness.

The first insight into the drivers of the REER changes can be obtained by graphical analysis, by comparing the movements of the NEER and REER. Bearing in mind that this is not the type of analysis we can rely on, it is necessary to use the appropriate methodology to decompose REER changes. For this type of analysis, we can use the methodology presented in [8, p. 5], which enables the analysis of short-run drivers of the REER change variance. This methodology was adapted to the needs of this research and is presented below.

Starting with the logarithmic transformation of the equating (2) we get:

$$reer_{i,t} = neer_{i,t} + \frac{p_{i,t}}{p_{j,t}} \tag{4}$$

Where $reer_{i,t} = ln(REER_{i,t})$, $neer_{i,t} = ln(NEER_{i,t})$ and $\frac{p_{i,t}}{p_{j,t}} = ln(\frac{p_{i,t}}{p_{j,t}})$, which can further be represented as $ln(P_{i,t})$ – $ln(P_{j,t})$.

Based on equation (4), real depreciation can be a consequence of nominal depreciation, a fall in the level of domestic prices and/or an increase in the level of foreign prices. The opposite is in the case of appreciation.

The variance of the change of the REER can be decomposed in this way:

$$\sigma(\Delta reer_{i,t}) = \sigma(\Delta neer_{i,t}) + \sigma\left(\Delta\frac{p_{i,t}}{p_{j,t}}\right) + 2\sigma\left(\Delta neer_{i,t}, \Delta\frac{p_{i,t}}{p_{j,t}}\right) \tag{5}$$

Where $\sigma(x_t)$ denotes the variance of x_t and $\sigma(x_t,y_t)$ denotes the covariance between x_t i y_t.

The further procedure involves putting the following into relation:

$$\frac{\sigma(\Delta neer_{i,t})}{\sigma(\Delta reer_{i,t})}, \frac{\sigma\left(\Delta \frac{p_{i,t}}{p_{j,t}}\right)}{\sigma(\Delta reer_{i,t})} \text{ and } \frac{2\sigma\left(\Delta neer_{i,t}, \Delta \frac{p_{i,t}}{p_{j,t}}\right)}{\sigma(\Delta reer_{i,t})} \quad (6)$$

which allows gaining a more detailed insight into short-run drivers of the REER changes. This analysis will be implemented in the next section of this paper.

For additional analysis purposes, starting from the logarithmic transformation of the expression (2), which is represented by the expression (4), it is possible to calculate the contribution of the NEER and inflation to the percent change of the REER:

$$\% \text{ change in } reer_{i,t} = \% \text{ point contribution of } neer_{i,t} + \\ + \% \text{ point contribution of } \frac{p_{i,t}}{p_{j,t}} \quad (7)$$

The results of this type of analysis are also presented in the next section of this paper, which provides a more complete insight into the drivers of changes in the REER of the SEE countries.

The evolution of the effective exchange rates in the SEE countries

Given that the REER represents a more comprehensive indicator of the country's international competitiveness because it considers the movement of domestic and foreign prices, by analyzing the movement of the REERs of the SEE countries we can obtain valuable information about which of them have gained and which have lost part of their global competitiveness in the considered period. The movement of the NEER is shown to gain a first look at the drivers of the REER changes. As this type of analysis provides only preliminary conclusions about the drivers of change, a more detailed analysis is provided in the second subsection using two approaches, which were previously discussed in the previous section of this paper.

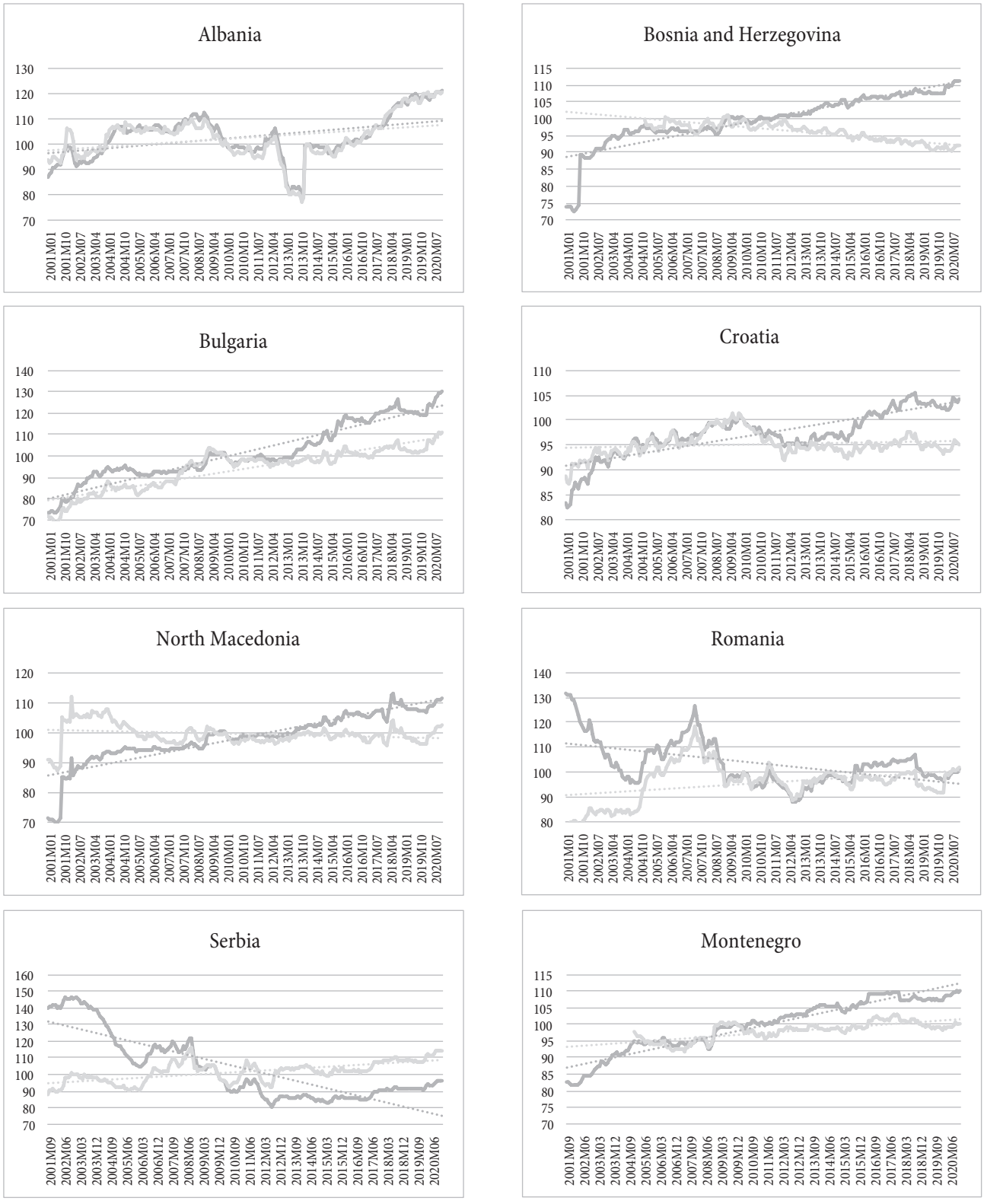
NEER and REER behavior in the SEE countries in the period 2001-2020

Figure 1 presents the NEER and REER movements for each of the eight SEE countries in the period from January 2001 to December 2020, with a few exceptions due to missing data. The movement of the NEER and REER in Figure 1 is presented based on data from one of the previously mentioned databases, to achieve greater transparency. This approach is justified by the results of the correlation analysis previously conducted in this paper, which showed that both in the case of the NEER and in the case of the REER there is a high correlation between exchange rates calculated using different methodologies. For this research, we opted for the CEPII EQCHANGE database given that, compared to the other considered databases, it contains data for all the countries in the sample. By using the data from one database, we achieved greater comparability of results between countries. As CEPII EQCHANGE database contains data on the EER calculated using different approaches, which was discussed in the second section of this paper, for this research we opted for the EER calculated based on a basket containing 30 trade partners of the country, using time-varying weights which are based on non-overlapping five-year average weights (CEPII_TV_30_ EER exchange rate from Table 1). In this way, the EER calculated in relation to the top trading partners of each country was chosen (compared to the EER calculated based on the basket containing 186 trading partners), while the selection of the EER calculated based on time-varying weights has the advantage of giving an accurate picture of both current trade patterns, as well as those for past periods [27]. As noted by [18, p. 57], this ensures that the EER accurately reflects medium to long-term exchange rate movements by considering the varying importance of different trading partners at different points in time. Figure 1 also presents a trend line which, when it comes to data on the movement of the REER, facilitates the analysis of changes in the competitiveness of the considered SEE countries in the observed period, while its comparison with the trend line based on data on the movement of the NEER provides preliminary information on the drivers of changes in the REER.

A glance at the data shows the wide variation in the NEER and REER in terms of the results obtained, both across countries and within each country, across time. Observing the trend line of the REER movement, we conclude that in Bosnia and Herzegovina and North

Macedonia there was a real depreciation of the domestic currency in relation to the value of the currencies of the main trading partners, in the considered period. Thus, in the period from January 2001 to December 2020, the competitive position of these countries improved. On the other hand, in the same period, in Albania, Bulgaria,

Figure 1: NEER and REER movements in the SEE countries in the period January 2001 – December 2020



Note: The darker line represents the movement of NEER, while the lighter line represents the movement of REER. Dotted lines represent trend lines. An increase in the NEER and REER index marks real appreciation, while a fall indicates depreciation.
Source: Author based on data from [1], [6] and [15].

Croatia, Montenegro, Romania and Serbia, there was a trend of real appreciation of the domestic currency in relation to the value of the currencies of the most important trading partners, which indicates the deterioration of the international competitiveness of these countries. The largest real appreciation was in Bulgaria, of 55 percent in the entire sample period, while Bosnia and Herzegovina experienced the largest real depreciation, of 7.6 percent.

An examination of developments through time reveals that in the years that followed the crisis (2008-2020), real appreciation levels were much lower, while in some countries (Croatia and Romania) real appreciation, which characterized the pre-crisis period, was followed by real depreciation in the post-crisis period.

Based on Figure 1, we can conclude that the NEER has a dominant role in determining the value of the REER of the considered countries, which is in line with expectations. However, we cannot conclude with the same certainty that changes in the REER were driven by changes in the NEER. Namely, in the case of several analyzed countries, clear differences can be observed in the trend lines of these two types of exchange rates, which indicates the importance of price differentials in determining the movement of the REER. This confirms that analyzing the trend of global competitiveness based on the trend of the NEER can lead to wrong conclusions considering the impact that differences in inflation have on the trend of trade competitiveness of the economy. Divergent trends in the NEER and REER suggest that, in the case of Bosnia and Herzegovina and North Macedonia, real depreciation of the domestic currency is not a consequence of nominal depreciation. In the same line, in the case of Romania and Serbia, real appreciation is not a consequence of nominal appreciation. This implies the importance of price differentials in driving international competitiveness of these countries. Starting from relation (4) we can conclude that in Bosnia and Herzegovina and North Macedonia real depreciation, i.e. improvement of the competitive position, is a consequence of the decrease in the value of the ratio of domestic and foreign prices. On the other hand, although the NEER trend in Romania and Serbia indicates an improvement in competitiveness, the unfavorable trend in the relationship between domestic and foreign prices leads to a deterioration of their competitive position in the considered period. Although graphical analysis provides some valuable information, the following should be kept in mind. First, in order to make more precise conclusions, it is necessary to conduct a more reliable type of analysis, which is done in the next section, using two approaches that allow analyzing the contribution of changes in NEER and the inflation differential to changes in REER. Second, the movement of exchange rates must be analyzed in the context of the exchange rate regime applied by the country. Based on the Annual report on exchange arrangements and exchange restrictions published by the IMF [16], countries from the SEE region show considerable diversity in exchange rate regimes. Nevertheless, some of them follow similar strategies in their exchange rate policy. Bosnia and Herzegovina and Bulgaria have a fixed exchange rate in the system of strictly managed currency board with the euro as the anchor currency. Montenegro also has a rigid exchange rate regime, which uses the euro as its legal tender. According to [16, pp. 10-12], stabilized arrangements are applied by North Macedonia and Serbia, as well as Croatia before it replaced its currency with the euro on January 1, 2023, while Romania applies a crawl-like arrangement. In other words, these countries apply managed floating exchange rate regime with euro as the exchange rate anchor in the case of Croatia and North Macedonia, or inflation targeting framework in the case of Romania and Serbia. The most liberal exchange rate regime is applied is Albania, given that the Bank of Albania operates under a free-floating exchange rate regime with the inflation targeting framework. These differences in the applied exchange rate regimes will be considered when interpreting the obtained results in the following section.

Contribution of the NEER and inflation to change in the REER of the SEE countries

The analysis will be carried out using two approaches discussed in the second section of this paper.

The first approach involves analyzing the variance of the change in the REER by applying the methodology presented by [8]. With this type of analysis, it is possible to establish whether the variance of the REER change is

driven by the variance of the NEER change or the variance of the inflation differential. By applying the procedure outlined in the second section of this paper, results were obtained for each of the eight countries using monthly data for the period January 2001 – December 2020. They are presented in Table 4.

The results show that in the case of seven out of eight countries (the exception is Bosnia and Herzegovina) the variance of the change in the REER is dominated by the variance of the NEER change. In the case of these seven countries, the variance of the inflation differential change is on average about one-quarter of the real exchange rate change variance. The covariance has a small negative impact on the real exchange rate change variance in the case of most countries.

The second approach involves the decomposition of the impact of inflation and the NEER on the REER by calculating the contribution of the change in the NEER and the change in the inflation differential to percentage change in the REER, expressed in percentage points, which is based on the previously discussed equation (7). The analysis is based on monthly data for the period January 2001 – December 2020. Obtained results are averaged on an annual basis and presented for each country in Figure 2.

At first glance at Figure 2, we can notice wide variation across time within each country and between countries, in terms of the results obtained. In this sense, the calculation of the average percentage point contribution of the NEER and inflation to changes in the REER can provide a basis for concluding. The calculated values are presented in Table 5.

Table 4: Contribution to the variance of the monthly REER change

	Nominal rate change	Inflation differential change	Covariance
Albania	0.818506931	0.200582694	-0.01909
Bosnia and Herzegovina	0.39906014	0.612718717	-0.01178
Bulgaria	0.719494901	0.361692118	-0.08119
Croatia	0.790905619	0.330019149	-0.12092
Montenegro	0.623628383	0.438461342	-0.06209
North Macedonia	0.949819792	0.10564966	-0.05547
Romania	0.956220684	0.231697186	-0.18792
Serbia	0.878398943	0.255191314	-0.13359

Source: Author's calculations using data from [6] database.

Table 5 shows that the greater impact on the REER changes was exerted by the NEER fluctuations compared to differences in inflation rates between these countries and their main foreign trade partners, in most of the analyzed countries. The exception is again Bosnia and Herzegovina, whose REER changes were driven by differences in inflation rates. The presented results fully correspond to the results obtained by the first approach, thus confirming them, and representing the basis for the interpretation below.

The dominant contribution of NEER changes on REER changes in the case of Albania, Bulgaria, Croatia, Montenegro, North Macedonia, Romania and Serbia is in accordance with the point of view of one of the main empirical regularities in recent decades according to which "real exchange rates co-move closely with nominal exchange rates at short and medium horizons" [17, p. 284]. In the theoretical literature, this is commonly interpreted as an indicator of price stickiness and is the basis of models based on sluggish price adjustment, such as the well-known Dornbusch model. The result about the dominant influence of NEER changes on REER changes is comparable to the results obtained by Darvas on a much larger sample that included 177 countries and the euro area [8], as well as to the results of the research conducted by [17] which provide "evidence in favor of co-movements among nominal and real exchange rates not only in developed countries but also in transition economies" [17, pp. 295-296]. The same conclusions were reached by [27] observing the movement of euro REER, whose changes are dominated by movement in euro NEER. However, the results for

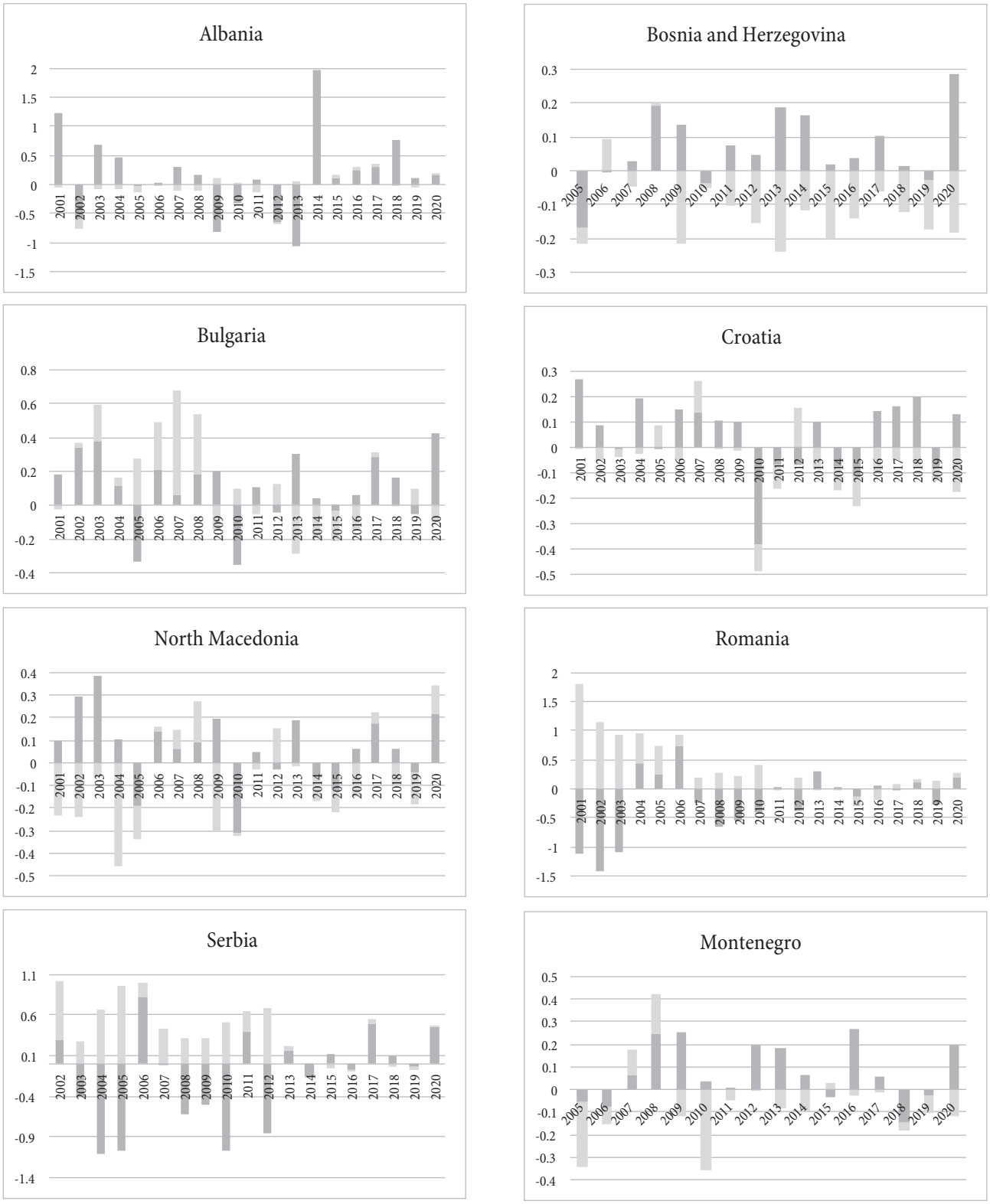
Table 5: Average percentage point contribution of the NEER and inflation to change in the REER

	Average percentage point contribution of the NEER	Average percentage point contribution of the inflation differential
Albania	75.59	24.41
Bosnia and Herzegovina	41.99	58.01
Bulgaria	54.02	45.98
Croatia	59.66	40.34
Montenegro	53.17	46.83
North Macedonia	52.63	47.37
Romania	54.63	45.37
Serbia	64.54	35.46

Source: Author's calculations using data from [6] database.

Bosnia and Herzegovina deviate from the others. When interpreting, differences in applied exchange rate regimes should be taken into account because, as Stavárek and Miglietti state, "many aspects of the effective exchange rate development can be fully or partially explained by the exchange rate arrangements applied in each country" [28, p. 162]. More specifically, according to Stavárek and Miglietti "deviations in the REER in countries with fixed

Figure 2: Percentage point contribution of the NEER and inflation differential to change in the REER, in %



Note: The darker color represents the percentage point contribution of NEER, while the lighter color represents the percentage point contribution of P/P*.
Source: Author based on data from [1], [6] and [15].

arrangements are mainly driven by changes in relative price levels" [28, p. 163], which explains the result obtained in the case of Bosnia and Herzegovina. However, when interpreting the result for Bosnia and Herzegovina, it should be borne in mind that the exchange rate anchor is the euro, while results of the research conducted by [27], demonstrate that most of the variation in the euro REER is accounted for by movements in NEER [27, p. 28]. In this sense, it could be expected that in countries that use the euro as an exchange rate anchor, changes in REER are led by changes in NEER. This is indeed the case when it comes to Bulgaria, which, like Bosnia and Herzegovina, has a currency board regime with the euro as an exchange rate anchor. What makes the difference? By fixing the national currency against another currency an economy can achieve stability against that currency, while relative price movements depend on a range of factors that cannot be controlled even in a country with a fixed regime [28, pp. 163-164]. Additionally, membership in the EU can also have an influence on prices, which provides an explanation of the different results obtained in the case of Bosnia and Herzegovina and Bulgaria. The dominant influence of euro NEER changes on euro REER changes shown by [27], provides an explanation for the result obtained in the case of Montenegro, which uses the euro as its legal tender. The results obtained in the case of Croatia and North Macedonia can be explained in the same way having in mind their exchange rate regime discussed in the first subsection of this paper. The dominant influence of NEER changes on REER changes in the case of Serbia, Romania and Albania can be explained by the inflation targeting strategy they implement, although they have different exchange rate regimes. The impact of NEER changes on REER changes is most pronounced in the case of Albania, which is expected considering that the Bank of Albania operates under a free-floating exchange rate regime.

The analysis conducted in this section yielded more accurate and reliable results about short-run drivers of the REER changes. Compared to the previous interpretation in the first subsection, which was based on a less reliable approach using illustrative analysis of the drivers of the REER changes, according to the results of the analysis carried out in this section, the importance of prices is reduced, except for Bosnia and Herzegovina. However, it should be borne in mind that there are wide variations across time within each country in terms of the results obtained, which indicates the necessary caution of all countries in this region, especially in periods of large price changes.

Conclusion

The research in this paper tries to fill the gap in the previous literature by analyzing the movement of the NEER and REER of the SEE countries, to find out what drives the short-term changes in the REER of these countries, by applying a new approach in the literature which was developed in 2021 [8], and which enables the decomposition of REER changes into NEER changes and inflation differential changes.

Starting from the various available databases on the EER, the research first carried out a correlation analysis of data collected from different sources, which showed that there is a high correlation between EER data published by different international institutions. This result represents an important contribution of this paper for future research because it suggests that the choice of the database used to collect EER data will not affect the research results.

The analysis of the NEER and REER trends in eight countries of the SEE region showed that there are wide variations, both across countries, and within each country across time in terms of the results obtained. Observing the movement of the REER, it was concluded that in the period from January 2001 to December 2020, there was an improvement in the competitive position of Bosnia and Herzegovina and North Macedonia. In other analyzed countries, i.e. in the case of Albania, Bulgaria, Croatia, Romania, Serbia and Montenegro there was a deterioration of the international competitiveness.

Although the current situation in the global market requires caution in all fields to reduce adverse economic consequences on the country's competitiveness, the research conducted in this paper showed which segment countries in the region should pay special attention to prevent large fluctuations in the REER of their currencies, which could undermine the international competitiveness

of their economies in an already unstable environment. Thus, this paper provides useful information considering current uncertainties in markets around the world.

Divergent trends in the NEER and REER behavior in the case of several analyzed countries suggested a dominant role of the price differential in driving the REER changes. However, the decomposition of the influence of inflation and the NEER on the REER, using a more precise and reliable analysis presented in [8], as well as the analysis of the percentage contribution of the NEER and inflation to change in the REER, showed that changes in the REER are predominantly driven by price changes only in Bosnia and Herzegovina.

This result is in a certain sense encouraging in light of current price instabilities because it shows that inflation differential affected the REER to a lower extent than the NEER did, in all analyzed countries except for Bosnia and Herzegovina, which provides important information regarding the potential consequences of current price oscillations on the competitiveness of these countries. However, it should be borne in mind that there are wide variations across time within each country. In addition, although in the case of the remaining seven countries of the sample the contribution of price changes (domestic and foreign) is less than the contribution of the NEER changes, it cannot be concluded that the inflation differential contributes little, and not negligibly, to the REER changes in these countries. More specifically, the analysis showed that the average share of inflation differential in most of these countries is between 40 and 50%. This suggests the necessary caution of the SEE countries, considering that the current large price changes can have a negative impact on their international competitiveness, through the exchange rate. In this regard, the countries of the SEE region should actively think about alternative ways to increase international competitiveness.

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ORGANIZATIONAL CULTURE AS A FACTOR IN THE SUCCESSFUL IMPLEMENTATION OF THE TQM CONCEPT

Organizaciona kultura kao faktor uspešne implementacije TQM koncepta

Abstract

Continuous work on quality improvement in all business domains, based on employee teamwork and process orientation, is one of the key predictors of maintaining and improving the company's existing competitive position. Organizational culture, as a key factor of the company's internal environment, is an important determinant of the implementation of the concept of total quality management (TQM concept), which is directly reflected in the generation of TQM performance improvement. The conducted empirical research includes a sample of 64 manufacturing companies, with a certified quality management system, in the territory of the Republic of Serbia. Their business practice indicated the existence of a strong direct correlation between the dimensions of organizational culture – the principles of the TQM concept – TQM performance, which is an indicator of the significant impact of organizational culture on generating improvements in any domain of implementing the quality management philosophy and reaching the level of business excellence. The contribution of the paper is reflected in the expansion of the knowledge base and a better understanding of the mutual relationship between internal organizational relations and the quality improvement process.

Keywords: *organizational culture, TQM concept, principles, performance, Serbia*

Sažetak

Kontinuiran rad na unapređenju kvaliteta u svim domenima poslovanja, zasnovan na timskom radu zaposlenih i procesnoj orijentaciji, jedan je od ključnih prediktora kako održavanja, tako i unapređenja postojeće konkurentske pozicije preduzeća. Organizaciona kultura, kao ključni faktor internog okruženja preduzeća, važna je determinanta implementacije principa koncepta totalnog upravljanja kvalitetom (TQM koncepta), što se direktno odražava na generisanje unapređenja performansi istog. Sprovedeno empirijsko istraživanje obuhvata uzorak od 64 proizvodnih preduzeća, sa sertifikovanim sistemom menadžmenta kvalitetom, na teritoriji Republike Srbije. Njihova poslovna praksa ukazala je na postojanje jake direktne korelacije na relaciji dimenzije organizacione kulture – principi TQM koncepta – performanse TQM, što je pokazatelj značajnog uticaja organizacione kulture na generisanje unapređenja u bilo kom domenu implementacije filozofije menadžmenta kvalitetom i dostizanja nivoa poslovne izvrsnosti. Doprinos rada se ogleda u širenju baze znanja i boljem razumevanju međusobnog odnosa internih organizacionih relacija i procesa unapređenja kvaliteta.

Ključne reči: *organizaciona kultura, TQM koncept, principi, performanse, Srbija*

Introduction

Generating business excellence is a key goal of the implementation of the total quality management concept (TQM concept) [8], [18], [33], [42], [49]. The principles of the TQM concept are aimed at running a company based on a vision, creating a sustainable future, continuously developing the organization's capabilities, achieving success through the teamwork of talented people, working to maintain long-term partnership relationships with suppliers and customers, encouraging creativity/innovation and effectively adapting to recognized changes [27]. Operating in accordance with the principles of TQM reflects the company's aspiration to generate business excellence, and each of the listed objectives of TQM implementation is an important determinant of key performance [8], [18], [42], [44].

Organizational design dimensions are a predictor of generating improvements in all domains of quality management [2], [6], [14], [23], [24]. Organizational culture, as a contextual dimension of organizational design, is the most important factor of the internal environment, and determines the willingness of a company and its employees to make a maximum commitment to the successful implementation of TQM principles, and thus the generation of quality improvement in all business domains [1], [6], [28], [40]. The subject of the research is the examination of the role and importance of the organizational culture of a company in the implementation of the TQM concept. The goal of the research is to clarify which determinants of organizational culture in Serbian production companies should be corrected and improved in order to generate business excellence by improving quality in all business domains.

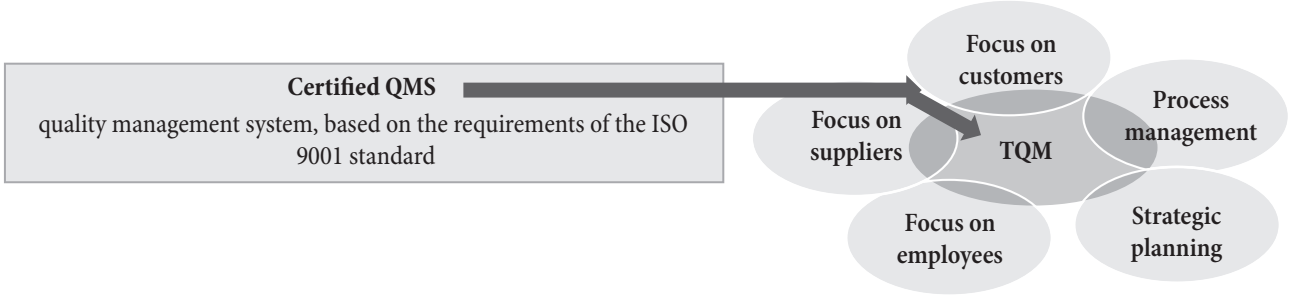
The work is structured in five logically connected units. The first part analyzes the implementation of the principles of the TQM concept aimed at improving the company's competitive advantage, while TQM performance is the focus of the second part of the work. The third part analyzes organizational culture as a key factor of the internal environment of the company, and then the fourth part examines the influence of the dimensions on the implementation of the TQM concept. The fifth part of the paper presents the results of the empirical research and the discussion of its results in the context of the influence of the organizational culture dimensions on the observance of the principles and improvement in TQM performance.

The principles of the TQM concept as a factor of the company's competitive advantage

In modern conditions of competition, the implementation of TQM is the basis of long-term business success [20], [44] and contributes to improving competitive advantage on domestic and global markets [8], [18], [42]. The concept puts in the foreground the orientation towards continuous improvement in the quality in all domains of business, based on teamwork, integration of processes and continuous improvement in business activities [1], [31].

The continuous improvement of business activities is the basis of the TQM philosophy, along with the identification of factors that influence the implementation of the concept, and thus competitiveness: focus on customers, integration of all processes through the establishment of efficient process management, involvement of the entire organization, the process of planning and improvement in the domain of all work and business activities [38], [47].

Figure 1: QMS as a key prerequisite for the successful implementation of TQM concept principles in companies



Source: [6], [17], [35], [39]

The basic principles of the TQM concept implementation (Figure 1) are based on the previously listed factors: process management, focus on suppliers, focus on customers, focus on employees, and strategic planning [6], [17], [35], [39].

Ahire, Waller and Golhar [5] investigated the implementation of the TQM concept by manufacturing companies and concluded that for the generation of business excellence it is not important that all companies, manufacturing and service, formally implement the concept, but that they adhere to the principles on which it is based in business [4], [5]. The implementation of TQM principles improves operational performance, which positively affects financial performance, customer satisfaction, and the satisfaction of all other stakeholders [19], [21], [43]. The positive impact of operations in accordance with TQM principles on the performance of research and development activities of manufacturing companies has also been proven [38]. The level of all indicators of organizational performance is higher in manufacturing companies that operate in accordance with the TQM philosophy compared to those that do not adhere to it [2], [7], [9], [16], [19], [20], [21]. It can be concluded that the implementation of TQM in the operations of manufacturing companies is one of the key prerequisites for improving competitiveness.

The results of the research show that a strong correlation between the establishment of an efficient and effective QMS – the successful implementation of the TQM principles is an important part of the most successful company management system in the current conditions of uncertainty. It is impossible to survive on the market if the company, with certified quality management, does not continuously work to improve quality beyond customer expectations, with a continuous aspiration to improve quality in all domains of business [30]. The international standard ISO 9001 defines the requirements for the quality management system in business organizations. The quality management system, based on the requirements of the ISO 9001 standard, is focused on ensuring efficiency and functionality with the aim of performing production and providing services in accordance with consumer needs and the law [53]. A certified quality management system is a key prerequisite for the successful implementation of the principles of the TQM concept [9], [19]. QMS and ISO 9001 principles significantly intertwine with TQM principles and are aimed at achieving success in the market.

Chinese companies have the status of leaders in the field of ISO 9001 certification at the global level (the period 2020-2021). Italy and Germany are leaders in this domain in Europe [54]. In the period 2007-2011, according to the results of the World Bank research, Serbia had the status of a leader in the region in terms of the number of industrial companies with ISO 9001 certification (Table 1). According to data for 2020, 3,092 companies in the industrial sector with ISO 9001 certification were registered in Serbia [53].

How rigorous the controls are in the field of compliance with the requirements of the ISO 9001 standard is best illustrated by the fact that the largest loss of certificates at the global level was recorded in the period 2017-2018, with the largest losses recorded in the following countries [54]: China (97,305 certificates), Germany (17,176 certificates), Great Britain (11,044 certificates), Japan (10,695 certificates) and Italy (9,852 certificate). In Serbia, the biggest drop in the number of certificates was recorded in the period 2016-2017 (from 921,760 to 746,204 certificates in all sectors of the economy) [55].

Serbian manufacturing companies that have a certified QMS are included in the research. Recertification of QMS is carried out every year and it is a signal of respect for the principles of QMS and TQM. Companies that strive for continuous quality improvement adapt their business to

Table 1: Number of ISO 9001 certificates in the industrial sector in the Balkan countries - period 2007-2011

	ISO 9001				
Albania	23	43	155	52	164
Bosnia and Herzegovina	652	811	909	944	1,119
Croatia	2,073	2,302	2,567	2,102	2,117
Macedonia	255	271	no data	no data	no data
Montenegro	136	160	157	85	146
Serbia	1,987	2,091	2,733	1,790	2,868

Source: [53]

the requirements of the ISO 9001 standard, with the aim of achieving business excellence by applying Deming's PDCA cycle (planning - realization - measurement - improvement) in process management [25]. The Foundation for the Culture of Quality and Excellence (FQCE), a non-profit organization that awards the National Award for Business Excellence, has defined the criteria for achieving the "Oscar of Quality", which are based on the cycle described above. FQCE emphasizes the importance of designing processes in the organization in accordance with the principles of the PDCA cycle, the requirements of management system and the criteria of business excellence, whereby all the listed principles form the basis of the implementation of the TQM concept and business success [55].

Total quality management performance

Doing business in accordance with the principles of QMS and the TQM principles is the main predictor of improvements in the performance of total quality management [5], [10]. TQM performance is a determinant of organizational performance [2], [9], [18], [27], [30] and affects qualitative indicators of business performance: quality, flexibility, cost efficiency, timeliness of quality product delivery, and innovation [1], [10], [46], [47].

The key performance indicators of the success in the TQM concept implementation are [6], [17], [21], [29], [32]:

- *Quality improvement* – by internal and external QMS checks, companies measure progress in the field of process management, quality management systems and operations in accordance with the principles of TQM and achieving business excellence every year. Each of the previously listed verification criteria is a signal of the level of quality improvement in all business domains.
- *Cost reduction* – improvements in the domain of process management and compliance with the procedures defined by QMS, in the performance of work activities (especially production activities) directly affect the reduction in business costs. The norms for all production activities of a company are precisely defined by QMS procedures, and the observance of the given norms and continuous work on improvements in that domain directly affect the reduction in scrap and the shortening of the time for performing work operations, which is a significant determinant of cost savings in manufacturing companies. The TQM implementation also indicates the importance of building long-term relationships with suppliers, which leads to significant savings in acquisition costs of strategic raw materials (more favorable commercial conditions), and thus the reduction in business costs.
- *Flexibility improvement* – the importance of a quick and efficient response to changes, primarily in the external environment, was particularly evident in the conditions of the Covid-19 pandemic and current geopolitical circumstances. It is a big challenge for companies to analyze opportunities from the environment, register and categorize risks, and define how to treat each of them. The methodology of the risk management system is defined by the requirements of the ISO 9001 standard, and companies that have a certified quality management system annually define a risk register, updating it if there are changes in the domain of internal and external environmental factors.
- *Delivery effectiveness* – TQM performance that overlaps with supply chain management performance. This performance indicator is the main signal of the impact of the implementation of the TQM concept on the establishment of efficient and effective supply chain management (SCM), i.e. the impact of compliance with TQM principles on the generation of timely delivery of quality products to customers at acceptable costs. Delivery effectiveness is determined by three indicators - quality improvement, cost reduction, and delivery efficiency, and affects the fifth qualitative indicator - customer satisfaction. This indicator points to the success in making improvements in the domain of supply chain management and customer satisfaction in all aspects of delivery.
- *Customer satisfaction* – it is about the joint performance of the successful implementation of the TQM concept, the establishment of successful supply chain management, and the generation of efficient

and effective customer relationship management (CRM). Customer surveys and detailed analyses of their satisfaction with product quality, price policy, delivery terms, payment methods, complaints handling, and staff cooperation provide a signal on which aspects should be worked on in the coming year. Improvement in customer satisfaction with all determinants of business cooperation depends on improvement in quality, reduction of costs, improvement in flexibility and efficiency of delivery.

Each of the listed performance indicators of the TQM concept implementation reflects the degree of progress in the domain of reaching the level of business excellence. They are predominantly measured by qualitative indicators and are a reflection of the company's overall success in responding to the requirements of the ISO 9001 quality management standard, which is reflected in the principles of TQM and improved competitive position. There is a strong correlation among all qualitative performance indicators of the implementation of the TQM concept, which implies that the improvement in the performance of any indicator directly affects the improvement in other indicators. The analysis of the performance of the TQM concept also proves its strong connection with the performance of SCM and CRM.

Organizational culture as a key factor in the company's internal environment

Organizational culture represents a set of values, norms and attitudes shared by employees in a company, which determines their behavior and decision-making [12], [26]. The analysis of organizational culture examines behavior and decisions in a company, which implies that this contextual dimension of organizational design has the status of a key factor of the internal environment that dominantly determines human resource management [3], [15], [40], [50]. Organizational culture is a source of a company's competitive advantage only if the level of employee homogeneity is very high, i.e. if all employees understand and interpret phenomena inside and outside the company in approximately the same way [12], [26], [34]. Successful companies view organizational culture as a means of influencing the behavior and habits of employees [41]. Organizational culture can also be a brake on the growth and development of a specific company if it discourages changes and prevents business flexibility, and therefore an effective reaction to changes in the market.

Deal and Kennedy consider risk-taking a key dimension of organizational culture [13]. Lopez, Peon and Ordas confirm, emphasizing the role of communication methods in the organization [23]. In some studies, the speed of the organization's response to changes, the control mechanism, the reward system, the progress and development of employees, and the focus on goals were singled out as important dimensions of organizational design [11], [14]. Rad combines the results of all previous research on the key dimensions of organizational culture and defines them as follows [39]:

- *Entrepreneurship* – management's ability to productively combine resources, while taking risks.
- *Risk taking* – solving problems using unconventional methods, with the risk of making mistakes.
- *Stability* – the degree to which employees value stability and job security.
- *Collectivism* – collectivism, as opposed to individualism, promotes teamwork based on joint problem solving and the realization of tasks through the exchange of knowledge.
- *Power distance* – the degree of inequality in the distribution of power within the organization.

Each of the dimensions reflects the key characteristics of organizational culture in a specific company and affects the quality of all domains of business, and thus the efficiency and effectiveness of business.

The influence of the dimensions of organizational culture on the success in the implementation of the TQM concept

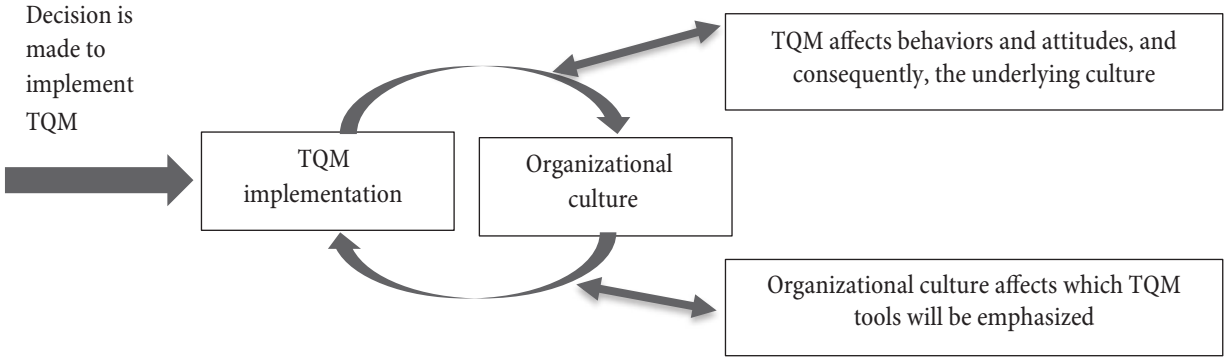
Organizational culture and the implementation of the TQM concept have crystallized as important determinants of competitive advantage through the results of numerous studies [8], [18], [26], [29], [33], [34]. The performance of the successful implementation of the TQM concept

partially coincides with qualitative indicators of business performance, which indicates the influence of organizational culture on their improvement [51].

The analysis of interdependence in the relationship between organizational culture and the TQM concept implementation has been a topic of research for decades. Rad indicated the existence of a statistically significant influence of the dimensions of organizational culture on the performance in the implementation of the TQM concept, with the conclusion that TQM requires a qualitatively oriented organizational culture, based on entrepreneurship, organizational learning, teamwork, a tendency to take risks, open communication, and a desire to continuous improvements in all domains of business [39]. Jancikova and Brychta came to similar conclusions as Rad, highlighting the importance of interdependence in the relationship between organizational culture dimensions and the performance of the TQM concept for generating a company's competitive advantage [17]. The statistically significant influence of organizational culture on the implementation of the TQM concept was also proven on the example of the business practices of Jordanian companies [16], where the authors paid special attention to the influence of norms and values within the company on the successful implementation of the TQM concept. The interdependence of the relationship between organizational culture - knowledge management - implementation of the TQM concept has been proven in research in the public sector of Pakistan [28]. The authors confirmed Pool's conclusions from 2000 [37] that for the successful implementation of the TQM concept, it is important that organizational culture of a company promotes the values of continuous learning. Therefore, the successful implementation of TQM and the achievement of business excellence are based on the support of an adequate organizational culture.

Sousa-Poza et al. [45] indicated the existence of a strong mutual interdependence in the relationship between the implementation of the TQM concept and organizational culture (Figure 2). The successful implementation of the TQM concept directly affects the content of organizational culture, while the content of organizational culture determines the success and functionality of the TQM concept [45]. It is precisely on this interdependence that the generation of performance improvement of the TQM concept is based. Rad presented it in the simplest way with the influence of dimensions of organizational culture on the realization of the principles of the TQM concept [39], while Janickova and Brychta in the research from 2009 indicated the existence of a direct influence of the dimensions of organizational culture on the performance of the TQM concept [17]. Both studies conclude that the dimensions of organizational culture statistically significantly determine the success of the TQM concept, while all improvements in the field of its implementation require certain changes in the content of the dimensions of organizational culture. The conclusions of the research of Sousa-Poza et al. [45], Rad [39] and Janickova and Brychta [17] are the basis for defining the initial research model in this paper because it most fully covers the interdependence in the relationship between the dimensions of organizational culture – principles of the TQM concept – TQM performance concept, which will crystallize what needs to be corrected and improved

Figure 2: The link between TQM and organizational culture



Source: [45]

in the field of organizational culture in order to generate the level of business excellence, based on constant work on improving the determinants of the TQM concept in the company.

Empirical research on the influence of dimensions of organizational culture on the performance in the implementation of the TQM concept

Research methodology

The analysis of the influence of dimensions of organizational culture on the implementation of the TQM concept was carried out on a sample of 64 companies (Table 2) dominated by the technological phase of the business (chemical production, production of metal semi-products, and production of spare parts from the domain of electronics, pneumatics and hydraulics), with a certified QMS, in the territory of the Republic of Serbia. The focus was on companies that are familiar with and implement the requirements of the ISO 9001 management system/ standard in their operations, operate in accordance with the goals of establishing efficient and effective management processes, and strive to reach the level of business excellence through quality improvement in all business domains. In the structure of the sample, 20% are production companies that are members of the FQCE organization and that continuously work on improving business excellence in accordance with the criteria of this organization. The data was collected by surveying employees who belong to top and operational management during the period September-October 2022. Top and operational management is the target research group because this segment of employees is best acquainted with the level of implementation of QMS, process management, TQM, and business excellence criteria. Interviews with employees during the research showed that employees with higher education in the production sector of the economy in Serbia are more familiar with the principles of QMS and TQM, while employees with secondary and lower education are rarely familiar with the same (Figure 3). Employees who perform work tasks on machines in production have the lowest level of knowledge in the domain of QMS and are familiar only with the procedures in performing their work tasks. All employees have an opinion about the dimensions of organizational culture, but due to the lack of knowledge of other variables important for research, the focus was on employees who have knowledge about organizational culture, QMS, TQM, process management and business excellence.

Table 2: Profile of surveyed manufacturing companies (n=64)

Profile of surveyed companies	Number of companies (n)	Percentage (%)
Company size		
Big companies	22	34%
Medium companies	42	66%
Headquarters of the company (statistical region in Serbia)		
Belgrade	23	36%
Eastern Serbia	7	11%
Western Serbia	13	21%
Southern Serbia	6	9%
Central Serbia	6	9%
Vojvodina	9	14%
Length of business		
up to 10 years	14	22%
10-20 years	29	45%
over 20 years	21	33%

Source: Output from SPSS

Figure 3: Knowledge of the principles/requirements of QMS, the requirements of the ISO 9001 standard, the principles/requirements of the TQM concept and the criteria for achieving the level of business excellence by employees in surveyed manufacturing companies in the Republic of Serbia

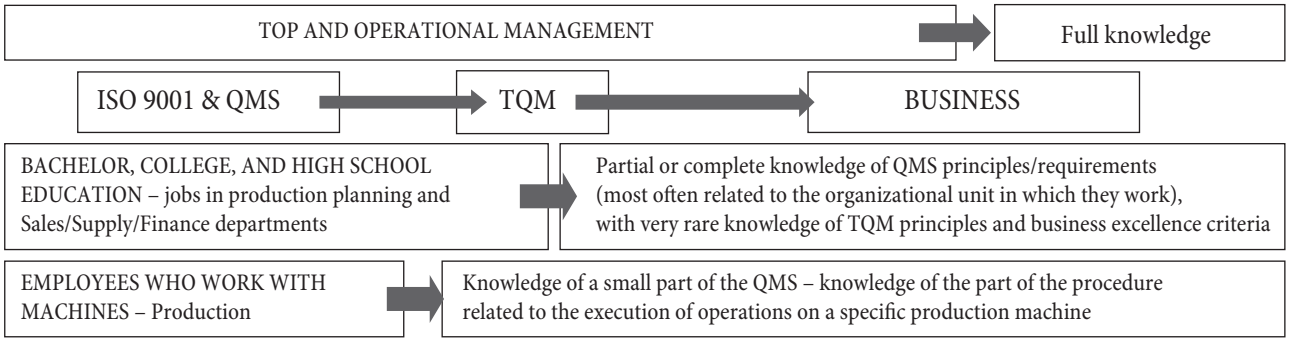
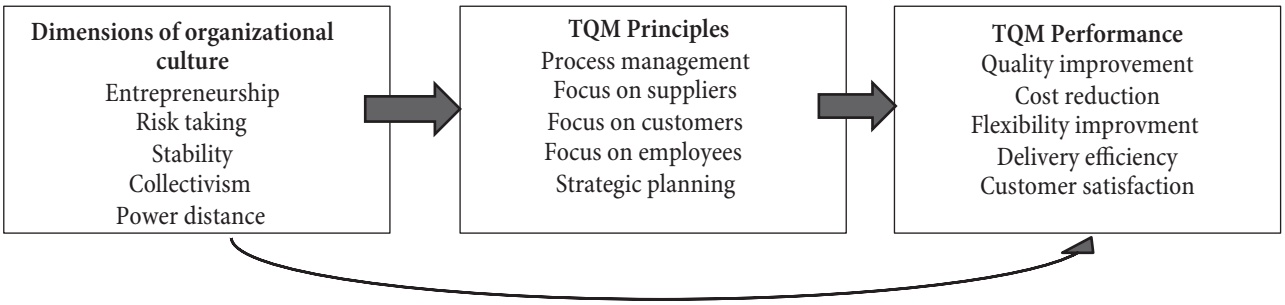


Figure 4: Initial research model



Source: [17], [39], [45]

The simplified initial research model is shown in Figure 4. The dimensions of organizational culture have the status of independent variables, while the principles and performance of the implementation of the TQM concept have the status of dependent variables. The following hypotheses will be tested in the paper:

H_1: Dimensions of organizational culture statistically significantly determine the respect and implementation of TQM principles by manufacturing companies in the Republic of Serbia.

H_2: Respecting the principles of the TQM concept implementation is a key predictor of generating improvements in the domain of TQM performance.

H_3: The dimensions of organizational culture of Serbian manufacturing companies have a statistically significant impact on performance as indicators of the success in the implementation of the TQM concept.

Each of the variables is assessed through five statements using a five-point Likert scale, where a score of 1 means absolute disagreement with the given statement, and a score of 5 absolute agreement. SPSS statistical software and the application of descriptive, correlation and regression analysis were used to process and analyze the collected data. First, a descriptive statistical analysis was conducted on the entire sample with the aim of assessing the homogeneity of the data across companies. In the second step, a correlation analysis was carried out in order to see in detail the correlation and the strength of the connection between all the variables that are the subject of the research. After that, a regression analysis was carried out with the aim of identifying the dimension of organizational culture which dominantly determines the respect for the principles of implementation of the TQM concept and the generation of improvement in its performance, and therefore the fulfillment of the criteria for reaching the level of business excellence of manufacturing companies in the Republic of Serbia.

Statistical analyses

The obtained results of the descriptive statistical analysis are presented in Table 3. For each of the variables, the arithmetic mean and standard deviation were calculated by implementing descriptive statistics. First, the statements related to the independent variable "dimensions of organizational culture" are listed, followed by the statements for the dependent variables "principles of the TQM concept" and "performance of the TQM concept."

Table 3 presents the dominant characteristics of the organizational culture of Serbian manufacturing companies with a certified QMS, as well as the current state of success in the implementation of the TQM concept. When it comes to the organizational culture of the surveyed companies, it can be concluded that entrepreneurship (combining resources in a productive way) and a sense of stability among employees are key dimensions of organizational culture in most companies (arithmetic mean 3.94). Propensity to take risks and collectivism also play a significant role (arithmetic means 3.61 and 3.81), while the least expressed dimension is the existence of a high-power distance within the organization (2.48). The representatives of the surveyed companies expressed their opinion after filling out the questionnaire that they predominantly strive to satisfy demands and needs of employees because they are aware of the importance of

Table 3: Results of descriptive statistical analysis for all variables

Variables	Statements	Mean	Standard deviation
Dimensions of organizational structure	Entrepreneurship	3.94	0.68
	Risk taking	3.61	0.74
	Stability	3.94	0.76
	Collectivism	3.81	0.75
	Power distance	2.48	1.18
TQM Principles	Process management	3.91	0.71
	Focus on suppliers	3.92	0.72
	Focus on employees	4.04	0.70
	Focus on customers	3.89	0.69
	Strategic planning	3.54	0.84
TQM performance	Quality improvement	3.92	0.69
	Cost reduction	3.55	0.77
	Improving flexibility	3.54	0.86
	Delivery efficiency	3.85	0.68
	Customer satisfaction	3.87	0.67

Source: Output from SPSS

employee satisfaction for generating their motivation to contribute to the successful implementation of the TQM concept and improvement in business performance. The results of the survey showed this – the focus on employees, as a principle of the TQM concept, was rated with the highest average score of 4.04. The part of the questionnaire that refers to the principles of TQM implementation signals that the surveyed companies pay significant attention to process management, supplier relationship management and customer relationship management. Ratings in the domain of current performance of the TQM concept, as well as the principles of its implementation (range of ratings 3.54-3.92), are a signal that there is significant room for improvement, which is one of the key challenges for the top and operational management of the surveyed companies in the coming period. The standard deviation values, for all statements, are in the range 0.67-1.18, which indicates a similar degree of disagreement (heterogeneity) of the respondents in the evaluations of all fifteen statements.

For each of the findings that determine independent and dependent variables, a reliability analysis was performed using the Cronbach's alpha coefficient, and values over 0.90 are a signal of a high degree of reliability. After descriptive statistics and analysis of the reliability of the findings, a correlational statistical analysis was conducted with the aim of identifying the relationship that exists between them. The relationship between the variables themselves, but also between the determinants of the variables, was considered. All statistically significant correlations are shown in tables 4, 5 and 6 with the mark ** (** indicates $p \leq 0.1$). Table 4 indicates the existence of a statistically significant and strong correlation between dimensions of organizational culture, TQM principles and TQM performance. There is a statistically significant correlation among all dimensions of organizational culture (Table 5), among all TQM principles (Table 5) and among all performance indicators of TQM concept implementation (Table 6). Stability and collectivism are dimensions of organizational culture that have the strongest positive statistical relationship with the implementation principles of the TQM concept and the realized level of performance (r is in the range 0.754-0.862). The existence of a high-power distance is the only dimension of organizational culture with a statistically significant and strong negative correlation with all the principles and performance of the TQM concept, but also a negative connection with other dimensions of organizational culture. The results of the correlational statistical analysis, when looking at the determinants of organizational culture and TQM principles, showed the existence of the strongest relationships in the following relations: entrepreneurship - management processes (r = 0.924), collectivism-focus on customers (r = 0.828) and stability-focus on suppliers (r = 0.814). Power distance correlates most negatively with the principles focus on employees (r = 0.755), focus on customers (r = 0.744), and focus on suppliers (r = 0.733).

The analysis of the links between the dimensions of organizational culture and the performance in the implementation of the TQM concept showed the existence of statistically the strongest positive correlations on the following relations: collectivism – delivery efficiency (r = 0.860), stability – delivery efficiency (r = 0.852), collectivism – customer satisfaction (r = 0.842), and stability – customer satisfaction (r = 0.830). Stability and collectivism correlate most positively with quality improvement and cost reduction as TQM performance. Power distance has the most statistically significant negative correlation with delivery efficiency and customer satisfaction. Tables 5 and 6 crystallized stability and collectivism as dimensions of organizational culture with the highest statistically significant and positive relationship with all principles of TQM concept implementation and TQM performance indicators. These dimensions of organizational culture are actually the basis for stimulating the motivation of employees to contribute maximally to respecting the principles of the TQM concept, which is dominantly manifested through the improvement in quality in all domains of business, cost reduction, delivery efficiency and customer satisfaction, and thus the generation of business excellence in these criteria.

After the correlation analysis, two regression analyzes were conducted with the aim of identifying the dimension of organizational culture with the greatest impact on the respect for the implementation principles of the TQM

Table 4: Correlation statistical analysis results - relationship between variables

	Organizational culture's dimensions	TQM Principles	TQM Performance
Organizational culture's dimensions	1	0.852**	0.846**
TQM Principles	0.852**	1	0.968**
TQM Performance	0.846**	0.968**	1

Source: Output from SPSS

Table 5: Results of correlational statistical analysis - the relationship between the dimensions of organizational culture and the principles of TQM

	1	2	3	4	5	6	7	8	9	10	
1	Entrepreneurship	1	.779**	.717**	.711**	-.739**	.924**	.792**	.714**	.744**	.742**
2	Risk taking	.779**	1	.632**	.546**	-.649**	.761**	.653**	.614**	.580**	.739**
3	Stability	.717**	.632**	1	.867**	-.768**	.794**	.814**	.782**	.811**	.754**
4	Collectivism	.711**	.546**	.867**	1	-.684**	.745**	.805**	.800**	.828**	.696**
5	Power distance	-.739**	-.649**	-.768**	-.684**	1	-.715**	-.733**	-.755**	-.744**	-.667**
6	Process management	.924**	.761**	.794**	.745**	-.715**	1	.798**	.655**	.750**	.752**
7	Focus on suppliers	.792**	.653**	.814**	.805**	-.733**	.798**	1	.752**	.965**	.719**
8	Focus on employees	.714**	.614**	.782**	.800**	-.755**	.655**	.752**	1	.789**	.672**
9	Focus on customers	.744**	.580**	.811**	.828**	-.744**	.750**	.965**	.789**	1	.657**
10	Strategic planning	.742**	.739**	.754**	.696**	-.667**	.752**	.719**	.672**	.657**	1

Source: Output from SPSS

Table 6: The results of correlational statistical analysis - the relationship between the dimensions of organizational culture and the performance of the TQM concept

	1	2	3	4	5	11	12	13	14	15	
1	Entrepreneurship	1	.779**	.717**	.711**	-.739**	.822**	.777**	.755**	.747**	,761**
2	Risk taking	.779**	1	.632**	.546**	-.649**	.678**	.688**	.779**	.594**	,618**
3	Stability	.717**	.632**	1	.867**	-.768**	.809**	.794**	.763**	.852**	,830**
4	Collectivism	.711**	.546**	.867**	1	-.684**	.800**	.831**	.649**	.860**	,842**
5	Power distance	-.739**	-.649**	-.768**	-.684**	1	-.715**	-.697**	-.724**	-.776**	-,775**
11	Quality improvement	.822**	.678**	.809**	.800**	-.715**	1	.783**	.664**	.927**	,944**
12	Cost reduction	.777**	.688**	.794**	.831**	-.697**	.783**	1	.708**	.805**	,797**
13	Improving flexibility	.755**	.779**	.763**	.649**	-.724**	.664**	.708**	1	.617**	,609**
14	Delivery efficiency	.747**	.594**	.852**	.860**	-.776**	.927**	.805**	.617**	1	,980**
15	Customer satisfaction	.761**	.618**	.830**	.842**	-.775**	.944**	.797**	.609**	.980**	1

Source: Output from SPSS

concept and its achieved performance. Table 7 presents the regression coefficients for the analysis in which TQM principles have the status of a dependent variable. The model defined in this way explains 92.3% of the variance of the dependent variable ($R^2 = 0.923$; $p<0.01$).

Entrepreneurship, collectivism and stability are the dimensions of organizational culture with the greatest influence on the observance of TQM principles in the surveyed manufacturing companies. Observing the results of correlation and regression analysis in parallel, it can be concluded that the management's ability to manage resources in a productive way (entrepreneurship) dominantly determines strategic planning in all business domains and the establishment of efficient and effective management of all processes within the company. Strategic planning is an important segment of process management, as evidenced by the highest correlation between these two TQM principles, and the way a specific company manages processes determines its policy towards employees and the technique of developing relations with customers and suppliers. Collectivism and stability, by looking at the correlation and regression analysis in parallel, crystallized as key determinants of respect for other TQM principles: focus on suppliers, focus on employees and focus on customers. The focus on employees actually reflects the degree of collectivism and stability, and this interdependence is a key source of generating employees' motivation to contribute to the development of long-term partnership relations with customers and suppliers, but also to the realization of management process goals. A summary conclusion can be drawn that there is a strong connection and influence in the following relation: entrepreneurship - strategic planning - process management - tactics towards stakeholders - focus on employees - degree of motivation of employees - contribution of employees to the development of long-term partnership relations with suppliers and customers - contribution of employees to the realization of goals management processes.

The regression analysis was repeated for the performance in the implementation of the TQM concept as a dependent variable (Table 8). The influence of each of the organizational culture dimensions on TQM performance was examined. This model is statistically significant and explains 92.2% of the variance of the dependent variable ($R^2 = 0.922$; $p<0.01$).

The dimensions of organizational culture that dominantly determine the observance of TQM principles actually have the greatest influence on the level of performance in the implementation of this concept. The influence of entrepreneurship on strategic planning and process management is reflected in the improvement in quality in all domains of business (which actually confirms the firm connection of process management with the quality management system), reduction in business costs and flexibility (quick and efficient reaction to changes in the environment is a feature of risk management that

Table 7: Table of regression coefficients (TQM principles as dependent variable)

	Unstandardized coefficients		Standardized coefficients	t	Sig.	VIF
	B	Std. Error	Beta			
Entrepreneurship	.317	.076	.331	4.157	.000	3.944
Risk taking	.103	.059	.116	1.746	.087	2.753
Stability	.226	.081	.263	2.797	.007	5.511
Collectivism	.232	.074	.267	3.131	.003	4.518
Power distance	-.057	.039	-.102	-1.466	.149	3.003

Source: Output from SPSS

Table 8: Table of regression coefficients (TQM performance as a dependent variable)

	Unstandardized coefficients		Standardized coefficients	t	Sig.	VIF
	B	Std. Error	Beta			
Entrepreneurship	.228	.078	.235	2.931	.005	3.944
Risk taking	.131	.060	.145	2.168	.035	2.753
Stability	.228	.083	.261	2.757	.008	5.511
Collectivism	.274	.076	.310	3.619	.001	4.518
Power distance	-.076	.040	-.134	-1.922	.061	3.003

Source: Output from SPSS

tightly overlaps with process management and QMS). Stability and collectivism determine the motivation of employees to contribute to the successful realization of management goals, processes and the building of long-term partner relationships with suppliers and customers, which spills over into the performance level of the TQM concept, and thus the realization of the goals of supply chain management, management of relations with suppliers, and management of relations with to customers – timely delivery of a quality product at acceptable costs to satisfied customers.

Discussion of the obtained results

Summarizing the conclusions of the previously conducted analyses, conclusions are drawn about the initial hypotheses:

- Dimensions of organizational culture statistically significantly determine the respect and implementation of TQM principles by manufacturing companies in Serbia - *confirmed hypothesis H1.* The results of the correlational statistical analysis indicated the existence of a statistically significant correlation between all dimensions of organizational culture and all principles of successful implementation of the TQM concept. Entrepreneurship, risk taking, stability, and collectivism statistically significantly positively correlate with each of the TQM principles: process management, supplier focus, employee focus, customer focus, and strategic planning. Expressed unevenness in the distribution of power within the company is the only dimension of organizational culture that has an inverse (negative) interdependence with each of the TQM principles, but also with each of the other dimensions of organizational culture. Correlation analysis showed that there is the largest negative correlation – the negative relationship between high power distance and entrepreneurship, a sense of stability among employees and respect for the principle of focus on employees, which is a signal of the negative effect of uneven distribution of power on the generation of employees' motivation to make a maximum commitment to respect TQM principles. Entrepreneurship, collectivism and a sense of stability are the dimensions of organizational culture with the greatest impact on generating respect for TQM principles, which is a signal of the importance of the workforce as a resource for the success of the company's operations.
- Respecting the principles of implementation of the TQM concept is a key predictor of generating improvements in the domain of TQM performance - *confirmed hypothesis* H_2. The results of the correlation analysis crystallized the existence of a statistically significant and very strong correlation between the respect for the implementation principles of the TQM concept and the level of its performance (r = 0.968). Establishing efficient and effective process management and strategic planning within the same, focus on employees, efforts to build long-term partnership relations with suppliers and customers directly lead to improvement in flexibility, cost reduction, delivery efficiency, customer satisfaction and generation of quality improvement in all domains of business. It is precisely in this interdependence that the existence of a solid positive interdependence between the implementation of the TQM concept and many domains of management is depicted: risk management, process management, supplier relationship management, customer relationship management, and supply chain management. It is the improvements in all previously listed management domains that are the key to generating business excellence of the surveyed manufacturing companies.
- The dimensions of the organizational culture of Serbian manufacturing companies have a statistically significant impact on performance as indicators of the success in the implementation of the TQM concept – *confirmed hypothesis* H_3. All dimensions of organizational culture are statistically significantly related to TQM performance indicators, with power distance being the only one with a negative impact. In fact, the influence of dimensions of organizational culture on the observance of TQM principles is reflected on the level of TQM performance, which further confirms hypothesis H2. Entrepreneurship, stability and collectivism are the dimensions of

organizational culture that most determine TQM performance indicators, which actually reflects the importance of employees and generating their motivation for improvements in any aspect of the TQM concept implementation.

It can be concluded that using resources in a productive way (entrepreneurship), a sense of competence among employees and collectivism are an important factor in respecting all TQM principles, which translates into quality improvement in all business domains, flexibility, cost reduction and building long-term partner relationships with suppliers and customers (delivery efficiency and customer satisfaction). Correlation and regression analysis proved a strong connection in the following relationship: entrepreneurship - strategic planning - management processes - tactics towards stakeholders - focus on employees - degree of motivation of employees - contribution of employees to the development of long-term partnership relations with suppliers and customers - contribution of employees to the realization of management goals, processes, management supplier relations, customer relationship management and supply chain management. Proven interdependence is a signal of the importance of improving entrepreneurship and collectivism/sense of stability among employees for generating their motivation for maximum contribution to generating quality improvement in all business domains because employees are the most valuable resource of any company. The existence of a significant unevenness in the distribution of power within a company is the main brake on progress in the field of implementing the TQM concept because it significantly negatively determines the collectivism and sense of stability of employees, and therefore their motivation and productivity. This confirms the research conclusions that were used to define the initial research model of Sousa-Poza et al. [45], Rad [39] and Janickova and Brychta [17]. The previously listed research studies partially analyzed the interdependence of the relationship between organizational culture - TQM principles and organizational culture - TQM performance, and this research summarized previously used research models, which fully crystallized the relationship between the dimensions of organizational culture - implementation of TQM principles - the level of realized TQM performance - reaching the level of business excellence. In addition to the strong connection between the dimension of organizational culture - TQM principles - TQM performance, the business practice of Serbian manufacturing companies has proven a strong connection between the following areas of management: risk management - process management - QMS - TQM - supply chain management (which combines SCM and CRM). It can be concluded that the organizational culture of a company significantly determines all variables of the previously described interdependence, which confirms the results of earlier research that organizational culture, as a key factor of the internal environment, is an important determinant of the company's competitive advantage (confirmed research results of sources [8], [19], [42], [44], [49]).

The collection of data for the implementation of previously explained statistical analyzes indicated the problem of ignorance of the determinants of QMS and TQM by a large number of employees in Serbian manufacturing companies. It is very important to conduct training and development in this domain at all levels of organizational structure because knowledge of the principles and criteria of these concepts is necessary so that employees are aware of their importance, and therefore of their own contribution to their successful implementation. Without knowledge of the principles and requirements of the QMS and TQM concepts on the part of the company's employees, it is not possible to generate long-term sustainable improvements in these domains, which significantly determines the long-term competitive positioning of any of the surveyed manufacturing companies in the Republic of Serbia.

Theoretical/practical implications, limitations and further research directions

The scientific contribution of the research is reflected in the detailed elucidation of interdependence in relation to the dimension of organizational culture - respect for the principles of the TQM concept - the level of realized TQM performance, with special reference to drawing conclusions about the importance of organizational culture, as the most important factor of internal environment, for generating improvement in all domains of management.

tightly linked to the successful implementation of the TQM concept: risk management, process management, supplier relationship management, customer relationship management, and supply chain management. The practical contribution of the research is reflected in giving guidelines to the management of the surveyed Serbian production companies, which dimensions of organizational culture should be focused on if they strive to improve quality in all business domains, i.e. generating efficiency and effectiveness in all previously listed management domains, which will directly affect reaching the highest level of TQM performance. The main limitation of the study is in the structure of the sample, i.e. research based on the views of top and operational management. The research signaled the existence of significant ignorance of the principles and requirements of IS0 9001, QMS and TQM by employees, which is a signal of the need for additional training and improvement in this domain because without the necessary knowledge of employees, despite improvements in the domain of organizational culture, it is impossible to generate any long-term advancement in any field of management.

Monitoring the evolution of dimensions of organizational culture, along with the analysis of how this evolution is reflected in the generation of improvements in the level of TQM performance, would significantly improve research in the field of interdependence of organizational culture and the implementation of the TQM concept. Future research should move in the direction of considering the importance of acquiring new and improving the existing knowledge of employees in the domain of QMS and TQM for generating efficiency and effectiveness in all domains of management, which will be reflected in the successful implementation of the principles of the TQM concept and the generation of levels business excellence. Research in the aforementioned directions, with a stronger connection of qualitative and quantitative research on this topic, would fully round off the analysis of interdependence in the relationship between organizational culture and the successful implementation of the TQM concept, which would clearly crystallize the key internal organizational predictors of generating the level of business excellence of the company.

Conclusion

Organizational culture, as the most important factor of the internal environment, is an important determinant of generating efficiency and effectiveness in all domains of management, which is directly maintained on the success of the implementation of the quality management system and the principles of the concept of total quality management. Entrepreneurship, collectivism and a sense of stability among employees, along with a more even distribution of power within the company, are the most important predictors of successful implementation of the TQM concept, which is directly reflected in the level of its performance: improvement in quality, improvement in flexibility, reduction of costs, delivery efficiency and customer satisfaction. The analysis of respect for the principles of implementation and the level of performance of TQM in Serbian production companies indicated the existence of significant room for improvement, especially in the area of knowledge of the principles and requirements of QMS and TQM by employees. It is not possible, despite improvements in the domain of organizational culture, to generate long-term sustainable improvements in all domains of management without adequate training and improvement of employees in the field of ISO 9001, QMS and TQM, which significantly determines the long-term competitive positioning of any of the surveyed manufacturing companies in the Republic of Serbia.

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ANALYSIS OF MEGATRENDS FOR THE PURPOSE OF STRATEGIC FORECASTING OF COMPANIES IN SERBIA

Analiza megatrendova u cilju strategijskog predviđanja preduzeća u Srbiji

Abstract

Megatrends represent a group of trends or phenomena of social, economic, and technological nature that develop gradually, ultimately making their elimination impossible. At a global level, companies are confronted with increasingly shorter business longevity, largely caused by the impact of megatrends. Considering that the influence of megatrends is omnipresent, and that their effects cannot be completely eliminated, the only option remaining is for management to provide an adequate response to their emergence, which simultaneously requires awareness of current and future megatrend developments. A specific focus of this study is examining the prevalence of strategic foresight and analysis of megatrends within a sample of companies with the highest revenues according to the Serbian Business Registers Agency (SBRA). The research was conducted through questionnaires. Furthermore, the subject of analysis is determining the extent to which companies in Serbia are exposed to megatrends based on relevant indicators. By weighing the defined indicators, final indicators for key megatrends have been established, through which the strength of megatrend impact in Serbia has been interpreted. If there is a desire for long-term sustainable business operations, there is a need to also be aware of future opportunities and potential threats posed by megatrends. The goal of conducting research in this domain is to raise awareness about the challenges that companies will face in the foreseeable future and thereby gain insights into the areas of business where adaptations are necessary.

Keywords: *strategic foresight, megatrend analysis method, impact of megatrends in Serbia*

Sažetak

Megatrendovi predstavljaju grupu trendova ili fenomena društvene, ekonomske i tehnološke prirode koji se obrazuju postepeno, da bi u krajnjoj instanci njihov nastanak bilo nemoguće eliminisati. Preduzeća su na globalnom nivou suočena sa sve kraćom postojanošću biznisa, što je upravo u velikoj meri prouzrokovano dejstvom megatrendova. Uzimajući u obzir da je uticaj megatrendova sveprisutan i da je njihovo dejstvo nemoguće u potpunosti eliminisati, preostaje jedino da menadžment pruži adekvatan odgovor na njihovu pojavu, što istovremeno podrazumeva informisanost o trenutnom i budućem razvoju megatrendova. Poseban fokus u ovom radu je ispitivanje zastupljenosti strategijskog predviđanja i analize megatrendova na uzorku preduzeća sa najvećim prihodima prema APR-u u Srbiji. Istraživanje je vršeno putem upitnika. Pored toga, predmet analize je i utvrđivanje koliko su preduzeća izložena megatrendovima na teritoriji Srbije na bazi odgovarajućih pokazatelja. Ponderisanjem definisanih pokazatelja utvrđeni su konačni indikatori za ključne megatrendove putem kojih je protumačena jačina uticaja megatrendova u Srbiji. Ukoliko postoji težnja za dugoročno održivim poslovanjem, onda se nameće i potreba upoznavanja sa budućim prilikama i potencijalnim pretnjama prouzrokovanim od strane megatrendova. Cilj vršenja istraživanja u ovom domenu je razvijanje svesti o izazovima sa kojima će se preduzeća suočiti u doglednoj budućnosti i time sticanje uvida u to na kojim područjima u poslovanju preduzeća su neophodna prilagođavanja.

Ključne reči: *strategijsko predviđanje, metoda analize megatrendova, uticaj megatrendova u Srbiji*

Introduction

Companies today operate in a turbulent and complex environment where it is difficult to predict the impact and probability of various types of risks. The field of strategic forecasting is tasked with helping managers navigate their companies in such complex business conditions. More precisely, strategic forecasting can be defined as a field of business economics that deals with the study and practical application of methods, theories, and techniques for the long-term analysis of a company's environment to predict strategic changes [6]. According to Capon and Hulbert [3], strategic forecasting should meet certain conditions, namely:

- Be oriented towards strategic, long-term thinking and understanding of future changes;
- Be oriented towards "what-if" analysis that allows for scenario variability;
- Incorporate both qualitative and quantitative tools;
- Enable employees throughout the company to receive information and participate in the process of analyzing future changes to support innovative company actions.

There is a strong link between strategic forecasting and the analysis of megatrends, as it is one of the methods through which this activity can be performed. According to Slaughter [22, pp. 5-8], there are four methods of strategic forecasting: input methods, analytical methods, paradigmatic methods, and finally, research-iterative methods. The analysis of megatrends falls into the second group that can be applied for strategic forecasting according to this classification. The motivation for the topic in the field of strategic forecasting and megatrend analysis was the fact that there is very little available literature in Serbia regarding future trends and the overall state based on the impact of current megatrends. Therefore, since every company aims to initially establish a position in the market when starting a business, and later attempts to reach a leadership position, it is necessary to observe long-term environmental changes. Consequently, a requirement is imposed on the company to monitor the development of global megatrends. However, in order to determine the impact of a megatrend on a company, it is necessary to consider its influence in the context of the market in which the company operates. At the same time, I wanted to conduct research that would answer the following questions:

- What is the state of the impact of megatrends in Serbia on business operations?
- How widespread are the strategic forecasting and megatrend analysis among companies with the highest generated revenues in Serbia?

To answer these research questions, two studies were conducted. The first aimed to identify indicators that would indicate the extent of the impact of megatrends, while the second focused on collecting data through surveys from managers of companies that achieved the highest revenues for the year 2021/22.

The benefits a company can derive from strategic forecasting vary case by case, i.e. they differ between industries and companies. In practice, it has been observed that companies have very different opinions regarding the application of strategic forecasting [5, p. 1011]. Some consider strategic forecasting to be entirely useless, while others see it as important but do not invest enough effort in developing this concept. A third group believes that its application is necessary and that experts should seriously address the issue of forecasting within the company. If companies were to invest adequate effort in studying and implementing strategic forecasting, they could expect a return on investment that would far exceed their initial investments.

It is important to mention the reasons for the limitations that prevent many companies from engaging in the process of strategic forecasting. Three types of barriers are identified: emotional, cultural, and institutional barriers [8, pp. 7-8]. Emotional barriers involve the fear of facing the future and the high level of uncertainty. These must be overcome at the individual level by employees and company owners. Cultural barriers involve an organizational focus on short-term goals and a lack of motivation and incentives for employees who are dedicated to understanding future-oriented business trends. Institutional barriers are characterized by a lack of capacity for strategic thinking and time delays between forecasting and making practical decisions.

Previous research in the field of megatrends

Research using the method of megatrend analysis can be conducted at different levels: national, regional, and global. Consequently, the application of the method becomes more complex as the analysis progresses from the micro to the macro level. More often, megatrend analysis is carried out specifically for the segment of the industry in which the company operates, examining changes that could occur in the foreseeable future. However, by analyzing megatrends at the global level, a broader insight into future changes is obtained, thereby expanding the range of opportunities for concrete actions by companies.

There is a large number of studies conducted in the field of megatrend analysis. One extensive analysis was conducted by John Naisbitt [16]. He conducted a 12-year study describing ten key megatrends in the United States during the 1980s. According to him, to understand the future, we must understand the present and continuously monitor the developmental trends of megatrends.

Naisbitt continued to explore megatrends, including his research in the books "Megatrends 2000" [18]. During this period, Naisbitt defined the growing importance of the IT domain in the world, highlighting that one of the main problems would be the lack of a trained workforce to fill new job positions. After five years, his focus shifted to Asia in the book "Megatrends Asia" [17], defining that countries in the Asian region would have a dominant influence on the global economy.

In the book "Megatrends 2010: the rise of conscious capitalism" [1], Aburdene investigated corporate social responsibility and reported data showing that socially responsible practices actually help increase profits. Additionally, she researched the prevalence of current trends that redefine the way individuals live.

Research in the supply chain domain, conducted by Bowersox, Closs & Stank [2] as part of the analysis of ten megatrends affecting logistics activities, led to the conclusion that successful supply chain logistics change requires long-term leadership and planning. Moreover, it requires the alignment of operations that are not only under direct control but also those that are beyond the direct control of managers.

Proactive companies conduct analyses of global megatrends to utilize future market opportunities. Singh, Bartikowski & Dwivedi [21] defined three key megatrends – globalization, technological innovations, and the strengthening and improvement of the internet network, which lead to changes in consumer behavior.

The application of a developed methodology for megatrend analysis in North America is described by Guenes Castrona [11]. The methodology for megatrend analysis is defined through seven steps, and its implementation leads to the development of various economic sectors, which in turn reflects progress in the country. The method is applied using data from the social, economic, and political spheres, with the incorporation of experts being necessary throughout the entire process.

The impact of global megatrends on the European packaging industry was examined in the study by Olsmats & Kaivo [19]. It was concluded that industries should focus entirely on recyclable packaging types, recognizing it as an important element for waste prevention and resource conservation while protecting products.

The implications of megatrends over the next 20 years and the corresponding development pathways that businesses should follow were defined by Hajkowicz [12] based on research from 2015. He highlighted seven key megatrends: resource scarcity, the challenge of biodiversity protection, an aging population, transforming digital technology, urbanization growth, increased demand for experiential products/services, and innovation growth.

According to a more recent study conducted by Lithorst & De Waal [13], based on 162 articles, the impact of 13 megatrends and one disruption (the pandemic) was determined. However, the researchers note that there is a limitation in terms of the amount of literature covered. They point out that companies will face exponential changes in business in the foreseeable future.

Research results and considerations presented in the article by Gajdzik, Grabowska & Saniuk [9] confirm that Industry 4.0 is a megatrend that requires radical changes at both strategic and operational levels. Key trends highlighted include the digitization of the economy and ICT development, the knowledge economy, virtual organizations, smart business, and customer orientation

and product personalization. In the current research, technological trends dominate over others.

It is important to emphasize that a very small number of articles addressing megatrends and their impact in Serbia are available. I would like to highlight two studies that inspired me to conduct a deeper analysis of the situation regarding megatrends in Serbia.

The first study was conducted by Schwarz & Rohrbeck [20], focusing on activities aimed at realizing a strategic vision through the process of strategic foresight in 77 multinational companies in Europe. The study concluded that companies that implement formalized activities to achieve a strategic vision simultaneously have a greater ability to perceive changes in their environment and provide adequate responses. This study motivated me to explore how widely strategic foresight is adopted by the most successful companies in Serbia.

The second study was conducted by Malik & Janowska, who examined the impact of megatrends in the territory of Poland [15]. Based on a literature review, seven leading megatrends were identified as most frequently mentioned [14]. These include: digitization and ICT development, resource scarcity, climate change, global population growth, population aging, and urbanization growth. The seventh megatrend, which is relevant, represents geopolitical changes, but it was omitted from the analysis as the research conducted was socio-economic in nature. This study found that the strongest impact was from the megatrend of population aging, while the weakest impact was from population growth. Therefore, the idea of the second study was to determine the state of affairs regarding the impact of megatrends in Serbia.

Research methodology

The analysis conducted aims to provide answers to two research questions:

- Question 1: What is the impact of megatrends on Serbia, and which of them has the strongest effect?
- Question 2: How common is it for companies in Serbia to make use of strategic foresight, and to what extent is megatrend analysis employed?

Answering the first research question will be explained through Research A, while addressing the second research question is elaborated in Research B.

Research A

Building on the methodological framework developed in the study related to the application of megatrends to predict the development trends of the Polish economy [15], the idea is to conduct an analysis for the Serbian economy. To assess the impact of megatrends (outlined in [14, p. 216]), appropriate metrics will be used for each megatrend individually. Weighted averages of these metrics will be used to arrive at the final exposure indicator.

The process of arriving at the final indicator for each megatrend is as follows:

- The first step involves defining two metrics that best represent each megatrend. Where possible, synthetic indices are used, combining various impact factors. However, for certain megatrends, due to the unavailability of index information or the absence of Serbia's ranked position among other countries, alternative forms of metrics such as rates and other indicators are used.
- In the second step, a comparison is made between Serbia and other countries (observed on a global level). A scale from 1 to 10 is used, depending on the decile in which the economy is ranked based on Serbia's position relative to the total number of countries in the analysis.
- Based on the determined deciles, an inverted scale is used where appropriate. This scale is employed to establish a connection between the exposure of the Serbian economy to a specific megatrend on one hand and the content of the applied index on the other hand. For example, regarding the expected population growth, Serbia is positioned in the lower decile using the inverted scale, which simultaneously implies that it is the least susceptible to rapid population growth.
- The fourth step pertains to obtaining the final indicator, based on which the exposure of the Serbian economy to the mentioned megatrends is assessed

in comparison to other countries. By comparing the indicators for all megatrends (in our case six), it is determined how susceptible Serbia is to the influence of changes caused by megatrends. This creates a picture of how important megatrends are for the country and to which future changes the most attention should be directed.

For the field of technology (specifically megatrends related to digitization and ICT development), two complex types of metrics will be used: the Networked Readiness Index created by the World Economic Forum and the Technological Readiness Ranking developed by the Economist Intelligence Unit. The first index was created in 2001 and assesses the readiness of countries to harness the potential of the Fourth Industrial Revolution. It aggregates 53 indicators. Whether a country is ready for networking depends on whether the factors enabling the use of digital technologies are fulfilled [4, p. 5]. On the other hand, ranking technological readiness by the Economist Intelligence Unit determines the readiness of the economy for technological changes from three aspects: internet access, digital economy infrastructure, and openness to innovation [7].

The megatrend of climate change will be analyzed through the prism of two indices: the Global Climate Risk Index and the ND GAIN Country Index. The Global Climate Risk Index analyzes the extent to which different countries have been affected by events that have caused losses due to weather-related disasters [10]. The second index incorporates data from 45 indicators. It is a tool that helps governments, communities, and businesses examine the risks arising from climate change. This index provides insight into how vulnerable a country is to climate change and, at the same time, how prepared it is to respond to it. Since both the general index and the specialized index have been combined, we are using a weighted average of 0.75 for the Global Adaptation Index and 0.25 for the Global Climate Risk Index to calculate the final score [23].

Within the megatrend of resource scarcity, the focus is on two key resources that tend to decrease – water and energy resources. The limitation of energy resources is observed through the World Energy Trilemma Index, while the scarcity of water is taken from the ranking of water stress projections, the Aqueduct Projected Water Stress Country Rankings. The World Energy Trilemma Index is prepared annually, starting from 2010. It measures the performance of national energy systems from three perspectives: energy security (related to the efficiency of managing national and external energy sources and the resilience of the energy sector's infrastructure), energy equity (the ability of a country to provide access to energy to all households), and energy sustainability (related to a country's transition to reducing environmental damage and the impact of climate change) [24]. The ranking of water stress projections provides long-term scenarios (up to 2040) on the basis of which the level of water stress in agriculture, industry, and households can be determined [25].

Two megatrends considered in the field of demography are population aging and population growth. The population growth megatrend will be observed through two metrics: the population growth rate and the fertility rate. In this segment, there is no availability of data regarding specific indices that could be used in the analysis. A similar situation exists with the population aging megatrend. In this case, two indicators are taken into account. The first one is related to the percentage of the population above 65 years of age, while the second one represents the average life expectancy of people.

Finally, when calculating the final indicator related to the urbanization megatrend, there is a lack of data for Serbia regarding the urbanization index, so two metrics are used as a substitute: the urbanization rate and population density in urbanized areas.

Research B

The sample criterion that was planned for analysis involved the inclusion of the largest companies in Serbia. The research was conducted among 150 companies in Serbia, from various municipalities, with the highest revenues for the year 2021/2022. Other relevant elements of the research:

- Respondents were managers at low, middle, and high levels within the company.

- The survey was conducted in May, June, July, and August 2023.
- Questionnaires were used as the method of interviewing, which were sent via email.

The main drawback of the conducted research is the insufficient number of respondents who participated in the study (13%). As a result of the limited number of respondents in the research, it's important to exercise caution when interpreting the data regarding the adoption of strategic foresight and megatrend analysis methods in Serbia. On the other hand, the advantage of the research is that the obtained results can serve as a reference point for understanding this issue in the country and as a starting point for new hypotheses to be explored in future research on the topic of strategic foresight in Serbia.

The questionnaire used in the research consists of a total of 18 questions. The questions are categorized into three groups:

The first group of questions (a total of 4) includes general questions aimed at getting acquainted with the company itself. They are related to the primary activity and the territory in which the company operates, the duration of the company's business operations, and the managerial level to which the respondent belongs.

The second group of questions (a total of 6) is related to the field of strategic foresight. In this part of the questionnaire, the prevalence of strategic foresight in Serbia was investigated, including its duration and methods of implementation. It was determined who conducts strategic foresight in the company and from which sources. Additionally, the survey inquired about the managers' knowledge of the sequence of activities in the company, i.e. whether strategic planning or strategic foresight is conducted first.

The third group of questions (a total of 8) focused on determining the prevalence of the megatrend analysis method. The idea in this part of the questionnaire was to examine the respondents' knowledge of the term "megatrend" and determine whether the company implements this method. Specifically:

- For companies that indicated they use the method, it was determined how much the method has contributed to improving business results and how often they review reports based on this method.
- For companies that indicated they do not use the method of megatrend analysis, the reasons for such a decision were examined as well as their plans to change this in the near future.

All companies were asked about their opinion on which megatrends currently have the strongest impact on their business and which megatrends will have the strongest impact on their business in the future. The provided megatrends were selected from the range considered in the research, including those related to geopolitical changes.

Results of Research A

To arrive at the ultimate indicator concerning the exposure of megatrends to the Serbian economy, it is necessary to consider metrics 1 and 2, which provide the respective set of results. According to metric 1, the levels of exposure to individual megatrends can be observed in Table 1.

The relative position of the Serbian economy compared to other countries globally is shown through

Table 1: Serbia's exposure to the impact of megatrends according to metric 1

	Place of Serbia	Items in analysis	Place of Serbia (decile)	Inverted scale	Exposure (1-least,10-most)
Digitalization	55	131	5	Yes	6
Climate change	105	179	6	No	6
Resource scarcity	47	91	6	No	6
Population growth[1]	225	236	10	Yes	1
Population aging	18	196	1	Yes	10
Urbanization growth[1]	136	226	6	Yes	5

Source: own calculations based on: Portulans Institute. (2022). The Network Readiness Index 2022; Germanwatch. (2021). Global Climate Risk Index 2021; World Energy Council. (2022). The World Energy Trilemma Index; The World Factbook (2023). Population growth rate; The Global Economy. (2021). Population ages 65 and above; World Population Review. (2023). Urbanization Rate.

1 In both metrics used for the population growth megatrend, certain countries that are not yet territorially sovereign are incorporated into the ranked list of countries. This also applies to the metric for the urbanization megatrend in Table 1.

the decile position. An inverted scale has established a connection between the metric and exposure to the impact of the megatrend. Based on the obtained data, Serbia is positioned for all megatrends except population growth and aging approximately in the middle (see the last column of Table 1) in terms of considering the exposure of the economy to the impact of megatrends. In the case of the population growth megatrend, Serbia is positioned in the lower decile position, meaning it is the least exposed to the impact of this megatrend. Conversely, regarding the aging population megatrend, Serbia is ranked in the highest decile, and consequently, it is the most exposed to the impact of this megatrend.

Based on existing data for selected metric 2, for individual megatrends, a similar situation arises as with metric 1 (see Table 2). In other words, Serbia is positioned approximately in the middle by deciles for all megatrends except population growth, and consequently, the exposure to the impact of megatrends is not notably high.

The main difference compared to the previous selected metric, i.e., metric 1, is in the case of the aging population. In metric 2, for the observed megatrend of aging population, Serbia is not intensely exposed to the impact of this megatrend, as it was the case with metric 1.

In Table 3, the results obtained based on both metrics are summarized. It further defines the value of the final indicator of exposure to the impact of megatrends, as the weighted values of exposure to the impact of megatrends (previously defined by the two metrics). Figure 1 presents the values of the final indicators based on metric 1 and metric 2.

Results of Research B

In the research conducted through questionnaires, which were sent via email to companies, a total of 19 out of 150 companies participated. The questionnaire did not require any confidential information about the businesses themselves.

In the initial part of the questionnaire aimed at getting acquainted with the companies, the results show:

- Industry Sector: 53% of the companies surveyed are predominantly associated with the manufacturing sector, while the remaining companies are primarily engaged in service-related activities.

Table 2: Serbia's exposure to the impact of megatrends according to metric 2

	Place of Serbia	Items in analysis	Place of Serbia (decile)	Inverted scale	Exposure (1-least,10-most)
Digitalization	55	82	7	Yes	4
Climate change	76	185	5	No	5
Resource scarcity	104	158	7	Yes	4
Population growth [1]	207	227	10	Yes	1
Population aging	91	192	5	Yes	6
Urbanization growth [2]	493	990	5	Yes	6

Source: own calculation based on: EIU (2018). Preparing for disruption: Technological Readiness Ranking; University of Notre Dame. (2021). ND GAIN Country index; World Resources Institute (2015). Aqueduct Projected Water Stress Country Rankings.; The World Factbook. (2023). Total fertility rate; The Global Economy. (2021). Life expectancy - Country rankings; Cox, W. (2022). Demographia World Urban Areas - urban areas by urban population density.

Table 3: Calculation of the final indicator for Serbia based on metric 1 and metric 2

	Metric 1		Metric 2		Exposure indicator
	Exposure (1-least, 10-most)	Weight	Exposure (1-least, 10-most)	Weight	
Digitalization	6	0.5	4	0.5	5
Climate change	6	0.25	5	0.75	5.25
Resource scarcity	6	0.5	4	0.5	5
Population growth	1	0.5	1	0.5	1
Population aging	10	0.5	6	0.5	8
Urbanization growth	5	0.5	6	0.5	5.5

Source: Own calculations[1]

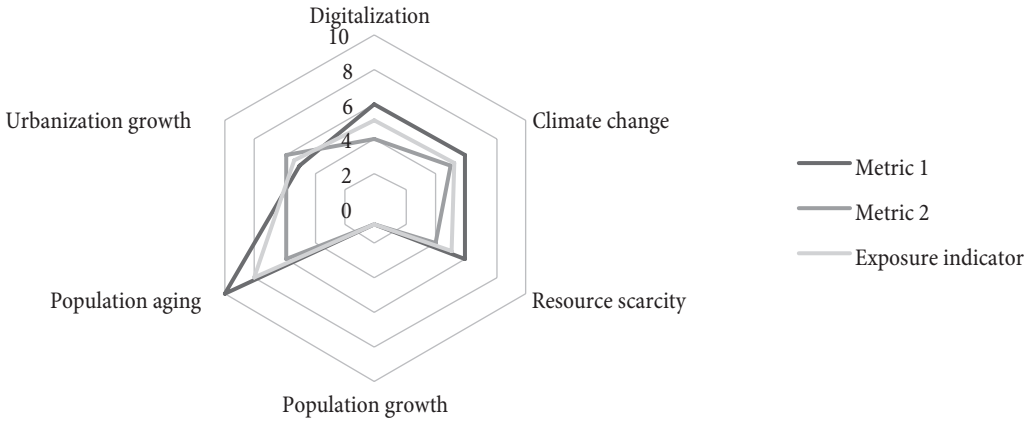
- Business Territory: 21% of the companies operate exclusively within the territory of Serbia, 32% of them operate in multiple countries in the Balkans, and 47% of the companies chose to respond with "other".
- Company Operating Duration: None of the companies operated for less than 5 years; 5% operated for 6-10 years, while 95% have been in operation for more than 10 years.
- Respondents filling out the questionnaire: None of the respondents belonged to the low management level; 58% of them belonged to the middle management level, while 42% belonged to the high management level.

In the second part of the questionnaire, the subject of analysis was determining the prevalence of strategic forecasting in companies in Serbia. The research results show that managers are familiar with the sequence of activities within the company, as 53% of them defined that strategic forecasting precedes the process of strategic planning. 37% of the respondents believe that planning is initially done, while 10% did not recognize a difference between the mentioned activities.

The key question revolved around determining the prevalence of strategic forecasting in companies and the duration of its implementation. The results are shown in Figure 2. It can be concluded that strategic forecasting is predominantly present in the most successful companies (as observed through revenue levels). Additionally, it should be noted that companies engage in strategic forecasting activities for an extended period (more than ten years).

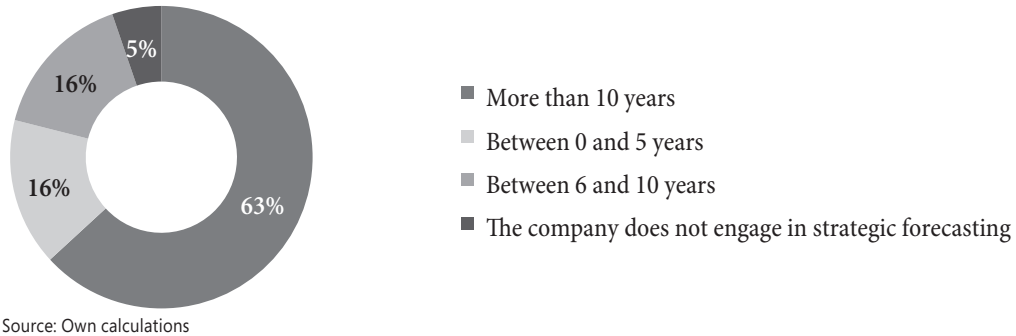
Professional literature suggests that qualitative methods are used in the process of strategic forecasting, primarily as a supplement to quantitative methods, which are expected to provide more precise data. In practice, it is shown that the majority of companies (79%) have opted for the use of combined methods of strategic forecasting, while 11% of respondents define the dominant use of qualitative methods, and 5% use quantitative methods predominantly. It should be noted that a total of 5% of surveyed companies do not engage in strategic forecasting, and this should be considered in other responses. Other relevant information:

Figure 1: Influence of megatrends based on final indicators (through metric 1 and metric 2)



Source: Own calculations

Figure 2: The duration of strategic forecasting implementation in enterprises



Source: Own calculations

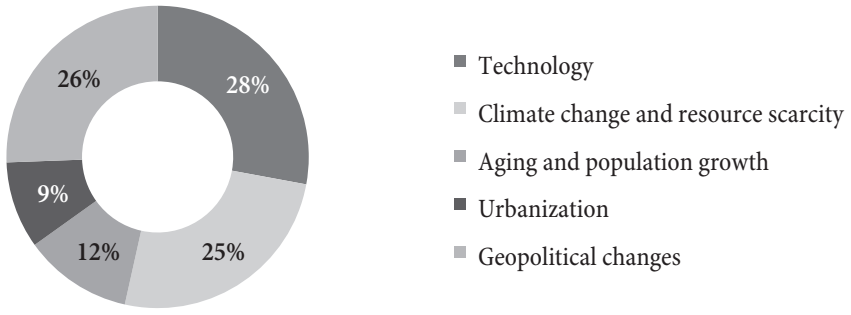
- Participants conducting strategic forecasting in companies: 58% of respondents indicated that this process is carried out by employees within the company, while 37% of them simultaneously conduct this process by both internal and external employees. This is the best way to obtain accurately conducted analyses because it combines the knowledge of employees who have insight into the company's operations with external experts who can objectively assess emerging problems.
- Dominant data sources used in the process of strategic forecasting: internal data (53%), the internet (37%), print media (5%).
- Objectives of conducting strategic forecasting, which is beneficial in the strategic planning process: 37% of respondents defined it as useful for long-term planning, while 58% believe that strategic forecasting contributes to both short-term and long-term forecasting. Companies should engage in the process of strategic forecasting primarily for the purpose of long-term planning, which is in line with the going concern approach to business. Additionally, long-term planning will provide the company with the flexibility to adapt to emerging changes, which would not be possible if we exclusively focused on short-term planning.

A large percentage of respondents are not familiar with the meaning of the term "megatrend" (37%), and the same percentage of respondents (37%) correctly defines the term "megatrend" (the concept of megatrends encompasses broad and far-reaching changes that develop slowly). A total of 26% of respondents did not select the offered correct definition of the term "megatrend".

The method of analyzing megatrends for the purpose of strategic forecasting is applied by a total of 53% of companies among the respondents, and all respondents have stated that the analysis of megatrends has contributed to improved business performance. The majority of respondents review the method annually (70%), while a smaller percentage of companies review it every 1-3 years (20%), and three or more years (10%).

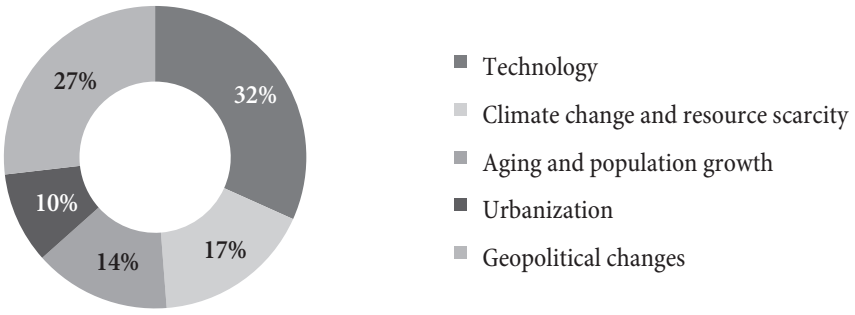
For 47% of respondents who indicated that they do not apply the mentioned method, it is worth noting that 26% of them plan to apply it in the near future, while for the remaining 21% of respondents, this is not the case (citing reasons such as the belief that such a method would not contribute to their company's future business, and the rest opting for the "other" option).

Figure 3: Impact of megatrends in the present



Source: Own calculations

Figure 4: Impact of megatrends in the future



Source: Own calculations

In the last part of the questionnaire, the idea was to examine the impact of megatrends on companies, specifically which megatrends have the strongest influence on current (refer to Figure 3) and future (refer to Figure 4) business operations. Managers had the option to select multiple options simultaneously.

Respondents believe that the current impact of megatrends is strongest in the sphere of technology (28%), followed by geopolitical changes (26%), and climate change and resource scarcity (25%). Other megatrends have a somewhat weaker impact: aging and population growth (12%) and urbanization (9%). Regarding the future impact of megatrends, the strongest influence is expected from the domain of technology (32%), followed by geopolitics (27%), and climate change and resource scarcity (17%). The least impact is anticipated in the sphere of demographic changes (14%) and urbanization (10%). From this, it can be concluded that respondents believe that the same megatrends will have a dominant influence in the future (technology, geopolitical changes, climate change, and resource scarcity).

Discussion

The scope for further analysis in Research A would involve incorporating a larger number of metrics to generate indicators that are inherently more complex and comprehensive. If a larger number of megatrends were also included in the analysis, we would obtain a more precise understanding of the economy's exposure to the long-term effects of megatrends. This type of analysis is available for any country globally, and a comparative analysis can be performed to provide a comparative view of the impact of megatrends on a specific group of countries. This can provide additional insights for formulating future strategies.

The existing analysis has its limitations, primarily concerning the number of selected metrics and the total number of megatrends considered in the analysis. Additionally, it is not known to what extent the values of the final indicators result from internal or external factors. The goal of the conducted analysis is to provide a general overview of the state of Serbia in terms of exposure to the most common megatrends.

Possible further improvements to Research B, which would represent an enhanced version of the conducted study:

- The follow-up research should involve a larger number of respondents.
- To gain a more precise insight into whether the implementation of the megatrend analysis method depends on the revenue levels generated by the company, the research could be conducted on multiple divided groups of companies (small, medium, large).
- Due to the existence of multiple groups, a comparative presentation of the responses can be conducted to identify the areas with the greatest deviations in responses between companies.
- The survey method could be combined with another method, such as interviews. Through interviews with knowledgeable individuals regarding forecasting, we could determine which segments of business the megatrend analysis method contributes to the highest achievement.

Conclusion

Based on Research A, the results obtained for the final indicators show that Serbia is moderately exposed to megatrends such as digitalization, resource scarcity, climate change, and urbanization. Significant deviations in these data are related to the megatrends of population growth and aging, where extremes are observed. Serbia is most exposed to the influence of the megatrend of aging population, while it is minimally exposed to the impact of the population growth megatrend. Consequently, the focus should be on depopulation and an aging population.

Based on the conducted Research B, it can be concluded that companies in Serbia with the highest generated revenues implement the megatrend analysis method. The research, despite the small number of respondents, shows that companies with the highest revenues have the need to conduct strategic forecasting. Encouragingly, managers have plans to apply the megatrend analysis method in the near future. However, a drawback is that a large number of respondents did not know how to define the term "megatrend." There is a need to raise awareness about the significance of megatrends and the corresponding analysis,

which can greatly facilitate business operations. Knowledge of the consequences that megatrends can cause can serve as an additional incentive for companies to implement this method of strategic forecasting in practice.

The readiness of companies to invest in the field of strategic forecasting will be crucial for becoming a leader in their industry. Proactivity will bring an advantage, while reactivity will only ensure survival in the market by adapting to the demands of leaders.

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SPECIFIC IMPACT OF THE COVID-19 PANDEMIC ON THE PROFITABILITY OF LOGISTICS COMPANIES BASED IN THE WESTERN BALKAN COUNTRIES

Specifičnost uticaja pandemije kovida 19 na profitabilnost logističkih kompanija u zemljama Zapadnog Balkana

Abstract

The aim of this paper is to theoretically and empirically present the effect of the Covid-19 pandemic on profitability. In difficult economic times caused by coronavirus, companies that supplied logistical services assisted other businesses in successfully conducting their daily business operations. On the other side, the pandemic has been a contributing factor in the massive interruption in transportation flows all over the world. The research was conducted on a sample of 798 active companies that operated within the logistics industry of the Western Balkans in the period from 2015 to 2020. An empirical research was performed using panel regression analysis. Evaluation of the fixed-effect models confirmed the existence of a positive and statistically significant impact of the Covid-19 pandemic on the profitability expressed through return on total assets (ROA) and return on equity (ROE). The results confirmed the specificity of the logistics industry, indicating that it is one of the few industries that have managed to achieve higher profitability during the crisis and recession brought by the pandemic in early 2020. Given that the logistics sector has played a vital role in supplying household supplies, medicines and medical equipment, the results could help logistics companies to further improve operational performance and risk management in pandemic situations, as well as to improve the resilience of their activities to future similar crises.

Keywords: *Covid-19, pandemic, profitability, logistics, Western Balkans*

Sažetak

Cilj rada je da se teorijski i empirijski predstavi uticaj pandemije virusa kovid 19 na profitabilnost. U otežanim ekonomskim uslovima izazvanim koronavirusom, kompanije koje su pružale logističke usluge omogućavale su drugim kompanijama da uspešno obavljanju svakodnevne poslovne operacije. S druge strane, pandemija je doprinela masovnom prekidu transportnih tokova širom sveta. Istraživanje je sprovedeno na uzorku od 798 aktivnih kompanija koje su poslovale u okviru logističke industrije Zapadnog Balkana u periodu od 2015. do 2020. godine. Empirijsko istraživanje sprovedeno je korišćenjem panel regresione analize. Procena modela sa fiksnim efektom potvrdila je postojanje pozitivnog i statistički značajnog uticaja virusa kovid 19 na profitabilnost izraženu kroz prinos na ukupnu imovinu (ROA) i prinos na kapital (ROE). Rezultati su potvrdili specifičnost logističke industrije, ukazujući da je ona jedna od retkih industrija koja je uspela da ostvari veću profitabilnost tokom krize i recesije koje je donela pandemija početkom 2020. S obzirom na to da je sektor logistike odigrao vitalnu ulogu u snabdevanju kućnih potrepština, lekova i medicinske opreme, rezultati bi mogli da pomognu logističkim kompanijama da dodatno unaprede operativne performanse i upravljanje rizikom u kriznim situacijama, kao i da poboljšaju otpornost svojih aktivnosti na buduća slična stanja.

Ključne reči: *kovid 19, pandemija, profitabilnost, logistika, Zapadni Balkan*

Introduction

The pandemic caused by the Covid-19 virus has brought numerous changes and limitations to the world economy as well as to national systems that have been established and unchanged over the years. According to the World Health Organization [45], by mid-February 2022, over 409 million cases and over 5.8 million deaths had been reported due to Covid-19 infection. According to the nature of the virus, most countries around the world introduced restrictions on the movement of people, goods, and capital, as the first step in reducing the spread of the virus, which weakened consumer power and deteriorated economies and industries around the world. Regardless of the alliances and unions of the countries that had established and respected the same rules in trade until then, the pandemic induced each country to decide individually on the rules that would be applied during the pandemic. These circumstances slowed down international trade and the supply chain, both between and within countries. The beginning of the pandemic was marked by the ban on the movement of individuals as well as the closure of traffic, which hit the transportation industry the hardest and led multinational companies to shorten supply chains and nationalize them [3].

The previous experience has confirmed that the coronavirus has affected different industries differently. Some industries, due to their nature, managed to effectively adapt to the external situation and increased sales, while some industries have long-term investments that could not be easily changed and adapted to new challenging conditions, such as unforeseen health pandemics [21].

The difficulty that was generated by the Covid-19 outbreak brought to light the fragile state of all areas, especially with regard to the acquisition of fundamental resources and the distribution of manufactured products to ultimate consumers [40]. The logistics sector belongs to the group of economic sectors that played a vital role during the Covid-19 virus pandemic, primarily in the organization of the supply of products that meet basic human needs such as food and medical products. The specificity of logistics as a branch of industry is that the coronavirus has caused increased demand in certain segments. Additionally, logistics companies provide support to other companies to conduct their business activities in challenging times. On the other hand, the pandemic has contributed to the major disruption in global traffic flows. The obligation to maintain physical distance between employees has caused major delays in many phases of transportation and storage. Many multinational companies were forced to hire a large number of additional employees in order to expand storage and transport infrastructure directly to consumers, rather than to retail facilities, which were mostly closed during the quarantine regime. Throughout the pandemic, companies faced a mismatch between supply and demand, technology, and supply chain development [38]. Furthermore, companies were exposed to additional costs such as equipment for preventing the spread of infection, increased wages for overtime or night work as well as increased material costs.

The contribution of this paper is reflected in the analysis of the impact of the Covid-19 virus on the profitability of companies in the logistics sector in the Western Balkans. Due to the vital role that the logistics sector played during the ban on movement, the research was conducted on a sample of companies from that sector. The first effects of the coronavirus were felt in the disruption of supply chains and international trade and transport [2]. Manufacturers or retailers, whether global or local, strived to provide a satisfactory level of product quality and safety to end consumers, what could be done using intelligent packaging, fast logistics and modern technology [18]. These factors are even more significant in times of crisis and recession. Moreover, one of the successful measures to create the resilience of companies to unforeseen circumstances caused by the pandemic is to accelerate the supply chain [32]. Furthermore, the countries of the Western Balkans are similar in political, historical, geographical, and economic characteristics. All countries are in transition, which states the degree of market development. Due to the nature of the area, the Western Balkans region is the subject of many studies, while it is not known that there exists academic research on the impact of the Covid-19 virus on the profitability of companies in the logistics sector. The manner in which the companies' profitability is affected by the shock of a

pandemic could be used as a basis for predicting profitable operations, as well as for forming a sustainable supply chain during future, primarily health, and even economic crises of similar type. Golubeva [16] confirms the importance of several factors for the profitability of companies during Covid-19: the sector to which companies belong, size, share in exports and market demand for products, indicating the importance of country-specific factors, including economic development and corporate management. The most significant academic contribution to this topic in the field of logistics was made by Atayah et al. [7], who, however, based their research on a sample of companies from the G20 countries, which are considered the most developed countries in the world, as well as Nguyen [29], whose research was based on a sample of Nigerian logistics companies. In this regard, there is a need to analyze the impact of the pandemic in European developing countries, such as the Western Balkans.

The paper structure is as follows. Firstly, we start with theoretical background and hypothesis development. Then, we present the data and the methodology, and then we show empirical results and discussion. In the end, the conclusion summarizes limitations and future recommendations.

Theoretical background

Logistics are considered as the main factor in the success of trade, both domestic and international, given that the organization, speed and cost of transporting goods from producers to consumers are a key segment of efficient and effective sales. The major advantage of logistics for all participants in the supply chain is the most efficient usage of time and resources, considering that goods have their value only if they are in the exact place at the accurate time [31]. Traffic is a bond between all branches of the economy, synthesizing production processes from different sectors [49]. Improved performance of the logistics sector increases business opportunities as well as gross domestic product (GDP) in favor of the national economy [44]. Generally, there is a significant increase in the logistics industry, which in recent years has been one of the factors for increased productivity of other companies.

The Covid-19 pandemic has tested a globally connected economy. Global trade and social activities were interrupted due to required social distance. Great consequences are noticeable for health, economy, environment and society [47]. The biggest indicator, in economic terms, is stock market reactions that are interrelated with the severity of coronavirus outbreaks in each country. The great uncertainty of the pandemic has led to markets becoming very volatile and unpredictable [48]. Empirical results of Najaf and Chin [26] show that the value of the Chinese stock exchange, as one of the leading in the world, and the number of Covid-19 cases significantly affect the trends of other foreign stock exchanges. The results showed a significant relationship between the variability of stock markets in China and other global stock markets, which means that the volatility of global stock markets at some point is explained by yesterday's closing value at the Chinese stock market.

Companies are facing new aggravating circumstances such as a sharp drop in demand, supply chain disruptions, termination of business arrangements, primarily related to foreign markets, lack of raw materials, delays in deliveries, increased input costs and distortions in transport networks [9]. The impact of reduced economic activity has also affected industrial energy consumption, with reduced production capacity and reduced transport levels improving environmental quality in terms of reducing emissions, especially in highly industrialized countries such as the US and China [41]. Baker et al. [8] analyzed trends in the U.S. stock market since 1900, concluding that no previous epidemic of infectious diseases, including the Spanish flu, had affected the stock market as strongly as the Covid-19 pandemic, naming key reasons social distancing as well as restrictions in the provision of service activities.

There are different views when it comes to the direction of the impact of the Covid-19 pandemic on financial performance, i.e. profitability and yield. Atayah et al. [7] analyzed the logistics sector on a sample of 565 companies based in G-20 countries and concluded that, on average, logistics companies increased their financial performance by 123% and 391%, respectively, taking into account ROA and ROE as profitability indicators. Moreover, the results of the study showed that the impact of the

pandemic varies between countries, with 14 of the 20 countries significantly increasing financial performance, while in 6 countries the pandemic had a negative impact on profitability. Amnim et al. [4] analyzed the impact of the Covid-19 pandemic on the profitability and liquidity of companies in Nigeria in the consumer goods and healthcare sector, concluding that there is a statistically significant and positive impact of the pandemic on company profitability. In addition, the authors state that retail companies will feel the milder consequences of the Covid-19 pandemic if they have developed flexible models of supplying and distributing products to customers. Devi et al. [14] included 214 companies from nine sectors in the analysis. The research showed that under the influence of the pandemic, increased profitability was observed in the consumer goods sector, while in contrast, profitability fell in the sectors of trade, transport, utilities, infrastructure, real estate, finance, and investment.

Based on the financial reports of 114 companies operating in the logistics sector in Vietnam, Nguyen [29] concluded that the pandemic has a negative impact on profitability, and that the coronavirus has a global impact on supply chains. Additionally, the author states that export activity and international transport difficulty develop, with the chance of expansion only for domestic logistics companies. Kubiczek & Derej [21] analyzed revenue trends before and after the beginning of the coronavirus pandemic by industry on a sample of companies listed on the Warsaw Stock Exchange. The results showed that the tourism sectors, the oil industry as well as the transport and logistics sector achieved the largest decline in revenue in 2020, compared to 2019. Shen et al. [39], by analyzing joint-stock companies based in China, concluded that there is a negative and statistically significant impact of the pandemic on profitability, with the negative impact being more pronounced when the volume of investment or sales revenue is lower. Rababah et al. [34] confirmed such results, concluding that small and medium-sized companies are more affected by the pandemic, in terms of financial performance. Xiong et al. [46] analyzed companies based in China, considering 3,518 observations. They concluded that larger companies, companies with higher profitability, higher growth potential, higher indebtedness, and companies with a smaller share of fixed assets are subject to the less negative impact of the pandemic compared to other companies. Hope et al. [19], analyzing the results of a questionnaire obtained from the owners of private companies in Nigeria, concluded that the pandemic caused by the Covid-19 virus negatively affects financial and non-financial performance. Ding et al. [15], using panel analysis of financial data of 6,700 companies, concluded that the decline in stock returns caused by the pandemic was slighter in companies with higher profitability before 2020 as well as in companies less involved in global supply chains.

Considering the aim and problem of this paper as well as the previous conclusions of other authors, the hypotheses that will be tested within the research are the following:

H1: There is a negative and statistically significant impact of the Covid-19 virus pandemic on the profitability of companies within the logistics sector in the Western Balkan countries.

H2: The impact of the Covid-19 virus pandemic on the profitability of companies within the logistics sector differs between the countries of the Western Balkans.

Data and methodology

The aim of the research conducted in this paper is to analyze the impact of the Covid-19 pandemic on the profitability of logistics companies based in the Western Balkans, consisting of Albania, Bosnia and Herzegovina, Montenegro, North Macedonia, and Serbia. According to the Regulation on Classification of Activities [36], the sample includes companies whose activities are registered within sector H – Transporting and storage, under some of the following activity codes: 49.20 Freight rail transport, 49.41 Freight transport by road, 50.20 Sea and coastal freight water transport, 50.40 Inland freight water transport, 51.21 Freight air transport, 52.10 Warehousing and storage, 52.21 Service activities incidental to land transportation, 52.22 Service activities incidental to water transportation, 52.23 Service activities incidental to air transportation, 52.24 Cargo handling, 52.29 Other transportation support activities. The sample includes 798 active companies

operating in the period between 2015 and 2020, forming 4,788 observations. As source of data for the purposes of this research was used TP Catalyst database [11]. The dependent and independent variables used to test the models are shown in Table 1, which further shows the formulation as well as an overview of the authors who used the equal variables in their research.

Empirical results and discussions

Table 2 shows the results of descriptive statistical analysis for all variables used in the models. Due to the existence of extreme values, the use of median is preferred over the arithmetic mean when analyzing the average values. The median value of the variable ROA and ROE is 6.3% and 13.8%, which indicates a sufficient level of profitability of logistics companies from the sample. Also, the results show that the asset structure is slightly oriented towards fixed assets, which is expected given the type of activity that requires ownership of storage space, related infrastructure, and valuable fleet, especially for companies engaged in shipping by air, sea, or rail. In addition, the capital structure indicates that the analyzed companies operate according to the principle of traditional financing, maintaining a balanced level of own and borrowed resources. The median value of the liquidity variable is 1.4, which confirms that there is a low level of current liquidity, indicating a reduced ability of the companies in the sample to settle their short-term liabilities using current, liquid assets.

The first assumption regarding the direction and significance of the linear relationship between the variables will be made based on the results of Pearson's coefficient of correlation, presented in Table 3. The correlation matrix indicates the existence of a statistically significant influence between all independent variables and profitability variables ROA and ROE, except for the linear relationship between growth and ROA and gross domestic product and ROA. In addition, there is a positive linear relationship between the Covid-19 pandemic and the profitability indicators, which leads to the rejection of H1, i.e. the assumption that

Table 1: Overview of types, variable names, formulations and source literature

Variable type	Variable name	Variable formulation	Source literature
Dependent variables	Profitability	ROA	[7], [14], [15], [18], [20], [23], [25], [28], [29], [34], [39], [42], [43], [46]
	Profitability	ROE	[4], [5], [7], [28], [29], [30], [34], [41]
Independent variables	Size	Ln Total assets	[1], [7], [15], [19], [20], [22], [29], [34], [39], [42], [46]
	Asset structure	Fixed assets/Total assets	[18], [19], [20], [22], [23], [24], [25], [28], [30], [46]
	Capital structure	Total debt/Total assets	[1], [7], [14], [18], [19], [23], [25], [28], [39], [42]
	Growth	$(Sales_t - Sales_{t-1})/Sales_{t-1}$	[1], [18], [23], [24], [42]
	Liquidity	Current assets/Current liabilities	[4], [14], [18], [20], [22], [23], [24], [25], [28], [29], [30], [42]
Control variables	Covid-19 virus pandemic	Covid-19	[4], [5], [7], [14], [15], [26], [39]
	Gross domestic product	GDP	[6], [7], [15], [22]
	Inflation	CPI	[7], [10], [22], [30], [33], [35]

Source: Authors' calculations

Table 2: Results of descriptive statistics

Variable name	Number of observations	Median	Arithmetic mean	Minimum	Maximum	Standard deviation
ROA	4,788	0.063	8.547	-69.275	82.037	9.625
ROE	4,788	0.138	18.591	-253.666	837.273	25.794
Size	4,788	7.032	7.074	2.376	12.030	1.090
Asset structure	4,788	0.522	0.491	0.000	0.993	0.225
Capital structure	4,788	0.495	0.487	0.002	10.114	0.287
Growth	4,788	0.075	0.627	-1.000	1778.145	25.919
Liquidity	4,788	1.410	2.457	-0.027	84.894	4.099
Covid-19 virus pandemic	4,788	1.000	0.833	0.000	1.000	0.373
Gross domestic product	4,788	3.089	2.263	-15.307	5.078	2.263
Inflation	4,788	1.392	1.152	-1.584	3.131	1.152

Source: Authors' calculations

Table 3: Results of the Pearson's correlation coefficient

Variable name	ROA	ROE	Size	Asset structure	Capital structure	Growth	Liquidity	Covid-19	GDP
ROA	1								
ROE		1							
Size	-0.1880**	-0.1240**	1						
Asset structure	-0.2323**	-0.1767**	0.2690**	1					
Capital structure	-0.2613**	0.0939**	-0.0080	-0.0325*	1				
Growth	0.0127	0.0521**	-0.0145	-0.0049	0.0228	1			
Liquidity	0.1732**	-0.0355*	-0.0439**	-0.2007**	-0.3804**	-0.0087	1		
Covid-19	0.0774**	0.0808**	-0.0987**	0.0055	0.0031	0.0097	-0.0382**	1	
GDP	0.0254	0.0375**	-0.0381**	0.0427**	0.0211	0.0012	-0.0740**	0.8557**	1
Inflation	-0.1632**	-0.1098**	0.1010**	0.0870**	0.0387**	0.0233	-0.0381**	0.1272**	0.1525**

** - level of significance 1%; * - level of significance 5%
Source: Authors' calculations

there is a negative and statistically significant impact of the Covid-19 pandemic on the profitability of companies in the logistics sector in the Western Balkans.

To finally assess the impact of the coronavirus pandemic, as well as other microeconomic and macroeconomic variables, on the profitability of logistics companies based in the Western Balkans, which operated in the period from 2015 to 2020, panel regression analysis will be used. The impact will be measured through two models – a model in which profitability is represented by the return on total assets (ROA), and through a model in which it is presented through the determinant of return on total equity (ROE). Further, the following models will be evaluated:

$$ROAit = \beta it + \beta 1\ AS + \beta 2\ CS + \beta 3\ GR + \beta 4\ LIQ + \beta 5\ COVID + \beta 6\ GDP + \beta 7\ INF + uit \quad (1)$$

$$ROEit = \beta it + \beta 1\ AS + \beta 2\ CS + \beta 3\ GR + \beta 4\ LIQ + \beta 5\ COVID + \beta 6\ GDP + \beta 7\ INF + uit \quad (2)$$

Abbreviations are following: *i* is for each company (i = 1,2,3…, n), *t* is for each year (t = 1,2,3…, 10), *AS* is for the asset structure, *CS* is for the capital structure, GR is for growth, *LIQ* is for liquidity, *COVID* is for pandemic caused by Covid-19 virus, *GDP* is for gross domestic product and *INF* code for inflation.

Before starting the panel regression analysis, it is necessary to test the premises for the application of the chosen method. One of the few basic assumptions for the application of panel analysis is that the independent variables are not highly correlated with each other, i.e. that there is no presence of multicollinearity. Table 4 displays the test of multicollinearity of independent variables using Variance Impact Factors (VIF) and 1/VIF coefficients for both set models.

Considering that the results of VIF coefficients for all variables are less than 10 and the results of TOL coefficient (1/VIF) are higher than 0.1, it could be concluded that there is no multicollinearity in the models predetermined for the assessment of hypotheses. In further analysis, the presence of heteroskedasticity and autocorrelation was tested, as two additional basic assumptions of the panel regression analysis method (see Table 5).

Since the results of the Wooldridge test show that the value of p is lower than the level of significance threshold of 5% in both formed models, the presence of autocorrelation was confirmed. To investigate the presence

Table 4: Multicollinearity test results

Variables	VIF	1/VIF
Size	1.11	0.9050
Asset structure	1.14	0.8751
Capital structure	1.19	0.8412
Growth	1.00	0.9984
Liquidity	1.24	0.8059
Covid-19	3.81	0.2626
GDP	3.81	0.2622
Inflation	1.04	0.9603

Source: Authors' calculations

Table 5: Heteroskedasticity and autocorrelation test results

	ROA - Model 1		ROE - Model 2	
Test	Test statistic value	p - value	Test statistic value	p - value
Wooldrige test	47.796	0.000	1553.13	0.000
Breusch-Pagan/ Cook-Weisberg test	896.73	0.000	3.157	0.061

Source: Authors' calculations

of heteroskedasticity, the Breusch-Pagan/Cook-Weisberg test was used. The result of the p value for model 1 is below the level of significance threshold of 5%. In this regard, the presence of heteroskedasticity for model 1 was confirmed, while the value of p for model 2 is above the level of significance threshold of 5%, therefore, we conclude the absence of heteroskedasticity for model 2. Due to the violation of basic assumptions for the use of panel regression analysis, it is necessary to transform the model for adequate further evaluation. Finally, the transformed regression models whose evaluation led to conclusions about the acceptance or rejection of H_1 are shown in Table 6.

The results of the F test ($p < 0.01$) indicate a high statistical significance of the evaluated models. Also, considering the value of the coefficient of determination, it can be concluded that profitability expressed on the basis of ROA is explained with 13.55%, while profitability expressed through ROE is explained with 12.45% influence of selected independent variables. The obtained results of the evaluation of the transformed model using panel regression analysis indicate the positive impact of the coronavirus pandemic on the profitability of companies in both formed models. In this regard, H1 is partially accepted or rejected. In other words, it is confirmed that there is a positive and statistically significant impact of the Covid-19 virus pandemic on the profitability of companies within the logistics sector in the Western Balkans. The results are consistent with the conclusions of Atayah et al. [7] and Amnim et al. [4]. These results confirmed that the logistics sector is one of the few sectors that received a chance to grow and improve profitability during the coronavirus pandemic, despite movement restrictions. It proves necessary to emphasize the flexibility of the logistics sector, which managed to respond to the new situation in the local and international market in a very short period, caused by high demand for consumer goods, increased raw material costs, shortened delivery times and introduced epidemiological measures. Furthermore, the results of the transformed models indicate asset structure, capital structure, growth, gross domestic product, and inflation as significant determinants of profitability expressed by ROA, while statistically significant determinants of profitability expressed by ROE indicators are asset structure, growth, liquidity, gross domestic product and inflation.

Table 6: Results of the evaluation of transformed regression models 1 and 2

Variables	ROA Model 1		ROE Model 2	
	Coefficient	p	Coefficient	p
Size	0.5812	0.335	2.0365	0.274
Asset structure	-12.9011	0.000	-29.4221	0.000
Capital structure	-7.5030	0.005	-10.4785	0.000
Growth	0.0042	0.023	0.0299	0.000
Liquidity	0.0637	0.402	-0.1720	0.053
Covid-19	5.0586	0.000	14.1227	0.000
GDP	-0.4365	0.000	-1.3068	0.000
Inflation	-1.0205	0.000	-1.8301	0.000
Constant	12.2157	0.006	17.4414	0.180
Number of observations	4,788	4,788		
R^2	0.1355	0.1245		
F test	17.76	22.47		
p value (F)	0.000	0.000		

Source: Authors' calculations

The second hypothesis (H_2) states that there is a difference in the impact of the coronavirus pandemic on the profitability of companies within the logistics sector between the Western Balkans. To test the second hypothesis, the sample was divided into the countries of the Western Balkans. Considering the size of the countries and the size of their economy, the sample did not include the same number of companies from each country. Further, although Albania belongs to the Western Balkans, after setting the total assets as search criteria, the search eliminated all companies from that country. Table 7 shows the distribution of the number of active companies in the field of logistics according to the countries covered by the sample.

Table 7: Overview of the number of sampled companies by country of residence

Countries of the Western Balkans	Number of companies	Number of observations	Percentage participation
Albania	0	0	0%
Bosnia and Herzegovina	208	1,248	26.07%
Montenegro	10	60	1.25%
North Macedonia	112	672	14.03%
Serbia	468	2,808	58.65%
Total	798	4,788	100%

Source: Authors' calculations

Given that companies from different countries have different percentages of participation in the overall sample, it is necessary to individually test the impact of the coronavirus pandemic on profitability within each country. In that manner, the H_1 would be supported and H_2 will be tested. Table 8 shows the results of a panel regression analysis of the impact of Covid-19 on profitability within the Western Balkan countries.

Table 8: Impact of Covid-19 on the profitability of companies in individual countries of the Western Balkans

Countries of the Western Balkans	ROA Model 1		ROE Model 2	
	Coefficient	p	Coefficient	p
Bosnia and Herzegovina	2.0722	0.773	-13.2843	0.573
Montenegro	39.7067	0.450	-27.9497	0.829
North Macedonia	7.3328	0.037	9.7075	0.158
Serbia	5.8880	0.000	17.1246	0.000

Source: Authors' calculations

The results of the panel regression analysis by individual countries indicate the existence of a positive impact of Covid-19 on the profitability of companies operating in the logistics field, expressed by return on assets, in all Western Balkan countries, while such an impact is considered statistically significant only in North Macedonia and Serbia. Considering model 2, which assesses profitability through the return on equity, the results showed the existence of a negative impact of the Covid-19 on profitability, in the absence of statistical significance in Bosnia and Herzegovina and Montenegro. However, in the case of North Macedonia, there is a positive impact of the pandemic on the financial performance of logistics companies, also in the absence of statistical significance, while in the case of Serbia there is a positive and statistically significant impact of Covid-19 on company profitability. In this regard, we conclude that H2 is confirmed. The impact of the Covid-19 pandemic on the profitability of companies within the logistics sector differs between the countries of the Western Balkans. Finally, it could be concluded that the positive and statistically significant impact of the Covid-19 virus on the profitability of companies in the Republic of Serbia and North Macedonia is partly influenced by the measures taken by governments to mitigate the financial consequences of the pandemic. In Serbia, the total value of the package of measures aimed at the population and the economy introduced in 2020 is about 12.5% of GDP [27]. The measure of the greatest help and influence in the Republic of Serbia refers primarily to direct benefits in the form of payment of three minimum wages, which is considered to have had a high contribution to the survival of micro, small and medium enterprises, while large enterprises are subsidized in the amount of 50% of the prescribed minimum wage for staff granted paid leave due to reduced business volume or complete suspension of business [37]. In addition, the package of measures included the postponement of the tax payments and contributions on salaries for the private sector, the postponement of the corporate income tax advance payment, the moratorium on the repayment of installments of loans and leasing, as well as interest-free liquidity loans.

As for North Macedonia, the measure dedicated especially to the logistics sector refers to the subsidizing of obligatory contributions of employees in the amount of up to 50% of the average salary paid in 2019 in the tourism, the transportation, and the hospitality sector. In addition, the Government of North Macedonia has decided to completely exempt from import duties on imports of vital products, as well as medical supplies and equipment needed during the coronavirus crisis. All employees in private companies affected by the crisis caused by the spread of the coronavirus pandemic have been provided with compensation in the amount of the minimum wage of employees financed from the budget. In addition, the Development Bank of North Macedonia provided interest-free loans to small and medium-sized companies, while the government allowed a moratorium on loan payments [17].

To additionally confirm the significance of the impact of the Covid-19 crisis on the profitability of logistics companies, a placebo test was performed to analyze whether logistics companies have better financial results due to the change in the financial year. The test was conducted in a manner that the financial data of 2020 were excluded from the sample, and 2019 was set as the pandemic year. Table 9 shows the results of the placebo test for presented models, except for 2020.

Comparing the results of the evaluation of the original models and the results of the placebo test conducted in Table

Table 9: Placebo test for Model 1 and Model 2

Variables	ROA Model 1		ROE Model 2	
	Coefficient	p	Coefficient	p
Size	-0.9950	0.000	-1.4306	0.000
Asset structure	-7.9470	0.000	-16.1634	0.000
Capital structure	-10.6460	0.000	23.1501	0.000
Growth	0.0063	0.190	0.0445	0.001
Liquidity	0.0385	0.361	0.2273	0.062
Covid-19	0.6398	0.085	1.8139	0.090
GDP	-0.6207	0.000	-1.5779	0.000
Inflation	-1.0898	0.000	-2.5451	0.000
Constant	27.6610	0.000	32.3354	0.000
Number of observations	4,788	4,788		
R^2	0.1748	0.0932		
F test	105.41	51.17		
p value (F)	0.000	0.000		

Source: Authors' calculations

9, the significance of the impact of Covid-19 virus on the profitability of logistics companies could be noticed. The placebo test, excluding the pandemic year 2020, showed that the impact of the Covid-19 pandemic was positive, but not statistically significant, while in the originally tested regression models, which includes 2020, the results show a statistically positive pandemic impact on profitability. Exactly previously presented comparison confirmed that the increase in the profitability of logistics companies is not due to the change in the financial year, but due to the increase in demand for logistics services during the pandemic period. This test proves the results of the originally tested regression models 1 and 2 of this study. It could be concluded that despite difficult circumstances and disruption of movement of people and goods during the isolation period due to attempts to reduce Covid-19, companies operating in the logistics sector managed to meet customer needs and to maintain or establish a positive financial result and profitability.

Conclusion

The crisis caused by the Covid-19 pandemic pointed to the vulnerability of all industries, especially in the supply chain segment, primarily in the procurement of raw materials as well as the distribution of finished products to end customers. In this regard, the aim of the research conducted in this paper is to focus on the logistics industry, which played a vital role during the pandemic in the supply of vital goods and medicines during the strictly required distancing of people. The purpose of the paper is to show the extent to which the Covid-19 pandemic affected profitability, as a measure of company success, through two dimensions. Firstly, the impact of the pandemic on the profitability of companies operating in the logistics sector based in the Western Balkans – Albania, Bosnia and Herzegovina, Montenegro, Northern Macedonia, and Serbia. Furthermore, the differences in the effect of the pandemic on financial performance between the countries of the Western Balkans were observed. The analysis was performed using Pearson's correlation coefficient and panel regression analysis. The results indicated the existence of a positive and statistically significant impact between the coronavirus pandemic and the profitability of active companies in the logistics sector, based in the Western Balkans, which operated from 2015 to 2020. Moreover, the results of the analysis of the pandemic impact on the profitability within individual countries, confirmed that there are dissimilarities between the influences of the pandemic on profitability between the countries covered by the sample.

One of the limitations of the research presented in this paper is that at the time of conducting the analysis, the Covid-19 pandemic was still ongoing, with an unforeseen course in the future. Given that Covid-19 could have a long-term effect, the research conducted in this paper could be the basis for a more detailed investigation of the same topic, including new, alternative performance measurements in challenging and rapidly changing times. In this regard, the next research on this topic can be subsequently compared in terms of time. Despite all the limitations, this research contributes to the existing literature in terms of additional results regarding the Covid-19 virus pandemic. The results of the research are of great benefit to logistics companies in terms of understanding the impact of crises on the financial performance of the company. In this way, logistics companies will be able to focus on finding new business models that would be even more resilient to external shocks, with the possibility of faster recovery. In addition, the results presented in the paper confirmed the positive effects of digitalization and contactless business, which would most likely remain

represented after the end of the pandemic. Although it is difficult to predict the final economic impact of the epidemic caused by the Covid-19 virus, the crisis that has occurred has reminded companies of the constant presence of the risk of business interruptions. On the other hand, research is also important to public bodies in their formulation of public and corporate governance strategies regarding future preparedness and emergency responses. Furthermore, investors could use the presented results to predict fluctuations and trends in the level of return on investment in companies in the logistics sector, especially in times of crisis and recession.

Recommendations for further research are related to the consideration of other variables that may have an impact on profitability. Also, future research should focus on a more detailed analysis of the logistics sector in individual countries, considering the set of measures and constraints adopted by each country individually. In addition, it is necessary to analyze the logistics subsectors in more detail and to consider changes in the profitability of certain modes of transport, as well as the part of logistics related to warehousing. It was different types of transport that had different treatments during the ban of movement, which simultaneously caused a large increase in costs and decrease in operating revenues. In addition, each subsequent survey should be expanded with financial data from 2021 and 2022, which is a limitation of the analysis conducted in this paper, due to the unavailability of data at the time of analysis.

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TAXES AND INCOME INEQUALITY IN THE EUROPEAN UNION: A QUANTILE REGRESSION APPROACH

Porezi i dohodovna nejednakost u Evropskoj uniji – pristup kvantilne regresije

Abstract

This paper tests the role of taxes in reducing income inequality in the European Union members. Using Eurostat data on Gini coefficients in a 14-year period, a slight growing trend of income inequality is found. The main findings indicate that taxes have a negative and statistically significant impact on income inequality, though this impact is relatively weak. A quantile regression estimates suggest that the redistributive power of taxes is highest in the most unequal societies and vice versa. It implies that taxes reduce income inequality mostly in the early stages of government efforts toward reducing income inequality. In the paper it is argued that combating cross-border tax avoidance is of the first-order importance for reducing income inequality instead of increasing statutory tax rates or progressivity of taxes. Research results are robust to changes of sampling period and lagging independent variables.

Keywords: *taxes, income redistribution, income inequality, Gini coefficient, European Union*

Sažetak

U radu se testira uloga poreza u smanjenju dohodovne nejednakosti u članicama Evropske unije. Koristeći podatke Eurostata o Gini koeficijentima u periodu od 14 godina, utvrđen je blagi rastući trend dohodovne nejednakosti. Glavni nalazi ukazuju na to da porezi imaju negativan i statistički značajan uticaj na dohodovnu nejednakost, premda je taj uticaj relativno slab. Rezultati kvantilne regresije ukazuju na to da je redistributivna snaga poreza najveća u društvima sa najvećom nejednakošću i vice versa. To ukazuje na to da porezi smanjuju dohodovnu nejednakost mahom u ranim fazama napora vlade ka umanjenju dohodovne nejednakosti. U ovom radu se tvrdi da je sprečavanje prekograničnog izbegavanja poreza od primarnog značaja za umanjenje dohodovne nejednakosti, pre nego povećanje propisanih poreskih stopa ili progresivnosti poreza. Rezultati istraživanja su robustni na promene perioda uzorkovanja i odloženih efekata nezavisnih varijabli.

Ključne reči: *porezi, redistribucija dohotka, dohodovna nejednakost, Gini koeficijent, Evropska unija*

Introduction

In modern societies, governments use taxes as a tool for fulfilling many different objectives. For instance, taxes may be used to allocate resources and provide public goods and services, to mitigate market imperfections or to alter the behavior of individuals and companies. In addition, taxes enable governments to deduct the wealth from certain economic agents and distribute it to the others.

Concerns about income inequality across the society are one of the main reasons for introducing taxes. In this regard, redistributive function of the public finance promotes the idea of the welfare state, though a degree to which developed countries intervene considerably differs [20]. Many authors [29] add that the redistributive function is one of the first-order factors in discussions on optimal taxation.

Government policies toward reducing income inequality have always been controversial, mostly due to traditional trade-off between efficiency and equality. In other words, governments had to compare social welfare gains from redistribution programs and the economic costs of taxing individuals and companies.

The extent to which taxes are able to reduce income inequality has become one of the most important questions for economists [12]. In this regard, Shin [39] argues that higher taxes are an effective tool for reducing income inequality only in near steady states, but not in the state at the early stage of economic development. The relation between taxes and income inequality becomes more complex if the indirect effects on income distribution (i.e. behavioral responses of economic agents to the tax system) are taken into account [35]. In addition, tax avoidance, tax evasion and tax-motivated hiding of wealth make the estimation of income inequality harder, thus complicating the relation between taxes and income inequality.

Given the importance of income inequality, many research studies dealt with the determinants (i.e. key drivers) of income inequality. However, the previous research did not reach a consensus regarding the key determinants. In particular, it is hard to reach a consensus in cross-country analysis [31]. Taxes are just one of the many factors that are believed to significantly impact income inequality.

The logic that underlies the impact of taxes on income inequality may be explained in at least two ways. First, taxes may have a redistributive role by themselves and, in this way, may impact income inequality directly. It especially refers to progressive taxes such as personal and, in many countries, corporate income tax. However, such impact may be mitigated by some other regressive taxes (in particular, value-added tax) and the implementation of flat personal and corporate income tax scheme. Second, higher tax burden means a higher government potential to reduce inequality as governments have more resources to redistribute to the low-income layers of society. In this way, taxes indirectly impact income inequality. As a result, a negative relation between tax burden and income inequality may be assumed.

Research subject in the paper is income inequality in the EU. In general, prior research studies on income inequality are inconclusive, primarily due to the diversity and inconsistency of estimation methods and datasets, including gaps and errors in the underlying data [4]. Therefore, income inequality is still an attractive research issue despite abundant past evidence. In addition, the attractiveness of income inequality stems from the ever-present changes in societies and economics and, as a result, changes in the level of income inequality. Some authors also find increasing income inequality in developed countries [7], [43], thus raising many concerns about the unequal developed societies.

Income inequality in the EU has been subject of extensive academic research in economic and sociology literature [23], [26]. This research issue became particularly attractive after the EU enlargement toward Eastern Europe countries [23].

There are two main objectives of the paper. Firstly, the paper aims to examine the impact that taxes have on income inequality in 28 EU members. In addition, given the variety in the EU-28 regarding tax burden and income inequality, the second objective of the paper is to examine the magnitude of the impact of taxes at the different levels of income inequality distribution.

Although many papers studied the impact of taxes on income inequality in the EU [6], [23], [26], to our knowledge, this is one of the first research to cover each

EU-28 country. In addition, motivated by the prior research [6], [26] finding that taxes impact income inequality at the different magnitude in different parts of the EU, this is the first such paper that employs quantile regression methodology. This methodology should help in determining the role of taxes in reducing income inequality at different levels of income inequality distribution.

The paper contributes to the existing literature on the ability of the EU governments to reduce income inequality by increasing the tax burden. This paper actualizes the research results on the income inequality in the EU and expands them across the whole EU-28 territory. In addition, the paper sheds the light on the potential different impact of taxes on the income inequality at different parts of the income inequality distribution. In other words, we suggest that taxes do not have universal impact on the income inequality, but that such impact depends on the level of income inequality of the specific country.

We believe that many interest groups may benefit from the research results. First, national governments that strive to reduce income inequality may benefit from the findings on the ability of taxes to reduce income inequality. Quantile regression should enable governments of both egalitarian and unequal societies to make conclusions about the magnitude of taxes in reducing income inequality. Second, the EU governing bodies strive to enhance economic and social cohesion across the whole Union. In addition, the EU actions toward tax harmonization should be expected in the future. Therefore, the research results may help the EU governing bodies when deciding on the optimal relation between taxes and income inequality and when analyzing the convergence between countries.

The paper is structured as follows. After the introduction, it is presented literature review and hypotheses development, followed by the section devoted to variable selection, data and methodology. Then, the research results are presented. The final section of the paper offers conclusion remarks and policy implications of the research results.

Literature review and hypotheses development

The first question regarding income inequality is whether the government wishes to alter income distribution through redistributive policies or to leave the market to freely distribute income. Joumard et al. [27] argue that countries vary in terms of the volume of redistribution, as countries with more unequal distribution of market income tend to redistribute more. Doerrenberg & Peichl [18] conclude that world-wide governments seem to be interested in reducing income inequality as social-democratic and conservative economies appear to have lower income inequality. In addition, Eastern European countries experienced an important increase in income inequality after the transition from socialism to democracy in 1980s and 1990s, though income inequality in Eastern Europe was still lower than in many other regions in the world [30]. On the other hand, de Mello & Tiongson [16] find that unequal societies do spend less on redistribution.

Income inequality and the impact of taxation on income inequality have been widely studied in the past. However, there is much disagreement about the facts and explanations of income inequality [7]. In particular, research on these topics is abundant in developed territories. One of the reasons may be found in the fact that historical data on income inequality is, in general, more available in industrial countries and high-income developing countries [17]. Nolan et al. [31] provides the recent overview on the income inequality research in developed countries.

In the EU context, prior studies on the relation between taxes and income inequality only rarely captured the whole EU territory. In this regard, Jara & Tumino [26] and Avram et al. [6] worked with each-country sample (EU-27 at that time). In addition, Obadić et al. [32] cover each of the EU-28 countries.

Previous research find important differences in income inequality not only between European countries [6], [23], but also between regions within the European countries [13], [34], [36]. Giammatteo [24] showed that EU members have lower income inequality than other European countries. In addition, Milanovic [30] finds important cross-continental differences in income inequality. Perugini & Martino [34] argue that differences in income inequality may be attributed, *inter alia*, to institutional settings of labor market and regional labor market features. Čok et al. [14] find that even countries with the same socioeconomic background may have different income inequality levels.

On the other hand, Perugini & Martino [34] and Castells-Quintana et al. [13] find a positive impact of income inequality on regional growth, supporting the trade-off theory between efficiency and equality.

There are also conflicting findings on the trend of income inequality in recent decades. While some research find increasing trend, other research find the declining trend of income inequality. Increasing income inequality is observed in OECD (Organization for Economic Co-operation and Development) countries as a result of technological changes and globalization [7] and increased labor flexibility, decline in power of trade unions and retrenchment of public social spending [43].

Many research studies point out a declining trend of income inequality in EU-15 countries. Sylwester [41] compares income inequality (as measured by Gini coefficient) in 1970 and 1990 and shows the examples of France and Italy that reduced their Gini coefficients for more than twenty percent. Verbist & Figari [44] compare Gini coefficients in 1998 and 2008, finding that more EU-15 countries reduced rather than increased their Gini coefficients. On the other hand, Fuest et al. [23] stress that wide differences in income inequality in the EU are particularly evident after the EU enlargement toward Eastern Europe. Such findings may serve as a support for the concepts of the 'core vs. periphery in the EU' or 'two-speed EU' development.

Despite some efforts toward harmonization, national tax systems of EU members are still considerably different. Some countries, such as France or Scandinavian EU members impose relatively high tax burden (both to individuals and firms), while some other countries opted for lower tax rates. Lower tax rates are particularly evident in lower-income EU members and Vogiatzoglou [45] claims that relatively low tax burden enhanced foreign direct investments in Eastern EU members (Baltic countries, Visegrad Group countries and Slovenia). In fact, lowering tax rates is part of tax competition, intensified in the last three decades. Traub & Yang [42] develop a two-country model showing that tax competition increases income inequality.

While some EU countries impose relatively high statutory tax rates and/or have strong tax enforcement, some other EU members are considered tax havens or conduit countries as a route to the tax havens. For instance, the Republic of Ireland has been accused of providing an illegal state aid that enabled US giant Apple to achieve enormous tax savings [10], Luxembourg offers tax benefits to the multinational companies through advanced tax rulings [25], while the Netherlands is considered the world-wide largest conduit country as a route to the tax havens [46].

Prior research studies in the EU find significant role of tax-benefit system in reducing income inequality [6], [23], [26], [32]. Taxes and social contributions are considered the most important contributors to the income inequality reduction [23], though a degree of this contribution differs across the EU countries [26]. Avram et al. [6] find that tax-benefit systems reduce income inequality least in some newer EU members, such as Bulgaria, Cyprus, Latvia, Lithuania and Malta.

Jara & Tumino [26] find that share of taxes and benefit in disposable income is relatively large in Nordic countries and less important in Southern and Eastern European countries. On the other hand, Rodriguez-Pose & Tselios [36] argue that income inequality is lower in regions with Nordic family structures. Such evidence on Nordic countries supports the assumption of a negative impact of taxes on income inequality.

A taxation system may also determine the effectiveness of taxes in reducing income inequality. In this regard, Burman [12], Duncan & Peter [19] and Zee [48] argue that progressive taxes may contribute more to the income inequality reduction. Zee [48] adds that progressive taxation system would reduce income inequality stronger the more unequal the income distribution is.

On the other hand, Tridico [43] analyses income inequality determinants in OECD countries and includes top tax rate on earned income and tax on dividends (both by firms and individuals) as independent variables. He finds negative, but statistically insignificant impact of these tax variables on income inequality. Avram [5] studies the effects of tax allowances and tax credits in personal income tax on income inequality and finds that these tax instruments tend to significantly impact income inequality only in one of the six studied EU countries (tax allowances in Germany and tax credits in Italy). Such results may imply that certain types of taxes do not impact

the income inequality, but the whole tax revenue taken altogether may reduce income inequality. Such conclusion is also supported by Joumard et al. [27], stating that some countries with relatively small taxes achieve the same redistributive impact as countries with higher taxes, as they rely more on progressive income taxes.

It should be noted that not only the volume of tax revenue determines income inequality, but also the way of allocating tax revenue resources across the society. D'Agostino et al. [15] find that some EU countries (such as Greece, Italy and Poland) were not able to significantly reduce income inequality despite high social transfers and emphasize the importance of quality institutions in preventing corruption and low efficiency of public spending. Filauro & Parolin [21] also emphasize the importance of strengthening the egalitarian institutions, adding that quality institutions are more consequential than economic convergence for reducing income inequality in the EU.

However, the relation between taxes and income inequality is far more complex than simple analysis of tax revenue and income inequality statistics. Many research studies point out that some parts of society hide considerable portion of their wealth due to tax avoidance motives. Atkinson et al. [8] particularly point to rich layers of society as they have a strong incentive to understate their taxable incomes, adding that both rich individuals and rich companies seek to maximize their wealth on the tax-favorable basis. Wong & Ribeiro [47] add that the richest groups of society that hide significant part of their wealth distort the income inequality statistics. These arguments may imply that the official income inequality is underestimated due to tax-motivated large hidden wealth.

Roine [37] develops a model suggesting that the richest part of the population will always invest in tax avoidance. Some papers [2], [3] point out the role of tax havens in the increase of income inequality, suggesting that a very little percent of the richest households evade a relatively high portion of their taxes, and that tax havens are a tax planning tool available exclusively to the richest layers of the society. Sikka [40] argues that a special role in increasing income inequality may be attributed to big accounting firms offering complicated tax avoidance schemes to rich individuals and rich companies. These findings may imply that not only the taxes collected or increased statutory tax rates reduce inequality itself, but also the measures toward tackling tax avoidance implemented by national and supranational tax authorities.

Given the results of prior research in the EU that dominantly find that taxes contribute to the income inequality reduction, in the paper is hypothesized that taxes have a statistically significant negative impact on income inequality. In addition, there are wide differences across the EU countries regarding income inequality, tax burden and the degree to which taxes contribute to the income inequality reduction. Therefore, in the paper is also hypothesized that the impact of taxes on income inequality is different on the different parts of income inequality distribution. In this regard, the research hypotheses are formulated as follows:

H_1: *Taxes have a statistically significant negative impact on income inequality.*

H_2: *The impact of taxes of income inequality is different on the different parts of income inequality distribution.*

Variable selection, data and methodology

Several income inequality measures have been developed in the past. For instance, Frank [22] employs many different measures, such as Gini coefficient, Atkinson index or Theil entropy index. In this paper, we measure income inequality by Gini coefficient of equivalised disposable income (GINI). Gini coefficient is probably the most widely used statistical measure of income inequality [1] and most widely used measure in the EU-related research [6], [13], [23], [26], [34], [44]. On the other hand, Beblo & Knaus [11] and Rodriguez-Pose & Tselios [36] use Theil entropy index to measure income inequality in the EU.

Gini coefficient enables intuitive interpretation and comparison with other studies [23]. The value of Gini coefficient usually varies between 0 and 1, as value 0 implies perfect equality while value 1 implies perfect inequality. Analogously, following the Eurostat methodology, Gini coefficient in this paper varies between 0 and 100.

We measure tax burden in the country by total receipts from taxes and social contributions as a percent of gross domestic product (TAX). Alternatively, tax burden may

be measured using statutory tax rates. However, we have ignored this measure since statutory tax rates do not capture, for instance, the effects of tax credits, tax exemptions, tax deductions and company's tax planning [38].

The impact of taxes on income inequality is controlled for the impact of some macroeconomic and demographic factors. In line with the prior research [30], [36], [41], [43], the following control variables are used: gross domestic product per capita (GDP), unemployment rate (UNEMPL), population age (AGE) and education attainment (EDUC). Based on the findings of these prior research studies, we expect positive impact of GDP, UNEMPL and EDUC on income inequality, and negative impact of AGE on income inequality. Table 1 presents the definition of employed variables.

Many additional control variables were considered but not incorporated in the research model due to exceptionally high correlation with employed variables. For instance, total general government expenditure (Eurostat data code: gov_10a_main) appears to have Pearson's correlation coefficient *r* of 0.7977 with TAX, while at-risk-of-poverty rate (Eurostat data code: ilc_li02) has coefficient *r* of 0.8809 with GINI. Some other control variables were not considered due to data unavailability for the whole sampling period.

In order to ensure consistency and reliability of the research results, we retrieved the whole data from the Eurostat database (ec.europa.eu/eurostat). Doerrenberg & Peichl [18] note that blending data from different sources in income inequality analysis may be doubtful as different data sources measure income inequality highly inconsistently. GINI estimates in this paper are based on the EU-SILC (Statistics on Income and Living Conditions) data. In addition, it is worth noting that data on income inequality have been considered in the past as doubtful [30] since they are based on household surveys.

We chose a sampling period between 2005 and 2018 due to data availability. In fact, most of the variables have data available from 2000 – however, we chose 2005 as a starting point since 2002, 2003 and 2004 Gini coefficients are not available for more than half of the EU members. In addition, using 2005 as a starting point ensures relative research homogeneity since it covers only the period after big EU enlargement in 2004 when ten countries became the EU members.

Covering 28 EU members across the period of fourteen years, the initial sample consists of 392 observations. However, Gini coefficient is not available for eight observations, so the econometric analysis is conducted using an unbalanced panel of 384 observations.

The regression method has been inevitably used in analyzing the impact of taxes on income inequality. Like many authors [32], we use panel regression analysis, but also upgrade it, using a quantile regression analysis. In line with defined variables, it is possible to formulate the basic regression equation for the country *i* in the year *t* as follows:

$$GINI_{i,t} = \beta_0 + \beta_1 TAX_{i,t} + \beta_2 GDP_{i,t} + \beta_3 UNEMPL_{i,t} + \beta_4 AGE_{i,t} + \beta_5 EDUC_{i,t} + \varepsilon_{i,t} \quad (1)$$

The regression analysis begins with Ordinary Least Squares (OLS) estimates, though there are also Random Effects (RE) and Fixed Effects (FE) model estimations. Breusch-Pagan LM test and Hausman test were used to determine the most appropriate regression model, choosing between OLS and RE estimation, and RE and FE estimation, respectively. Multicollinearity doubts are eliminated using the analysis of Pearson's correlation matrix and variance inflation factors.

In order to examine the possible different impact of taxes on income inequality on different parts of income inequality distribution, we also employ a quantile

Table 1: Definition of variables

Label	Description	Eurostat data code
GINI	Gini coefficient of equivalised disposable income – EU-SILC survey	ilc_di12
TAX	Total receipts from taxes and social contributions (including imputed social contributions) after deduction of amounts assessed but unlikely to be collected, as a percent of gross domestic product	gov_10a_taxag
GDP	Natural logarithm of purchasing power adjusted gross domestic product per capita	sdg_10_10
UNEMPL	Number of unemployed persons as a percentage of the labor force	tipsun20
AGE	Median age of population	demo_pjanind
EDUC	Percent of population aged 15-64 with less than primary, primary and lower secondary education	edat_lfse_03

regression. Quantile regression, originally proposed by Koenker & Bassett [28], enables the estimation of impact of independent variables on dependent variable at different levels of the dependent variable distribution. Besides providing different estimators for each quantile, an additional advantage of quantile regression is a less sensitivity to outliers. Bang et al. [9] summarize that quantile regression has become a common method in income distribution analysis. However, to our knowledge, this is the first research to study the impact of taxes on income inequality using quantile regression. To obtain as detailed as possible results, in the paper are used ten quantiles or deciles.

Research results

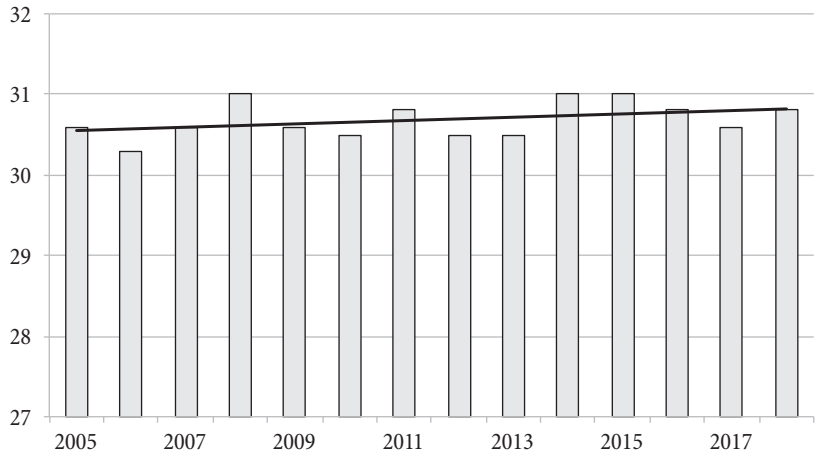
Descriptive statistics

Table 2 shows descriptive statistics for each employed variable. In the observed period, the lowest value of Gini coefficient is reported in Slovakia in 2018, while the highest value is reported in Bulgaria in 2017. It is interesting to point out that ten observations with the lowest Gini coefficient regard Denmark, Sweden, Slovakia and Slovenia. On the other hand, ten observations with the highest Gini coefficient regard Latvia, Lithuania, Bulgaria, Romania and Portugal.

If Gini coefficients in 2005 and 2018 are compared, it may be observed that 13 EU members increased, while 12 countries reduced Gini coefficient. For three countries (Bulgaria, Croatia and Romania), the Gini coefficient for 2005 is not available. In this regard, Luxembourg had the largest increase (from 26.5 to 33.2), while Poland had the largest decrease (from 35.6 to 27.8) of Gini coefficient.

As the Gini coefficient is the main variable of interest, we tracked the trend of this variable. Figure 1 presents the dynamics of Gini coefficient in the EU-28 with the linear trendline. It could be noticed that income inequality during the observed period was relatively stable, though with slight growing linear trend.

Figure 1: The dynamics of Gini coefficient in the EU-28



Note: Based on the Eurostat (online data code: ilc_di12); the period 2005-2009 refers to the EU-27 due to data unavailability for Croatia

Table 2: Descriptive statistics (2005-2018)

	GINI	TAX	GDP	UNEMPL	AGE	EDUC
Mean	29.8979	36.4939%	10.0815	8.7974%	40.5712	28.2355%
Minimum	20.9000	23.0000%	8.9746	2.2000%	33.3000	11.7000%
25th percentile	26.6000	32.1000%	9.8456	5.9000%	39.3750	20.0000%
Median	29.7000	36.0500%	10.0900	7.7000%	40.7000	25.4000%
75th percentile	33.1250	41.0500%	10.3328	10.1250%	42.1000	31.9500%
Maximum	40.2000	49.9000%	11.2810	27.5000%	46.3000	72.7000%
Standard deviation	3.9128	5.8689%	0.3906	4.3233%	2.3467	12.2363%
Observations	384	392	392	392	392	392

The highest level of taxes and contributions (as a percent of gross domestic product) is reported in Denmark in 2014, while the lowest level is reported in the Republic of Ireland in 2018. In addition, ten observations with the highest level of taxes and contributions regard Belgium, Denmark and France, while ten observations with the lowest level of taxes and contributions regard Bulgaria, the Republic of Ireland and Romania.

In the levels of taxes and contributions in 2005 and 2018 are compared, we may conclude that 20 EU countries increased (most in Greece, from 33.5% to 41.5%), while remaining eight EU members reduced it (most in the Republic of Ireland, from 31.4% to 23%).

Among control variables, the highest value of gross domestic product per capita is reported in Luxembourg in 2018, while the lowest value is reported in Romania in 2005. Greece had the highest unemployment rate in the sample, in 2013, while Czech Republic reported the lowest unemployment rate in the sample, in 2018. The oldest population is reported in Italy in 2018, while the youngest population is reported in the Republic of Ireland in 2007. The highest level of education indicator is reported in Portugal in 2005, while the lowest value is reported in Lithuania in 2018.

Univariate analysis

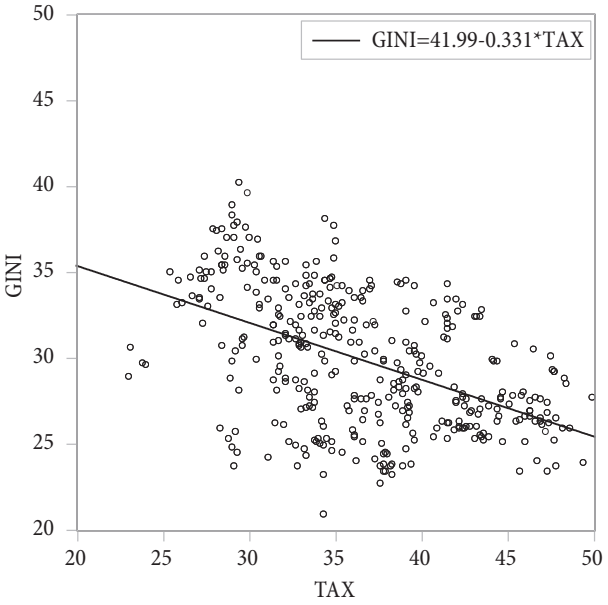
Table 3 presents the correlation matrix with Pearson's correlation coefficients *r* reported. We do not expect multicollinearity problems as there is no highly strong correlation (for instance, higher than 0.7) between independent variables.

The main variable of interest, GINI, appears to have the strongest correlation with TAX. In fact, GINI is the only variable that is correlated at statistically significant levels with each variable employed in the research model. On the other hand, the strongest correlation among independent variables appears between TAX and GDP.

Regression analysis

Figure 2 shows a simple scatter diagram with simple regression between taxes and Gini coefficient. Declining regression line implies that increasing TAX for 1% results in statistically significant decrease in Gini coefficient for 0.331.

Figure 2: TAX-GINI scatter diagram (2005-2018)



However, the relation between taxes and income inequality should be controlled for the impact of specified control variables and include random or fixed effects. Therefore, Table 4 presents the linear regression estimates with OLS, RE and FE models reported. In each regression model, variance inflation factor for each employed variable is lower than ten, confirming the inexistence of multicollinearity problems.

Table 3: Pearson's correlation matrix (2005-2018)

n = 384	GINI	TAX	GDP	UNEMPL	AGE	EDUC
GINI	1.0000					
TAX	***-0.4987	1.0000				
GDP	***-0.4085	***0.5002	1.0000			
UNEMPL	***0.3459	***-0.1622	***-0.3276	1.0000		
AGE	**0.1002	***0.3337	-0.0292	0.0474	1.0000	
EDUC	***0.2118	0.0786	0.0689	***0.1320	-0.0245	1.0000

Note: statistically significant at the level of 10% (*), 5% (**) and 1% (***).

Breusch-Pagan LM test showed that RE regression model outperformed OLS model. On the other hand, Hausman test suggests that FE regression estimates should have priority over RE estimates. However, the impact of taxes on income inequality is relatively consistent throughout the presented regression models.

Table 4: Linear regression estimates (2005-2018)

	Expected sign	Dependent variable: GINI		
		OLS	RE	FE
Intercept		***29.7370 (4.3446)	***75.8258 (6.9319)	***68.8237 (4.5536)
TAX	-	***-0.3576 (-10.4068)	***-0.1479 (-3.2589)	*-0.0948 (-1.6603)
GDP	+	-0.8582 (-1.5505)	***-3.1040 (-3.1248)	-1.8096 (-1.2527)
UNEMPL	+	***0.2041 (4.9636)	0.0512 (1.5932)	*0.0662 (1.8249)
AGE	-	***0.4502 (5.2306)	***-0.3446 (-2.6665)	***-0.5429 (-3.6196)
EDUC	+	***0.0750 (5.6666)	***0.0984 (3.5437)	***0.0921 (2.6629)
Year dummies		Yes	Yes	Yes
Adjusted R^2		0.4353	0.1169	0.8892
F-value		***17.4024	***3.8171	***69.3122
Period		2005-2018	2005-2018	2005-2018
Observations		384	384	384

Note: beta coefficients in front of parentheses, t-values in parentheses; statistically significant at the level of 10% (*), 5% (**) and 1% (***).

In line with theoretical predictions, the presented regression outputs indicate that the impact of taxes on income inequality is negative and statistically significant. Therefore, *the first research hypothesis cannot be rejected*. However, this impact is relatively weak as an increase in tax burden for 1% reduces income inequality for only 0.3576% (OLS model), 0.1479% (RE model) or 0.0948% (FE model).

Therefore, research results indicate that the redistributive function of taxes in the EU-28 is far from perfect. As pointed out in D'Agostino et al. [15], some macroeconomic or sociological factors (such as high corruption or low quality of institutional setting) may explain low redistributive power of taxes. On the other hand, national tax authorities may decide to increase tax burden (through increase of statutory tax rates or elimination of tax exemptions and tax credits) or progressivity of taxes.

However, we argue that increasing the tax burden or progressivity of taxes are not the key measures to enhance the redistributive function of taxes. In fact, the redistributive effects of increased tax burden would be (at least partially) offset by increasing tax avoidance – by the richest individuals and companies, in particular. Therefore, the first task for governments should be to combat tax avoidance and, then, to redesign the current national tax systems.

Although it is hard to quantify accurately, national tax authorities within the EU probably have billions of euros in lost tax revenue each year due to tax avoidance. Due to integration of national markets and globalization of economies, cross-border tax avoidance is available more than ever before. The richest individuals in a society may move their money abroad (usually in some high-secrecy and low-tax jurisdictions), while the richest companies incorporate subsidiaries in tax havens and account the largest portion of their profits in such jurisdictions. As per rule, cross-border tax avoidance requires some investments in tax planning and, as a result, only the richest layers of society can afford such tax avoidance mechanisms. Therefore, if statutory tax rates or progressivity of taxes are increased, the richest layers of society would be increasingly motivated to invest in tax planning and move their wealth abroad.

Considering that tax avoidance is a cross-border phenomenon, national tax authorities are not able to combat it by themselves. On the other hand, the full cooperation between national tax authorities becomes an imperative. Some of the efforts in the EU have been conducted (for instance, Anti Tax Avoidance Package, Base Erosion and Profit Shifting, or Code of Conduct in Business Taxation), though they have not been fully effective yet.

Governing bodies of the EU should recognize that modern tax havens are not placed only in exotic Caribbean islands, but also on the EU territory. In addition, they should recognize that conduit countries (serving as a route to the traditional tax havens) make almost similar damage to income inequality as the traditional tax havens. The EU should also revise their criteria for blacklisting countries that have tax haven features. A list of tax havens by the EU is published and updated, but the blacklisting criteria are not applied to the EU members. Non-government organization Oxfam

[33] argues that as many as five EU countries (Cyprus, Luxembourg, Malta, the Netherlands and the Republic of Ireland) should be considered tax havens if the EU blacklisting criteria is applied to them.

Eliminating the role of conduit countries within the EU would heavily hit traditional tax havens since the companies would be demotivated to shift profits to low-tax jurisdictions as they would have to pay withholding tax on such transfers. This would surely result in higher corporate tax revenues for the European national tax authorities. In addition, higher corporate tax revenues would enable governments to reduce indirect tax burden in the EU countries and to rely on indirect taxes to a lesser extent. Since indirect taxes are usually regressive (most heavily impact the lower-income layers of society), it is rational to assume that lower relying on indirect taxes would reduce the regressivity of national tax systems and make the society more egalitarian.

Regarding control variables, the impact of unemployment and education is in line with expected as higher employment and higher education attainment leads to a more egalitarian society. The impact of age of the population depends on the employed regression model. Contrary to the research predictions, the impact of gross domestic product per capita on income inequality is negative.

Table 5 presents the results of quantile regression with the impact of taxes on income inequality reported on each decile of the income inequality distribution. In this regard, the impact of taxes on income inequality is negative and statistically significant throughout the whole income inequality distribution.

Quantile regression estimates suggest that the redistributive function of taxes has a lowest magnitude on the first deciles, and the highest magnitude on the latter deciles of the income inequality distribution. For instance, on the first decile a one percent increase in tax burden reduces income inequality for only 0.1522%, while on the ninth decile a one percent increase in a tax burden reduces it for 0.3927%. Since the taxes have a different impact on income inequality at the different levels of the income distribution, *the second research hypothesis cannot be rejected*.

It may be concluded that taxes are the most efficient in redistributing income when income inequality is relatively high. Therefore, taxes may be a successful tool for income inequality reduction in early stages of income inequality reduction. On the other hand, as a society becomes more egalitarian, the redistributive power of taxes declines. The results also imply that governments of countries with low income inequality should not rely only on taxes to

Table 5: Quantile regression estimates (2005-2018)

Quantile	Dependent variable: GINI					
	C	TAX	GDP	UNEMPL	AGE	EDUC
Expected sign		-	+	+	-	+
0.1	**20.6261 (-2.0552)	**-0.1522 (-2.1075)	***3.1155 (4.7199)	***0.4036 (10.2180)	0.3506 (1.5347)	***0.0989 (7.0023)
0.2	-4.8672 (-0.3818)	***-0.1936 (-3.0061)	*1.5880 (1.9096)	***0.3825 (10.2755)	*0.4089 (1.6817)	***0.0857 (4.5166)
0.3	26.4072 (1.6115)	***-0.2659 (-4.7508)	-0.9665 (-0.9292)	***0.2183 (4.2396)	*0.3918 (1.8322)	***0.1046 (4.2165)
0.4	***33.4351 (3.7239)	***-0.3079 (-8.1096)	*-1.2596 (-1.8367)	***0.1712 (3.9144)	***0.3851 (3.9958)	***0.0890 (4.4384)
0.5	***41.6862 (5.5508)	***-0.3392 (-8.7424)	***-1.8240 (-2.7146)	***0.1676 (4.5920)	***0.3794 (5.1993)	***0.0738 (4.2570)
0.6	***42.1259 (5.5042)	***-0.3492 (-8.8110)	**-1.7061 (2.4185)	***0.1535 (4.2738)	***0.3866 (5.5408)	***0.0692 (4.3133)
0.7	***48.5366 (6.4585)	***-0.3587 (-8.9916)	***-2.0540 (-2.8548)	***0.1305 (3.3793)	***0.3414 (5.3127)	***0.0708 (4.1591)
0.8	***49.7526 (6.1206)	***-0.3966 (-9.4892)	**-1.7139 (-2.3539)	***0.1207 (2.6579)	***0.2700 (3.2890)	***0.0777 (3.7426)
0.9	***53.7338 (4.8557)	***-0.3927 (-8.0230)	**-1.6514 (-1.9771)	*0.1135 (1.7976)	0.1836 (1.3614)	***0.0813 (3.3144)

Note: beta coefficients in front of parentheses, t-values in parentheses; statistically significant at the level of 10% (*), 5% (**) and 1% (***); year dummies included.

further reduce income inequality, but to combine taxes with some other factors.

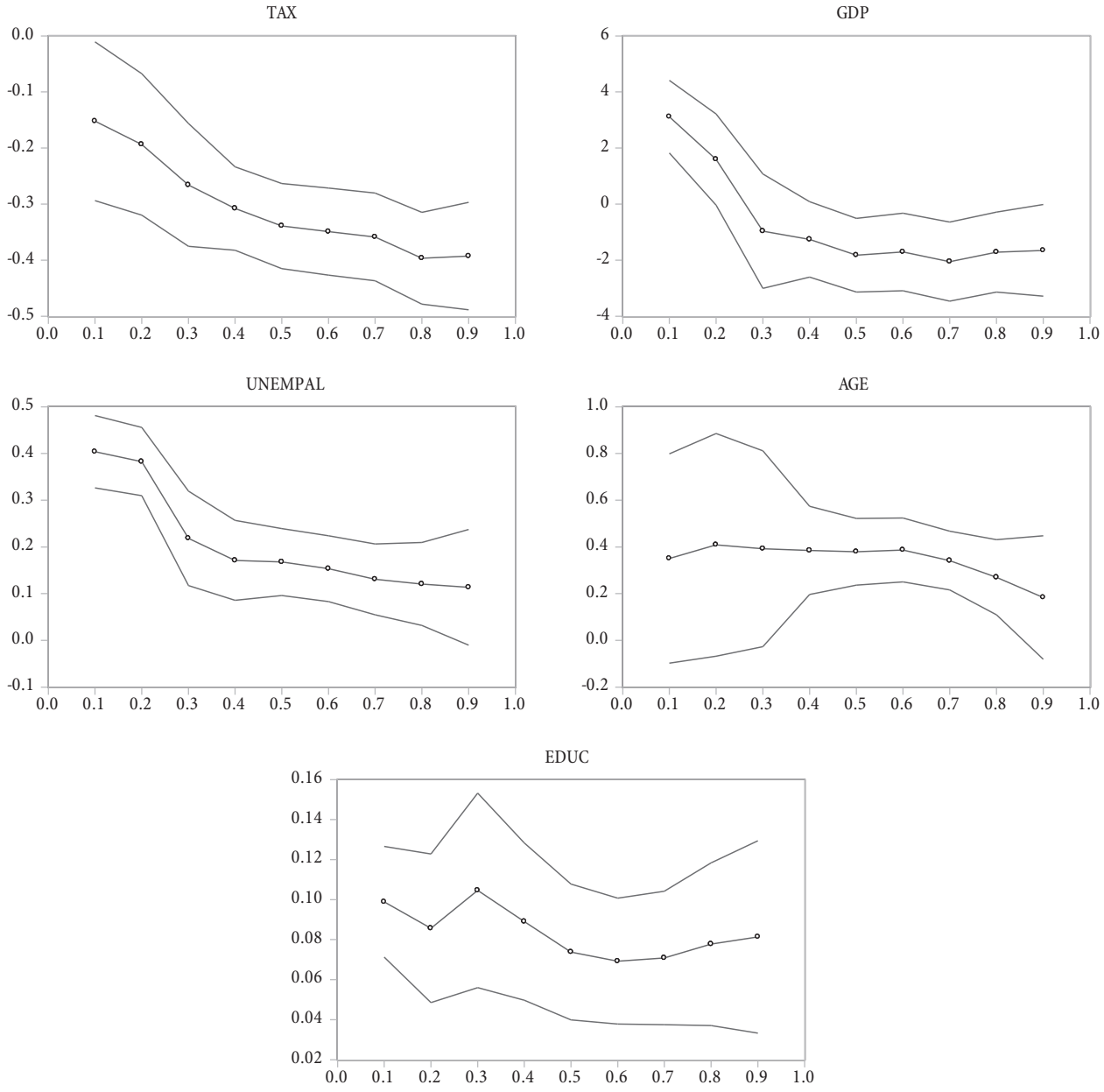
Taxes, unemployment and education are the variables that have statistically significant impact on income inequality on each decile of income inequality distribution. In this regard, the power of unemployment in increasing income inequality declines throughout the income inequality distribution.

Figure 3 graphically presents the impact of employed independent variables on the income inequality on different parts of income inequality distribution. A 95% percent confidence intervals are also presented. Regarding the impact of taxes, confidence intervals at each decile are placed below the null line.

Robustness analysis

We check the robustness of the research results by changing the sampling period and lagging independent variables. First, we extent a sampling period for five years to cover the period between 2000 and 2018. The added period between 2000 and 2004 may significantly impact research results since it captures the current EU members in the period before big enlargement in 2004. Therefore, a

Figure 3: Quantile regression estimates with 95% confidence intervals (2005-2018)



sample comprises an important portion of observations that were not part of the EU. Regression estimates are presented in Table 6.

The impact of taxes on income inequality in the period 2000-2018 was quite similar to the original linear regression estimates. However, such impact in robustness analysis period is slightly stronger than the impact in original estimates. This may be due to the fact that arithmetic mean of GINI in EU-28 was lower in the period 2000-2018 (29.71) than in period 2005-2018 (29.90), while the arithmetic mean of TAX was almost unchanged (36.41% in the period 2000-2018 and 36.49% in the period 2005-2018).

Table 7 presents results of quantile regression for the extended period (2000-2018), confirming that the redistributive power of taxes increases throughout the income inequality distribution. Therefore, research results of the paper are robust to change of the sampling period. Graphical presentation of quantile regression estimates with confidence intervals for the period 2000-2018 is given in Appendix A.

Second, a time lag phenomenon is well-known in macroeconomic research. In this regard, it is possible that taxes affect income inequality not only contemporaneously, but also with a time lag. In order to test the existence of such time lag, we lag the independent variables at the first lag. Table 8 presents linear regression output, estimating the impact of taxes on income inequality in the following year.

The presented results confirm the original research results regarding the impact of taxes on income inequality.

Table 6: Linear regression estimates (2000-2018)

	Expected sign	Dependent variable: GINI		
		OLS	RE	FE
Intercept		***26.0759 (4.4761)	***33.5276 (3.8616)	*20.0920 (1.8198)
TAX	-	***-0.3751 (-11.6375)	***-0.2331 (-4.8399)	**-0.1466 (-2.4410)
GDP	+	-0.4381 (-0.8983)	-0.4569 (-0.5564)	1.1275 (1.0419)
UNEMPL	+	***0.1810 (4.6304)	0.0163 (0.4845)	0.0361 (0.9932)
AGE	-	***0.4299 (5.3071)	0.1041 (0.8285)	-0.0391 (-0.2676)
EDUC	+	***0.0823 (6.9120)	***0.1017 (3.9539)	***0.1058 (3.3107)
Year dummies		Yes	Yes	Yes
Adjusted R^2		0.4322	0.1386	0.8339
F-value		***16.0588	***4.1841	***46.6763
Period		2000-2018	2000-2018	2000-2018
Observations		456	456	456

Note: beta coefficients in front of parentheses, t-values in parentheses; statistically significant at the level of 10% (*), 5% (**) and 1% (***).

Table 7: Quantile regression estimates (2000-2018)

Quantile	Dependent variable: GINI					
	C	TAX	GDP	UNEMPL	AGE	EDUC
Expected sign		-	+	+	-	+
0.1	-13.8282 (-1.4790)	**-0.1096 (-2.1457)	***2.8373 (5.0738)	***0.3742 (8.0661)	0.2018 (1.0835)	***0.1066 (7.5982)
0.2	7.5589 (0.6083)	***-0.1718 (-3.0632)	1.0923 (1.3118)	***0.3488 (8.2008)	0.2091 (0.9637)	***0.1004 (4.6061)
0.3	***31.5618 (4.6359)	***-0.2582 (-3.9312)	*-0.9343 (-1.8501)	***0.2093 (3.8655)	0.2197 (1.3322)	***0.1160 (4.7016)
0.4	***31.3301 (5.6851)	***-0.3433 (-8.5558)	-0.7520 (-1.5938)	***0.1604 (3.7336)	***0.3224 (3.6341)	***0.0939 (4.9425)
0.5	***32.7709 (5.2892)	***-0.3841 (-10.4282)	*-0.9820 (-1.7234)	***0.1241 (3.0227)	***0.4094 (5.7767)	***0.0889 (5.2106)
0.6	***33.7181 (4.6657)	***-0.3926 (-10.8061)	-1.0073 (-1.4575)	***0.1597 (4.1296)	***0.4302 (6.4752)	***0.0893 (5.2320)
0.7	***46.0953 (5.4251)	***-0.3903 (-9.8029)	**-1.7742 (-2.1985)	**0.1097 (2.4840)	***0.3240 (4.6603)	***0.0837 (4.9475)
0.8	***49.6494 (5.5995)	***-0.4056 (-10.3815)	**-1.8013 (-2.2517)	**0.1105 (2.4638)	***0.2617 (3.2137)	***0.0881 (4.9116)
0.9	***51.0079 (3.6459)	***-0.4209 (-8.7605)	-1.5963 (-1.5496)	0.0830 (1.3226)	0.2155 (1.2796)	***0.0832 (4.4731)

Note: beta coefficients in front of parentheses, t-values in parentheses; statistically significant at the level of 10% (*), 5% (**) and 1% (***); year dummies included.

On the other hand, such impact is slightly stronger than the impact in original estimates. This may imply that taxes need some time, at least one year, to efficiently redistribute the income.

Table 8: Linear regression estimates with lagged independent variables (2005-2018)

	Expected sign	Dependent variable: GINI		
		OLS	RE	FE
Intercept		***28.5534 (4.2374)	***73.1213 (6.9580)	***69.9616 (4.9042)
TAX(-1)	-	***-0.3678 (-10.4598)	***-0.1850 (-4.0202)	**-0.1471 (-2.5624)
GDP(-1)	+	-0.7779 (-1.4161)	***-2.9083 (-3.0248)	-1.9771 (-1.4413)
UNEMPL(-1)	+	***0.1851 (4.4882)	0.0422 (1.3601)	0.0535 (1.5395)
AGE(-1)	-	***0.4676 (5.3894)	**-0.3012 (-2.2578)	***-0.4947 (-3.1775)
EDUC(-1)	+	***0.0757 (5.9444)	***0.1002 (3.7472)	***0.0988 (0.9678)
Year dummies		Yes	Yes	Yes
Adjusted R^2		0.4363	0.1232	0.8896
F-value		***17.4658	***3.9885	***69.5867
Period		2005-2018	2005-2018	2005-2018
Observations		384	384	384

Note: beta coefficients in front of parentheses, t-values in parentheses; statistically significant at the level of 10% (*), 5% (**) and 1% (***).

Table 9 presents the results of quantile regression with lagged independent variables. Lagging independent variables does not change the research results significantly as taxes have a different power in reducing next year's income inequality throughout the income inequality distribution. Therefore, research results of the paper are robust to lagging independent variables. The graphical presentation of quantile regression estimates with lagged independent variables and confidence intervals is given in Appendix B. The research results are also quite unchanged if second or third lag of independent variables are employed. However, these results are not tabulated due to reasons of space.

Conclusion

Income inequality is an ever-present attractive and controversial issue. We have tested the redistributive function of taxes, i.e. the power of taxes to reduce income inequality in the EU. In this regard, we have observed the period between 2005 and 2018 across the 28 EU countries.

During the observed period, income inequality in the EU was relatively stable, though with slight growing trend. However, dynamics of income inequality between the EU members considerably differs as some countries (such as

Table 9: Quantile regression estimates with lagged independent variables (2005-2018)

Quantile	Dependent variable: GINI					
	C	TAX(-1)	GDP(-1)	UNEMPL(-1)	AGE(-1)	EDUC(-1)
Expected sign		-	+	+	-	+
0.1	*-18.9993 (-1.9490)	**-0.1337 (-2.0959)	***2.9145 (4.1111)	***0.3934 (10.2177)	0.3479 (1.3674)	***0.0934 (7.0949)
0.2	-0.8742 (-0.0672)	***-0.1839 (-2.9562)	*1.5102 (1.6539)	***0.3742 (9.3844)	0.3176 (1.3265)	***0.0888 (3.7716)
0.3	**28.7226 (2.0475)	***-0.2587 (-3.9461)	-0.7369 (-0.7190)	***0.2078 (3.5465)	0.2654 (1.5542)	***0.1085 (4.3966)
0.4	***35.2659 (3.9746)	***-0.3266 (-8.0980)	**-1.4244 (-1.9903)	***0.1629 (4.1095)	***0.3838 (4.1038)	***0.0814 (4.3526)
0.5	***39.7566 (5.2544)	***-0.3545 (-9.2822)	**-1.5800 (-2.4514)	***0.1319 (3.4037)	***0.3773 (4.8972)	***0.0857 (4.7980)
0.6	***44.3188 (6.4307)	***-0.3749 (-10.0456)	***-1.8023 (-2.7673)	***0.1413 (3.9380)	***0.3675 (5.1515)	***0.0744 (4.3269)
0.7	***47.1948 (7.1840)	***-0.3860 (-10.1078)	***-1.7238 (-2.7627)	**0.0985 (2.5197)	***0.3195 (4.6708)	***0.0789 (4.4704)
0.8	***50.1487 (7.5396)	***-0.4161 (-11.5478)	***-1.7661 (-2.8540)	*0.0806 (1.9087)	***0.2728 (3.7372)	***0.0956 (4.9646)
0.9	***61.9822 (6.8506)	***-0.4046 (-9.6015)	***-2.3926 (-3.4254)	0.0194 (0.4280)	0.1645 (1.4743)	***0.0906 (4.0989)

Note: beta coefficients in front of parentheses, t-values in parentheses; statistically significant at the level of 10% (*), 5% (**) and 1% (***); year dummies included.

Poland) significantly reduced the income inequality, while others (such as Luxembourg) significantly increased it.

A linear regression analysis showed that taxes have a statistically significant negative impact on income inequality. This finding is in line with some prior research on the redistributive function of taxes in the EU [6], [23], [26]. However, this impact is relatively weak. We argue that combating cross-border tax avoidance may be a key to enhance the redistributive power of taxes instead of increasing statutory tax rates or progressivity of taxes. If cross-border tax avoidance is mitigated, the EU governments would collect more tax revenue from the richest layers under the same tax system and, therefore, more resources would be distributed to the lower layers of society. This logic may serve as a path for a more egalitarian society. In addition, this is in line with the arguments of Alstadsaeter et al. [2], [3] about the importance of mitigating cross-border tax avoidance for improving equality in the societies. We believe that this finding may be helpful for governing bodies in the EU as cross-border tax avoidance may be mitigated only with joint efforts of each EU country.

A quantile regression estimates showed that the impact of taxes on income inequality is not same on the different deciles of income inequality distribution. This finding is line with prior research [6], [26] on the different redistributive power of taxes across the EU countries. Taxes are most effective in reducing income inequality in the most unequal countries and *vice versa*. We believe that this finding may be helpful for national governments of the EU countries. In particular, governments of the most egalitarian countries should recognize that further reduction of income inequality requires the implementation of other instruments, not only the taxes. Additional statistical analysis was conducted using different sampling period and lagging independent variables. We have found that original research results are robust to such modifications.

The presented findings should be considered in the light of certain limitations. The research employed only Gini coefficient as the only income inequality measure available in the Eurostat database. In addition, research captures limited period due to data unavailability. Research also does not go beyond country-level data.

After the sampling period, the EU countries have experienced some important challenges, such as Brexit or Covid-19 virus crisis. However, the impact of these events on income inequality and redistributive function of taxes in the EU is left for future research.

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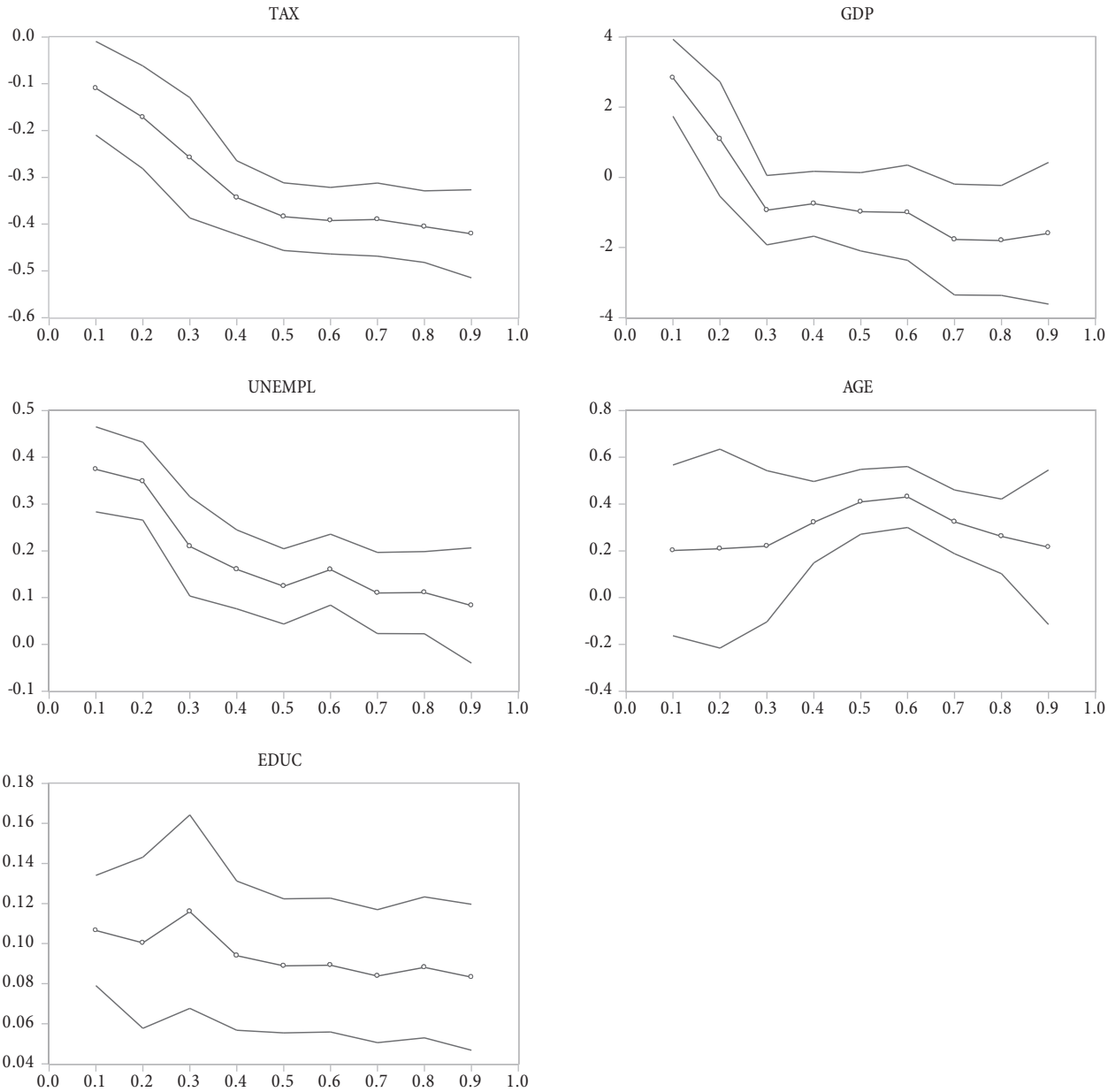
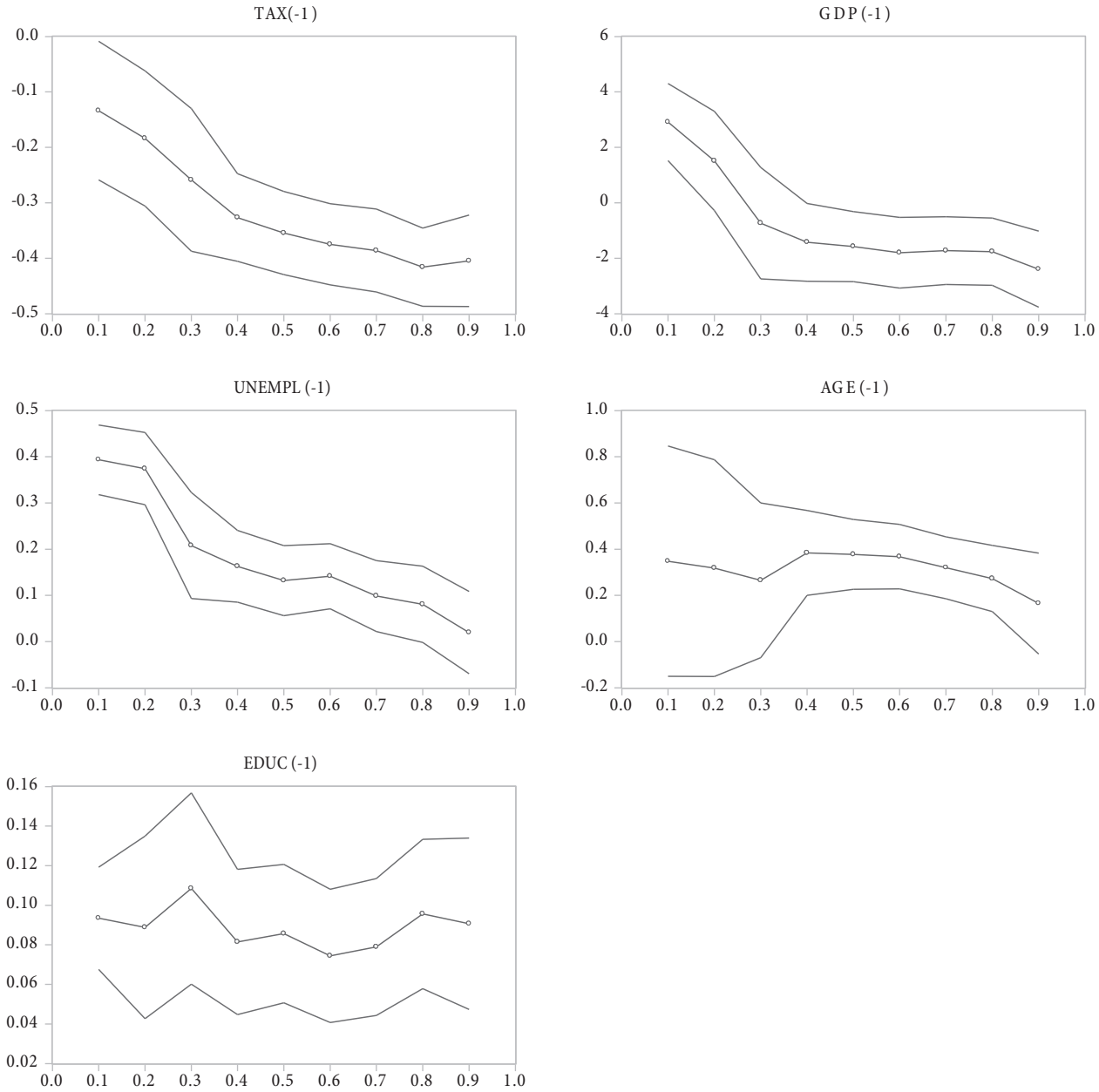
Appendix A

Quantile regression estimates with 95% confidence intervals (2000-2018)



Appendix B

Quantile regression estimates with lagged independent variables and 95% confidence intervals (2005-2018)



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INSPECTING THE INFLUENCE OF MACROECONOMIC FACTORS ON STOCK RETURNS: THE CASE OF SERBIA

Inspekcija uticaja makroekonomskih faktora na povrat akcija – slučaj Srbije

Abstract

In many developed economies, a stable financial market is the basis for the growth and development of a country's well-being. The movement of stock prices is, in many ways, a reflection of the development of the largest companies in a country. In this paper, we deal with the analysis of the impact of macroeconomic indicators such as inflation, interest rates, and exchange rates on stock prices on the stock market. The goal of the paper is a deeper understanding of how the movements of macroeconomic indicators affect the movement of stock prices and, at the same time, the economic growth of the largest companies. The analysis used monthly data on changes in inflation, interest rates, and exchange rates, together with the prices of shares of companies listed on the Belgrade Stock Exchange (BelexLine index) for the period from 2015 to 2021. The index itself contains a sample of 29 companies. The findings indicate the existence of a unidirectional relationship between interest rate changes and stock prices, and a bidirectional relationship between stock price changes and changes in inflation and interest rates. In addition to these two tests, the authors graphically show the impulse response of indicators as well as the decomposition of data variation, which indicates that the changes in stock price are explained mostly by the variance in the stock price itself. The results also indicate that the primary change of the BelexLine index to itself is positive, while in other periods there is a negative reaction, but at the end of the period, there is stabilization after the original occurrence of the shock.

Keywords: *stock exchange, BelexLine index, macroeconomic variables*

Sažetak

U mnogim razvijenim ekonomijama stabilno finansijsko tržište je osnova za rast i razvoj blagostanja jedne zemlje. Kretanje cena akcija je po mnogo čemu odraz razvoja najvećih kompanija u jednoj zemlji. U ovom radu bavimo se analizom uticaja makroekonomskih pokazatelja kao što su inflacija, kamatne stope i kursevi na cene akcija na berzi. Cilj rada je dublje razumevanje kako kretanja makroekonomskih pokazatelja utiču na kretanje cena akcija i, istovremeno, na privredni rast najvećih kompanija. U analizi su korišćeni mesečni podaci o promeni inflacije, kamatnih stopa i kurseva, zajedno sa cenama akcija kompanija koje se kotiraju na Beogradskoj berzi (BelexLine indeks), za period od 2015. do 2021. godine. Sam indeks sadrži uzorak od 29 kompanije. Nalazi ukazuju na postojanje jednosmernog odnosa promene kamatnih stopa na cene akcija, kao i dvosmernog odnosa između promena cena akcija i promena inflacije i kamatnih stopa. Pored ova dva testa, autori grafički prikazuju impulsni odziv indikatora kao i dekompozicija varijanse podataka što ukazuje da se promene cene akcija uglavnom objašnjavaju varijansom same cene akcija. Rezultati takođe ukazuju da je primarna promena BelexLine indeksa na sebe pozitivna, dok u ostalim periodima dolazi do negativne reakcije, dok na kraju perioda dolazi do stabilizacije nakon prvobitnog nastanka šoka.

Ključne reči: *berza, BelexLine indeks, makroekonomske varijable*

Introduction

The exchange of money and capital is a basic element of financial markets or stock exchanges. The capital market, as a form of the financial market, is a crucial and inseparable part of any economy. In addition to the financial market, interest rate, inflation as well as the exchange rate represent a very important element of economic growth and development. So, it is very important to understand the mutual relationship between these indicators and the capital market or, in the case of this research, the stock market and the movement of company share prices on that market. Business entities (companies, banks, financial institutions, and other financial intermediaries) meet and connect individuals who need financial resources with those who have excess cash and are ready to invest in the stock market in exchange for compensation for the risk taken [25, p. 2]. The stock market is considered one of the most important economic indicators of the country. The Serbian financial capital market is still in its early stages, with few shares in circulation and a low amount of total transactions [9, pp. 183-197]. The interest rate, together with inflation and the exchange rate, is a key macroeconomic indicator that is directly related to economic growth. Efficiency is one of the main conditions for the success of the market, as few people can make extraordinary profits in an inefficient market, which is why people lose faith in the market. In such cases, if the interest rate that banks pay to depositors increases, people transfer their money from the stock market to the bank [39, pp. 123-132] The stock market, as the most active and central component of the financial sector, serves as a "barometer" of the real economy [22, pp. 173-208]. It is a vital location for businesses to collect cash and for ordinary people to manage their savings [21, pp. 83-93]. Global central banks modify their policy rule (key interest rates) downward when their economies are suffering and upward when inflationary pressures are mild [1, pp. 20-35]. [31, pp. 154-166] suggests that the stock market allows the economy to hedge long-term liabilities in real capital. As a result, establishing the stock market's efficiency is crucial for investors, legislators, and other major players who provide long-term real capital to the economy. In theory, stock price will be affected by inflation because it is determined by the company output. Interest rates are one of the methods used by the central bank to manage inflation. In theory, stock prices will be affected by inflation since it will influence investors' investment decisions [41, pp. 42-68].

Also, many other factors in addition to the macroeconomic factors that are the subject of this study have an impact on stock prices. Looking at the broader picture of factors, one should keep in mind the effect of various factors not only on the stock market but also on the entire financial market. In Serbia, the underdevelopment of the entire financial market is present due to an excessive and dominant influence of banks as well as the lack of innovations in the financial sector, which represents the backbone of the development of the financial market [27, pp. 269-279]. There is a special period before and after the Covid-19 pandemic where there was a sudden increase in inflationary pressure as well as increased volatility of the exchange rate and a more restrictive monetary policy. Shortly after the pandemic began, it became apparent that this world shock would have a significant impact on global economic activity and inflation [38, pp. 23-40]. Gordon [12, pp. 99-105] argues that the discount rate should be determined by the expected rate of return on equity or dividend yield on stocks. As a result, increases in inflationary expectations and actual inflation rates should increase the expected stream of future nominal dividend payments for stocks, causing the stocks to rise in value. In this paper, we will focus on the impact of interest rates, inflation, and exchange rates on stock prices. According to research by Graham and Harvey [13, pp. 187-243], managers in American companies consider the interest rate risk the second most important element of risk, after the market risk. According to financial theory, changes in interest rates affect both the firm's expectations of future corporate cash flows and the discount rate used to value these cash flows, and thus the value of the company. When all cash flows are predictable, the interest rate can be used to illustrate the time value of money [40, p. 4]. The use of the key interest rate, inflation, and exchange rate in this study is largely supported by Fisher's theory [6]. Fisher's theory states that the difference between the nominal interest rate of two countries will be equal to

the difference in inflation between the two countries. The theory talks about the mutual connection between interest rates and inflation, as well as the connection between these two factors and the exchange rate. The theory seeks to explain the interrelationship and close connection between money supply, demand, economic growth, development, and factors such as inflation, interest rates, and exchange rates. Based on the great connection of these three factors, the authors try to understand their influence on the price movements of shares in Serbia. One of the goals of this research is to determine how the Belgrade Stock Exchange is ranked and to understand the impact of macroeconomic variables.

As previously stated, the purpose of this paper is to better understand how interest rates, inflation, and exchange rates affect the movement of stock values as well as the economic growth of the largest corporations. The paper is divided into four parts. After the introduction and insight into the theoretical literature, we move onto the statistical analysis and finally draw conclusions and recommend future research directions. In the first part of the analysis, monthly data on percentage interest rates were used, along with the share prices of listed companies from 2015 to 2021. The application of the research of macroeconomic factors and their influence on the movement of stock prices originates from the Arbitrage Pricing Theory, which is based on the modern portfolio theory. The theory talks about the use of various factors in trying to predict the movement of share prices. This research serves as a starting point for the application of arbitrage pricing theory on the example of the Serbian Stock Exchange. Limitations of the study are the use of only three macroeconomic factors, the use of gold prices, oil prices, and bond prices in future research advised.

Literature review

In this part of the study, the authors review the relevant literature. In the first part, the authors list relevant research done according to geographical criteria, where they mention the studies that included the analysis of various factors on share prices in certain countries or groups of countries. In the second part of the review, the authors list the studies that dealt with the analysis of specific sectors of the economy, such as the agricultural sector, the banking sector, and the real estate sector.

One of the many types of research such as the study [30, pp. 200-212], found that the use of macroeconomic variables provides an effective technique for automatically identifying and extracting macroeconomic factors that affect the actions of different sectors and offers an accurate prediction of the future share price, according to the consequences on e.g. Stock Exchange in Ghana. A more recent study by Prasad, Bakhshi & Seetharaman [32, p. 126] studied the impact of macroeconomic factors in the US market on the CBOE VIKS index, which is a short-term measure of real risk on the stock market. The study indicated a positive impact of capital market volatility and the financial stress index on the VIKS index, while returns on fixed-income securities did not show a strong effect. The findings of the study by Celebi & Honig [7, p. 18] show that compared to the period before and after the crisis, in the German financial market, a greater number of variables and economic indicators had a significant impact on stock returns during the year. This suggests that the market driven by macroeconomic factors is dominant in the post-crisis era. An analysis of the Turkish stock market found that economic development, the relative value of domestic currency, portfolio investments, and foreign direct investments increase the stock market index, while interest rates and crude oil prices have the opposite effect [8, p. 8]. A study of BRICS stock markets found that there is no longer a two-way causal relationship between stock returns and inflation in the post-crisis eras, with the exception of the pre-crisis period. In the long run, the study found a unidirectional causal relationship between the GDP growth rate and stock returns both in the pre-crisis period and in the total period [36, pp. 110-118]. Only in the case of Brazil did the study find a strong positive correlation between changes in inflation and stock growth. The Granger causality study found a unidirectional relationship between stock returns and rising inflation in Russia, India, and South Africa, but a bidirectional relationship in China [37]. In their conceptual study [20, pp. 85-106], Keshadi and Wadhva investigated how macroeconomic factors affect stock returns. The

results show that stock prices are significantly influenced by GDP, money supply, industrial production price index, consumer price index, and inflation. Although consumption, oil prices, exchange rates, and interest rates had no effect on stock prices, national income showed a negative relationship with them. Abdo, Kudah & Kudah [2, pp. 1-14] investigated the influence of macroeconomic factors on the movement of stock prices on the Amman Stock Exchange and determined that GDP growth had a direct and statistically significant positive relationship with stock returns, while inflation was turned out to have a negative impact. A study by Fahlevi [11, pp. 157-163] showed that there is a statistically significant relationship between exchange rate changes, interest rates, and stock returns of all companies listed on the Indonesian Stock Exchange, negative in the case of interest and positive in the case of exchange rates. A similar study by Wijaya & Muljo [42, pp. 63-73] covering companies listed on the Indonesian Stock Exchange indicates a positive effect of inflation on stock returns, which was previously investigated and confirmed by Basard, Modeljadi & Indravati [5, pp. 310-320]. McMillan [29, p. 9] implies that higher inflation rates and money growth often reduce returns while supporting the market in times of crisis. Higher inflation and money growth, on the other hand, have shown consistent positive predictive power since the financial crisis and reflected a change in risk perception of higher values. In the previous three years, many studies included the impact of the Covid-19 pandemic on the economy. One of the studies looked at the impact of the pandemic on inflation and its relationship with stock price movements in the Nigerian stock market. The study pointed to the negative impact of the pandemic on stock returns, due to the increase in inflationary pressure during the pandemic and the crisis period [17]. Tripathi and Kumar [36] examined the BRICS stock markets before and after the crisis. They found bidirectional long-run causality between stock prices and money supply and oil prices, as well as unidirectional long-run causality between stock prices and GDP, inflation, and interest rates. This work is based on several works by the author [4, pp. 1497-1521], [24, pp. 603-616]. Both studies looked at how macroeconomic factors affect the stock returns of listed companies in Pakistan. The results of the variance decomposition showed that most of the movement in the KSE 100 index was caused by its shocks. As a result, stock price forecasting has been found to be highly dependent on exchange rate movements, inflation, and interest rates.

Pratana, Aji & Vitjaksono [33] dealt with the analysis of the impact of company-specific and macroeconomic factors on the stock returns of companies from the agri-food sector in the Indonesian market. The results showed that company-specific factors have no relationship with stock returns, while macroeconomic factors such as inflation and exchange rates have a negative impact on stock returns. Analyzing banks listed on the Indonesian Stock Exchange, the study by Kusumaningtias, Vidagdo & Nurjannah [20, pp. 97-108] showed the negative influence of interest rates, inflation, and exchange rates on the movement of bank share prices. Research results of Huy, Dat & Anh [16, pp. 189-205] indicate that the use of a seven-factor model, which included GDP growth, inflation, interest rate, exchange rate, the movement of the VNIndex, the risk-free exchange rate, and the movement of the SP500 index and their impact on the share prices of the joint-stock commercial bank Sacombank (STB) in Vietnam. The study's findings indicated that GDP growth, CPI decline, and lower interest rates had a significant impact on stock appreciation. In the study by Huy, Nhan, Bich, Hong, Chung & Huy [17, pp. 189-205], the effects of several macroeconomic factors on the stock price of one of the largest real estate businesses in Vietnam were investigated. The research study found a negative correlation between Vinigroup's share price and Vietnam's risk-free rate and commercial bank deposit rate, but a positive correlation between Vinigroup's share price and Vietnam's loan interest rate.

Methodology and hypothesis

The focus of this study is to analyze the effect of macroeconomic variables on the movement of stock prices on the Belgrade Stock Exchange. The analysis covers the period from 2015 to 2021, while the study used monthly data, so that the study includes 84 observations. The subject of the study is the BelexLine index, the largest stock index on the Belgrade Stock Exchange, as a dependent variable,

while the data on the exchange rate, interest rate, and inflation were taken as independent variables. In Table 1 the authors show more precisely the variables used as well as the sources of the data themselves.

Table 1: Variables

Variable		Source
BELEXLINE	$BELEXLINE_t = \ln (C_t / C_{t-1})$	Belgrade Stock Exchange
EXCH	$EXCH_t = \ln (R_t / R_{t-1})$	World Bank
INT	$INT_t = \ln (IR_t / IR_{t-1})$	World Bank
CPI	$CPI_t = \ln (CPI_t / CPI_{t-1})$	World Bank

Source: Authors

In addition to the variables used, the calculation method is also shown in Table 1. Ct represents the index points of the BelexLine index for a given month, while Ct-1 represents the index points of the previous month. Stock returns are calculated by taking the logarithm of the quotient of these two items. The same method is used to calculate the change in the exchange rate (EXCH), interest rate (INT), and inflation (CPI), where the logarithm of the rate and exchange rate of one period with the rate and exchange rate of the previous period is also performed. The most important requirement for the econometric approach, stable data, is one of the conditions underlying the econometric research of time series [28]. It refers to the constant mean and variance values of the time series. The authors use the Augmented Dickey-Fuller test to determine the stationarity of the data in their analysis. The optimal lag test determines the optimal lag length to be used in the analysis that follows, as well as parameter estimation for the VAR model. This was done because of the causality assessment and the sensitivity of the VAR model to lag time. To accurately calculate the lag length, it is necessary to first review the data [43]. The tests used are the Akaike Information Criterion [3], Hannan-Quinn [34], and Schwarz Criterion [35].

One dynamic linear model that is often applied for long- and medium-term forecasts of economic variables is the VAR model. Causality can also be established using VAR models. The VAR model is a multivariate time series analysis used in econometrics [44, pp. 261-268]. The threshold value for accepting the statistical significance of the influence of a certain variable is 1.96. Using the VAR model, the authors derive the following formula, which is the basis of this study:

$$Xb = \alpha + \beta 1X1b - 1 + \beta 2X2b - 1 + \beta 3X3b - 1 + \epsilon \quad (1)$$

Where:

Xb = Vector element from BelexLine

X1 = Exchange rate

X2 = Interest rate

X3 = Inflation rate

α = Constant vector n x 1

βn = Coefficient from Xb

n = Lag length.

The presence of stability is another crucial factor pertaining to the VAR model's validity. A stability test is necessary to evaluate stability, which the authors did in this study. The calculated VAR model is unstable and cannot be used if the value of the result exceeds the threshold value of one. The analysis of the Impulse Response Function, which is found at the conclusion of the study, was used to assess the effect of the shock of the utilized independent variables on the price of the BelexLine index. The impact of one shock on subsequent shocks in the past, present, and future of the endogenous variables was examined using an impulse response function test. Through the dynamic VAR structure, a shock in the i-endogenous variable might have an immediate impact on the variable and propagate to other endogenous variables. The impulse response function also displays the magnitude influence link between the endogenous variables in addition to its direction. As a result, when a variable in the VAR system is shocked in the presence of new information, both the shocked variable and other variables are affected. The following formula is what the authors used to determine Granger causality:

$$Xt = c1 + \sum_{i=1}^{n} \alpha 1, iXt - 1 + \sum_{i=1}^{n} \beta 1, iYt - 1 + \sum_{i=1}^{n} \gamma 1, iZt - 1 + \sum_{i=1}^{n} \delta 1, iVt - 1 + \epsilon x, t \quad (2)$$

Where:

Xt = Change in BelexLine index

Yt= Change in the exchange rate

Zt = Change in interest rate

Vt = Change in inflation rate

n = Number of lags

e = Standard error

c = Constant.

After presenting the diagnostic tests and statistical models used in the analysis, the authors derive the following hypotheses:

H1: Exchange rate has a significant impact on BelexLine Index

H2: Inflation has a significant impact on BelexLine Index

H3: Interest rate has a significant impact on BelexLine Index

Table 2 shows a descriptive analysis of the variables used. The results of the analysis indicate that the largest amount of change is noticeable in the change of the key interest rate of 0.06132100 in 2019. The largest change in the exchange rate occurred in 2018, while the largest changes in the BelexLine index and inflation occurred in 2019 and 2021, respectively. The largest amount of standard deviation is observed for the key interest rate variable (INT), which indicates that this variable has the largest range between the maximum and minimum amount for the observed period.

Table 2: Descriptive statistics

Variables	Mean	Std. Dev.	Max	Min
BELEXLINE	0.00324900	0.02946100	0.04971700	-0.16663000
EXCH	0.00121400	0.00667500	0.01959200	-0.01367500
INT	-0.02384800	0.04102500	0.06132100	-0.19000000
CPI	0.00091900	0.00547900	0.01342300	-0.01068000

Source: Authors' calculations

Findings and discussion

One of the main conditions for performing a correct regression model is data stationarity. One of the most common unit root tests used in practice is the Augmented Dickey-Fuller (ADF) test. The results indicate the stationarity of all used variables at the level, which represents the fulfilled condition of a correct regression model (see Table 3). In the following step, the authors use more stability tests to fulfill the conditions of a valid Vector Autoregression Model (VAR). The stability test of the VAR model in the appendix uses a threshold value of 1 to establish the stationarity of the variables at a specified number of lags. With the model of 4 lags, Table A in the appendix illustrates that the Modulus does not exceed the threshold value of 1, which proves the stationarity of the data and positively confirms the stability condition of the VAR model. Along with the stability test, Figure A in the appendix is used to graphically present the result of the stability test. It shows that all points do not cross the boundaries of the circle that is on the border of 1, which confirms the obtained results and rejects the null hypothesis of non-stability.

Before performing the stable VAR model and the Granger causality test, the authors need to determine the optimal lag length. For this, the authors used the Akaike Information Criterion (AIC), the Schwartz Criterion (SC), and the Hannan Quinn (HQ) method within a vector autoregression model. Table B in the appendix indicates that the optimal lag length is 1 lag according to AIC and HQ, while the optimal length according to SC is 0 lags. In practice, AIC is generally taken as the most correct, so the authors use a model with an optimal lag length of 1. Also, in addition to the test of the optimal length of the lag duration, a test of the presence of autocorrelation was carried out. The presence of autocorrelation represents one of the main obstacles to deriving a valid VAR model. Autocorrelation represents the presence of a high level of correlation between one variable and its previous values in a certain period of time. In the appendix, Table C presents that, at the accepted lag level of 1, the null hypothesis of the existence of autocorrelation is not rejected.

After checking the stationarity, stability, autocorrelation, and optimal lag length of the model, in Table 4 the authors performed an analysis using the Standard Vector autoregression model (VAR). As explained in the

Table 3: ADF unit root test

Variables		BELEXLINE	EXCH	INT	CPI
Test Critical Values	1% level	-3.5122900	-3.5122900	-3.5122900	-3,5256180
	5% level	-2.8972230	-2.8972230	-2.8972230	-2,9029953
	10% level	-2.5858610	-2.5858610	-2.5858610	-2,5889020
Probability		0,0000	0.0000	0.0000	0.0162
		Level	Level	Level	Level

Source: Authors' calculations

Methodology section, the threshold value for accepting statistical significance is 1.96. The results indicate that the exchange rate does not have a statistically significant relationship with the return of company shares in the BelexLine index, while the interest rate and inflation have a significant and positive influence on the change in share prices. The results indicate the influence of the delay in the return value of the shares contained in the BelexLine index on changes in the key interest rate and the inflation rate. More precisely, this influence can be explained as a reaction of the macroeconomic factors themselves to the previous rise in share prices. The model also shows the influence of the previous value of the key interest rate on its future value. In the continuation of the study, the authors use Variance decomposition analysis for a better understanding of the spread of influence, as well as the Granger causality test of the variables used. The percentage of forecast error variation for the s-period forward BelexLine index that is explained both by its lag and by the lag of other explanatory variables in the system is calculated using the variance decomposition methodology. The findings of the variance decomposition analysis (see Table 5) show that 98.37466% of the variation in the BelexLine index can be attributed to its factors, while the remaining variation is explained by shocks to other variables such as exchange rate changes, interest rates, and inflation that occurred 10 periods before the shocks (0.3122%, 0.3229% and 0.9902%, respectively). The findings also show that as the number of shocks increases, the impact of interest rate changes increases the most.

In Figure 1, the authors use the impulse shock function to analyze the impact of macroeconomic variables on the BelexLine index of the Belgrade Stock Exchange. The impulse response function measures the response of the independent variables to shocks in the dependent variable. The results indicate that the primary change of the BelexLine index is positive, while in other periods there is a negative reaction, but at the end of the period, there is stabilization after the initial occurrence of the shock. Inflation and exchange rate shocks have a minimal

Table 4: Var model

	BELEXLINE	EXCHANGE RATE	INTEREST RATE	INFLATION RATE
BELEXLINE (-1)	0.012457	0.047556	**0.388686**	**0.056442**
	[0.10272]	[1.75916]	**[2.57970]***	**[2.82128]***
EXCHANGE RATE (-1)	0.120368	0.100362	0.169374	-0.082438
	[0.22518]	[0.84227]	[0.25503]	[-0.93486]
INTEREST RATE (-1)	-0.052492	0.02484	**0.3187**	0.016802
	[-0.54453]	[1.15599]	**[2.66101]***	[1.0567]
INFLATION RATE (-1)	0.476816	0.026564	0.514763	0.149787
	[0.69970]	[0.17487]	[0.60799]	[1.33240]
C	0.002488	0.001428	**-0.017682**	0.000685
	[0.54589]	[1.40545]	**[-3.12286]***	[0.91052]
R - squared	0.26536	0.296251	0.464365	0.332581

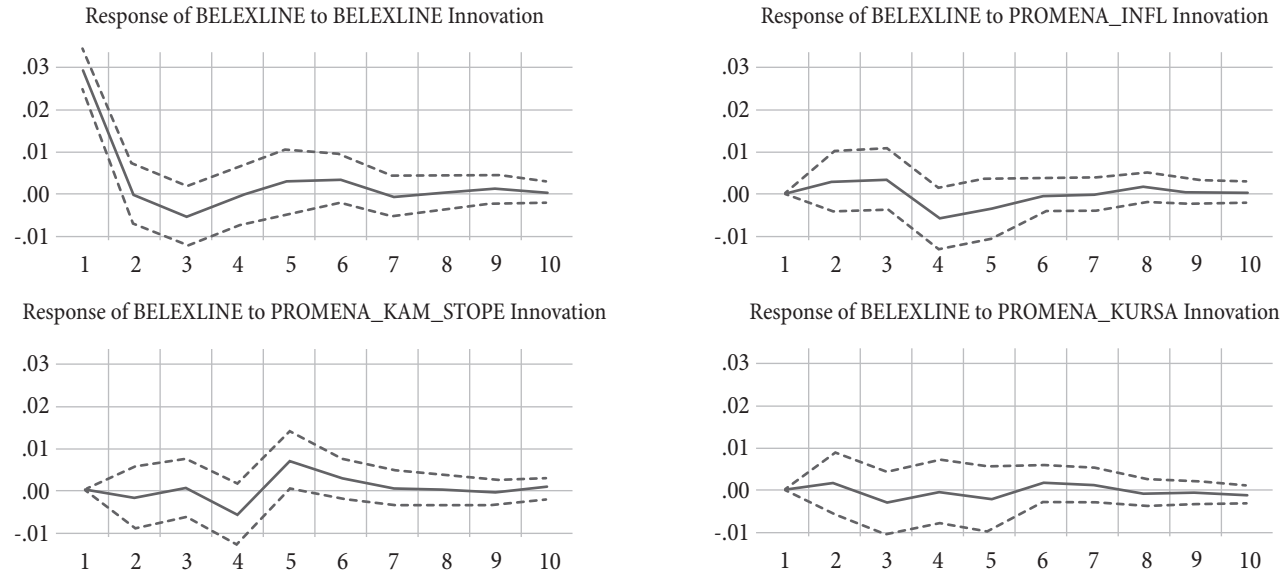
Source: Authors' calculations

Table 5: Variance decomposition

Period	BELEXLINE	EXCH	INT	CPI
1	100	0	0	0
2	98.37466	0.312188	0.322899	0.990252
3	95.93657	1.305258	0.334065	2.424106
4	89.73897	1.231413	3.693972	5.33564
5	84.48557	1.542483	7.914681	6.057263
6	83.85773	1.762654	8.445317	5.934294
7	83.75016	1.873465	8.451416	5.924955
8	83.46986	1.914509	8.422498	6.193134
9	83.41134	1.953846	8.426439	6.208378
10	83.25291	2.05366	8.464194	6.229239

Source: Authors' calculations

Figure 1: Impulse reaction



Source: Authors' calculations

but persistent impact on changes in the BelexLine index, but at the end of the period, stabilization occurs. Interest rate shocks also have a small impact on changes in the BelexLine index, but they have proven to be the strongest of the independent variables used.

Table 6 shows the results of the Granger causality test. Since the probability sum exceeds the threshold value of 0.05, the results show that there is no statistically significant mutual causality between stock price changes and exchange rate changes. As a result, it is not possible to reject the null hypothesis that causality does not exist. The null hypothesis was rejected in three cases. When it comes to the relationship between the price change of the BelexLine index and the interest rate change. Also in the case of the relationship between the interest rate change and the BelexLine index price change and, finally, the inflation rate change. The analysis showed that exchange rate changes have no effect on the prices of shares in the BelexLine index basket, while there is a certain causal relationship with the other two dependent variables. The influence of interest rate and inflation is similar to the findings of Eldomiaty, Saeed, Hammam & AboulSoud [10], Hajilee & Nasser [15], Fahlevi [11], Jareno, Ferrer & Miroslavova [19], Tripathi & Kumar [37].

Conclusion

Understanding macroeconomic factors and the importance of their effect is one of the key items in the predictability of stock price movements. Looking at companies that are listed on the stock exchange and whose shares are traded on the free market, it is of great importance for investors to understand the factors that have any influence on the price movement of those shares. The existence of systemic and

Table 6: Granger causality

Null hypothesis	Chi-sq	Prob.	Decision	Direction
The casual relationship between BelexLine and Exchange rate				
BELEXLINE does not Granger cause EXCH	1.103685	0.8937	Not Rejected	None
EXCH does not Granger cause BELEXLINE	1.303499	0.8608	Not Rejected	
The casual relationship between BelexLine and Interest rate				
BELEXLINE does not Granger cause INT	12.30974	**0.0152***	Rejected at 5%	Bidirectional
INT does not Granger cause BELEXLINE	9.733864	**0.0452***	Rejected at 5%	
The casual relationship between BelexLine and Inflation				
BELEXLINE does not Granger cause CPI	13.49545	**0.0091***	Rejected at 5%	Unidirectional
CPI does not Granger cause BELEXLINE	4.616897	0.3289	Not Rejected	

Source: Authors' calculations

non-systemic risk is mentioned in the literature. Precisely, the systematic risk was named non-diversified risk because of the inability of investors and companies to avoid this type of risk. For this reason, it is of great importance to know the amount of influence of various macroeconomic factors on the movement of share prices. As representatives of macroeconomic factors of particular importance, the authors in this study used the change in the exchange rate, the change in the key interest rate, and the change in inflation on a monthly basis for the period from January 2015 to January 2021. The largest stock index on the Belgrade Stock Exchange, namely BelexLine, was taken as a representative of the share price, where monthly share return data for the same period were used for the analysis. The index contains 29 companies listed on the Belgrade Stock Exchange. Due to the use of time series, the authors decided to use the Vector autoregression model (VAR) as the method of analysis, as well as the Impulse reaction test and decomposition of the variation of the variables used. The results indicated that the exchange rate for the given period had no effect on the price of shares, while the persistence of causality was shown between changes in interest rates and inflation and changes in share prices, which was expected. The decomposition of the variation indicated that the largest percentage of change in the BelexLine index was caused by changes in itself with an increased number of delays, while the influence of other variables increased slightly with an increase in the number of delays, the biggest effect of which is the change in interest rates. The aim of this study is to help investors understand the exact impact of selected macroeconomic variables on stock prices for decision-making when investing in the stock market. The good side of this particular study is the aim to understand the mutual correlation between used variables and the use of the model to predict future changes in stock prices. The limitations of the study are the use of a smaller time frame of the study and the use of only three macroeconomic factors such as the price of gold, crude oil, and bonds. For further research, the authors suggest a comparative analysis of several developing stock markets, such as stock markets in the region. A comparative analysis with more developed markets is also possible in order to see the similarities and differences between the domestic and foreign financial markets.

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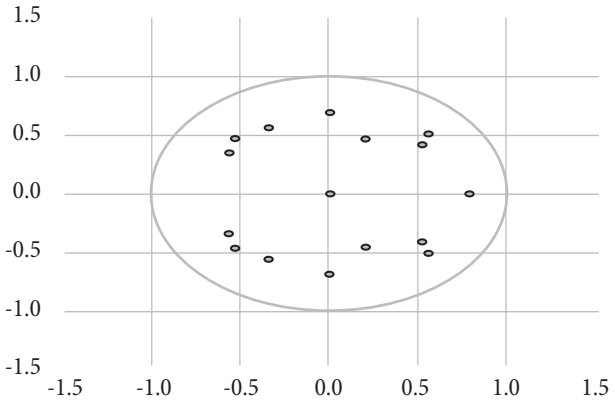
Appendix

Table A: Var stability condition check

Root	Modulus
0.787066	0.787066
0.561531 - 0.507201i	0.756683
0.561531 + 0.507201i	0.756683
-0.520257 - 0.468653i	0.700217
-0.520257 + 0.468653i	0.700217
0.009497 - 0.691648i	0.691713
0.009497 + 0.691648i	0.691713
0.520776 - 0.418243i	0.667933
0.520776 + 0.418243i	0.667933
-0.559285 - 0.350203i	0.659880
-0.559285 + 0.350203i	0.659880
-0.335720 - 0.560269i	0.653154
-0.335720 + 0.560269i	0.653154
0.207438 - 0.454314i	0.499431
0.207438 + 0.454314i	0.499431
0.011849	0.011849

*No unit root lies outside the unit circle
*VAR satisfies the stability condition
Source: Authors' calculations

Figure A: Inverse roots



Source: Authors' calculations

Table B: VAR Lag order selection criteria

Lag	LogL	AIC	SC	HQ
0	896,4744	-22,59429	-22,47432*	-22,54622
1	920,5313	-22,79826*	-22,19840	-22,55794*
2	927,8892	-22,57947	-21,49972	-22,14689
3	934,0978	-22,33159	-20,77195	-21,70675
4	945,1356	-22,20596	-20,16644	-21,38887

Source: Authors' calculations

Table C: Autocorrelation

Lag	LRE*statistic	df	Probability
1	15.33	(16,199.2)	0.5
2	10.12	(16,199.2)	0.86
3	14.85	(16,199.2)	0.535

Source: Authors' calculations

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A CONTEMPORARY BIBLIOMETRIC ANALYSIS OF THE SHARING ECONOMY LITERATURE

Savremena bibliometrijska analiza literature na temu ekonomije deljenja

Abstract

The study deployed an evaluative bibliometric analysis of contemporary literature on the topic of sharing economy indexed in the Web of Science (WoS) and/or Scopus within the fields of economics, business and management to provide an objective insight into its academic structure. Also, a comparative analysis of WoS and Scopus databases was conducted with the intention to examine the importance of both index databases concerning the investigated issue. Using a data-driven analysis, geographical distribution, the level of dispersion of papers among journals, the most frequently researched topics, the most influential authors, papers and scientific journals of the sharing economy knowledge within the predefined research field were determined. Comparative analysis of WoS and Scopus databases revealed that Scopus is a more comprehensive, but not more significant source of the sharing economy knowledge than WoS database, which itself could be characterized as an outstanding subset of Scopus.

Keywords: *sharing economy, bibliometric analysis, Web of Science, Scopus*

Sažetak

U radu je izvršena evaluativna bibliometrijska analiza savremene literature na temu ekonomije deljenja indeksirane u Web of Science (WoS) i/ili Scopus indeksnoj bazi u okviru oblasti ekonomija, biznis i menadžment, sa ciljem da se obezbedi objektivan uvid u akademsku strukturu ove discipline. Takođe, sprovedena je uporedna analiza WoS i Scopus baza sa namerom da se ispita značaj analiziranih indeksnih baza za istraživanu problematiku. Primenom analize zasnovane na podacima utvrđeni su geografsko područje koje prednjači u istraživanju discipline ekonomije deljenja u okviru unapred definisanih istraživačkih oblasti, nivo disperzije radova među časopisima, najčešće istraživane teme, najuticajniji autori, radovi i naučni časopisi. Putem uporedne analize WoS i Scopus indeksnih baza zaključeno je da je Scopus obuhvatniji, ali ne i značajniji izvor znanja iz oblasti ekonomije deljenja od WoS indeksne baze koja se u istraživanoj disciplini može okarakterisati kao izvanredan podskup Scopus-a.

Ključne reči: *ekonomija deljenja, bibliometrijska analiza, Web of Science, Scopus*

Introduction

Contemporary scientific thought is characterized by the growing interest of the academy in sharing economy concept and its wide application in various contexts, such as tourism, transport, finance, education, communications, retail, media, workspace, entertainment and more [8], [24], [33], [34], [61], [68]. The concept was grounded on the notion of sharing products, space, human and intellectual resources, but also time, through providing access to users [17], [44]. The consumption that goes beyond ownership has grown rapidly in the last decade. The driver of the accelerated development of the sharing economy knowledge comes as a result of the evolution of the consumption phenomena [43] and broader awareness of resource scarcity and growing concerns about its environmental, social and developmental impacts [40], [46]. In this context, the sharing economy was often grasped as a sustainable concept charachterized by access to resources at lower prices, their efficient and sustainable use and the promotion of cooperation and solidarity. Aimed at the three pillars of sustainability, it reduces resource use, stimulates economic growth and increases the quality of life [17]. The diffusion and growing importance of digital technologies, especially the Internet and smartphones, have played a key role in the concept development by reducing the cost of coordinating resources and enabling the involvement of large numbers of users [62], [70]. Although it relies on social dynamics and collaboration, and the concept itself was originally economic, based on economic philosophy and way of thinking, the basis of the sharing economy relies on the technological platforms [40], so it is percived as the platform economy concept [3], [25], [36].

Accordingly, the aim of the paper is twofold: first, to perform an objective evaluation of contemporary literature on the topic of sharing economy within the fields of economics, business and management by performing bibliometric analysis and second, to perform a comparative analysis of the Web of Science (WoS) and Scopus databases to determine which of them is a more comprehensive and reliable source of scientific information and contemporary knowledge on the sharing economy. The research is limited to fields of economics, business and management, due to the fact that the sharing economy was perceived as economic concept and philosophy, and to the ten-year period 2010-2019 reflecting the contemporary structure of the analyzed discipline.

Bibliometric analysis of sharing economy discipline has already been implemented by a few authors [28], [47]. However, in contrast to Lima and Carlos Filho study [47] that explores "sharing economy in a broad spectrum of knowledge fields" [47, p. 238] and without time constraints, this paper examines contemporary scientific thought related to the sharing economy exclusively from an economic perspective. By encircling the ten-year period, a difference was made in relation to the eight-year research period from the study of Ertz and Leblanc-Proulx [28]. The two-year difference between studies was significant given the exponential growth of literature in this field [42] and potential change in citation impact of authors, papers and journals. Finally, the comparative analysis of the WoS and Scopus databases was undertaken, to additionally distinguish the research from previous studies by applying the Meyer index, traditional overlap and relative overlap. These differences point towards the originality of the research, which is significant as it complements existing knowledge related to the comparison of the WoS and Scopus databases in different areas [31], [56], [59].

Methodology

Bibliometric analysis is "often used as a measure of the quality of the work produced by an author, journal or department" [6, p. 121]. The focus of an analysis of article citations and their impact on referencing and dissemination is determined by a set of bibliometric methodologies and analytical techniques [32], [57]. According to Acedo et al. [2] "the use of citation, frequency as an indicator of influence, is legitimate" [2, p. 965], and accordingly, it could be seen as a study quality indicator. The importance of bibliometric analysis lies in the fact that it is characterized by a high level of objectivity in contrast to the usual literature reviews, which is commonly exposed to subjective interpretation [23], [73]. One of the rare objections to bibliometric analysis is that it is, by definition, aimed at the past rather than the future [64, p. 383]. However, without acknowledgement

of the past (academic knowledge evolution), there is no possibility of a successful future, something that is apparent in scientific research. This data-driven analysis is widely used in the field of economics, business and management [5], [7], [21], [30], [32].

Bibliometric analysis within the study was deployed over 2020 using Harzing's Publish or Perish 6.45 software which has been used widely in the areas outlined [15], [39], [53], [69]. In the first step, Publish or Perish software was utilized to create a representative sample of documents based on the keywords search: *sharing economy, collaborative economy and collaborative consumption*, following the approach used in the previous studies [28], [47]. The initially formed sample of a total of 365 papers was then filtered by excluding: editorials, letters, notes or errata, chapters published in monographs, papers published in thematic collections and scientific papers not published in English. In accordance with the aim of the research, only papers published in the WoS and Scopus journals that have an impact factor or quartile Q1 or Q2 in the field of economics, business or management over the period 2010-2019 were included in the sample. Finally, the sample was further narrowed by considering solely highly cited papers and papers relevant to the research subject, that has eventually resulted in a list of 31 papers on the sharing economy within predefined research fields.

Within the bibliometric analysis of the predetermined sample, an analysis of the authors' affiliation countries was performed to determine the countries that lead the field. Moreover, the level of concentration of papers in individual journals and the analysis of keywords was obtained, identifying which the most frequently researched topics are within this relatively young subject matter. Also, to determine the most influential papers and the most influential journals, a citation analysis was conducted, which included self-citations in addition to heterocytes, since, according to Nisonger [58], they do not impair the quality of the analysis.

In the concluding analytical part of the paper, a comparative analysis of the WoS and Scopus databases was performed within the sample, to discover which of the index databases better depicts the area of the research. Some studies have shown that the coverage of the WoS and Scopus databases differs substantially [56], [65], as Scopus covers a broader number of journals [31]. According to Sánchez et al. [65], the WoS and Scopus databases are "complementary and not mutually exclusive" [p. 8]. The comparative analysis was performed by applying the following measures: the Meyer index; traditional overlap; and relative overlap, which were calculated both in the case of journals and papers. *The Meyer index* shows the degree to which a particular index base covers the research area. At the same time, this index is a measure of the singularity of the index base, thus, a higher value of the index indicates a higher degree of singularity in terms of more journals appearing in only one index database (primary sources/ single journals) and more papers appearing in only one index database (unique papers/single articles). When calculating the Meyer index, single journals and single articles are not weighted, while journals and papers that appear in the two index databases are weighted with 0.5. In the case of conducting a comparative analysis of three index bases, the weight is 0.3, in the case of four index bases, the weight is 0.25, and so on. The Meyer index for journals and papers is calculated using the following formula [52]:

$$Meyer\ index_{Sources} = \frac{\Sigma\ Sources * Weight}{Total\ Sources} \quad (1)$$

$$Meyer\ index_{Articles} = \frac{\Sigma\ Articles * Weight}{Total\ Articles} \quad (2)$$

Traditional overlap (TO) is a measure of the overlap of index bases A and B, with a higher value of this measure indicating a greater similarity of index bases in terms of the journals and papers covered, and vice versa. Traditional overlap for journals and papers is calculated using the following formula [37]:

$$\%TO_{Sources} = 100 * \left(\frac{|A \cap B|}{|A \cup B|}\right) \quad (3)$$

$$\%TO_{Articles} = 100 * \left(\frac{|A \cap B|}{|A \cup B|}\right) \quad (4)$$

The relative overlap shows the percentage of one index base that covers journals and papers of another index base, and is calculated as follows [10]:

$$\%Overlap_{A_{Sources}} = 100 * \left(\frac{|A \cap B|}{|A|}\right)$$

$$\text{and} \quad \%Overlap_{B_{Sources}} = 100 * \left(\frac{|A \cap B|}{|B|}\right) \qquad (5)$$

$$\%Overlap_{A_{Articles}} = 100 * \left(\frac{|A \cap B|}{|A|}\right)$$

$$\text{and} \quad \%Overlap_{B_{Articles}} = 100 * \left(\frac{|A \cap B|}{|B|}\right) \qquad (6)$$

The application of these measures enables detailed insight into the coverage, overlap and dispersion of sources and articles across the WoS and Scopus index databases.

Results and discussion

Bibliometric analysis

Upon the creation of a representative sample of papers, a bibliometric analysis of the countries of affiliation of the authors was initiated. This analysis aims to identify the countries that are at the forefront of research in the field of sharing economy (Table 1).

Within the analyzed sample, the country with the highest number of authors engaged in the sharing economy research is the United Kingdom (UK), with a share of 21.3%. The UK is followed by Germany and the United States of America (USA), both of which having a 13.1% share of the total number of authors. The percentage

Table 1: Country of affiliation of the authors

Author(s)	Country of affiliation of the first author	Country of affiliation of the second author	Country of affiliation of the third author	Country of affiliation of the fourth author
Albinsson, P.A., & Perera, B.Y. (2012)	USA	USA		
Bardhi, F., & Eckhardt, G.M. (2012)	USA	USA		
Behrend, M., & Meisel, F. (2018)	Germany	Germany		
Belk, R. (2010)	Canada			
Belk, R. (2014)	Canada			
Cadarso, M.-Á., López, L.-A., Gómez, N., & Tobarra, M.-Á. (2012)	Spain	Spain	Spain	Spain
Cheng, M. (2016)	Australia			
Christie, L., & Gibb, K. (2015)	UK	UK		
Cohen, B., & Kietzmann, J. (2014)	Chile	Canada		
DeVore, M.R., & Weiss, M. (2014)	Italy	Germany		
Dredge, D., & Gyimóthy, S. (2015)	Denmark	Denmark		
Edelman, B., Luca, M., & Svirsky, D. (2017)	USA	USA	USA	
Ert, E., Fleischer, A., & Magen, N. (2016)	Israel	Israel	Israel	
Forno, F., & Garibaldi, R. (2015)	Italy	Italy		
Guyader, H. (2018)	Sweden			
Hofmann, E., Hartl, B., & Penz, E. (2017)	UK	Austria	Austria	
Laamanen, M., Wahlen, S., & Campana, M. (2015)	Finland	Netherlands	UK	
Lichtenthaler, U. (2016)	Germany			
Lindblom, A., Lindblom, T., & Wechtler, H. (2018)	Finland	Finland	Australia	
Martin, C.J. (2016)	UK			
Martin, C.J., Upham, P., & Budd, L. (2015)	UK	UK	UK	
Mittendorf, C. (2018)	Germany			
Möhlmann, M. (2015)	Germany			
O'Sullivan, S.R. (2015)	Ireland			
Ravenelle, A.J. (2017)	USA			
Roos, D., & Hahn, R. (2017)	Germany	Germany		
Skerratt, S., & Hall, C. (2011)	UK	UK		
Sordi, J.D., Perin, M.G., Petrini, M. de C., & Sampaio, C.H. (2018)	Brazil	Brazil	Brazil	Brazil
Tridimas, G. (2011)	UK			
Wang, D., & Nicolau, J.L. (2017)	Hong Kong	Spain		
Wilson, I.E., & Rezgui, Y. (2013)	UK	UK		

Source: Authors

of the total number of authors from these three most prolific countries is 47.5% – accounting for almost half of the authors within the sample. If the affiliation of the first author is taken as a criterion for the distribution of articles by country [20], these three countries also have encircled more than half of the papers within the sample (UK - 22.6%, Germany - 16.1%, USA - 12.9%). The dominance of Europe as a geographical area is evident (64.5%), which is in line with the affiliation statistics provided by Ertz and Leblanc-Proulx [28]. However, in terms of individual countries, the dominance of the UK is in contrast to the conclusion of the study of Ertz and Leblanc-Proulx [28], in which the USA ranked first in terms of the number of published papers on the sharing economy, with a share of 25.5%.

It is important to note that 35.5% of the papers in the sample are single-author papers, as well as that the index of co-authorship is 1.97 (31 papers from the sample are the result of the cooperation of 61 authors). A similar value of the index of co-authorship (1.91) was determined by Lima and Carlos Filho [47] in their study of the sharing economy, while the percentage of single-author papers was slightly higher (40%). In the case of co-authored works, 70% of the papers included are the result of national cooperation (cooperation of authors from the same country), while the remaining co-authored works are the result of international cooperation (cooperation of authors from different countries). A slight increase in the share of co-authored papers in relation to the results of the research of Lima and Carlos Filho [47] indicates growing cooperation of authors within this field.

Table 2: The journal distribution of the papers

Journal	Number of papers
Ecological Economics	3
Journal of Consumer Behaviour	2
International Journal of Hospitality Management	2
Journal of Services Marketing	2
International Journal of Consumer Studies	2
Local Economy	2
Journal of Consumer Research	2
Journals with one paper	16
Total	30

Source: Authors

Table 2 shows the distribution of papers within the sample across the journals, proposing journals solely with a minimum of two papers per journal.

In terms of the journals in which the articles were published, the most popular was *Ecological Economics*, with three published papers and thus, a share of approximately 10%. The average number of papers per journal is 1.35, which undoubtedly indicates a low concentration of papers and, respectively, their large dispersion among journals. Lima and Carlos Filho [47] commented on the expansive scientific production dispersion of the "sharing economy in a broad spectrum of knowledge fields" [p. 238]. The distribution of papers among journals was an indicator of insufficient maturity of the research area, characterized by accelerated development, as evidenced by the growing production of papers on this topic [42].

In order to determine the most frequently researched issues within the sharing economy, a keyword analysis was performed (Table 3). The total number of analyzed keywords is 154, and the primary criterion for selecting a specific keyword and including it in Table 3 is its occurrence in at least three papers within the sample. It is important to emphasize that certain keywords of a similar context are adapted and proposed as a single phrase.

To gain even more precise insight into the dominant research niches within the sharing economy, a word cloud of the keywords was constructed (Figure 1). The keywords presented in a larger font and positioned closer to the center of the cloud are perceived as more important.

Table 3: Repeated keywords within the dataset

Keyword	Number of repetitions
sharing economy	14
collaborative consumption	12
sharing	8
theory	6
sustainability	4
management	4
tourism	4
Airbnb	4
trust	4
behavior	4
collaborative economy	3
innovation	3

Source: Authors

Figure 1: Word cloud of the keywords

Source: Authors

Since the search for papers included in the sample was performed in Harzing's Publish or Perish 6.45 software using the terms *sharing economy, collaborative economy and collaborative consumption*, it was expected that these words would occupy a dominant position in Table 3 and a central position in Figure 1. However, unlike the terms *sharing economy* and *collaborative consumption*, which are identified as the most commonly used keywords, the term *collaborative economy* has a modest frequency of three instances. In addition to the widespread application of the concept of sharing in consumption, the analysis indicated that important research niches within the sharing economy are the application of this concept in the field of sustainable development, management and tourism. Also, the pronounced application of different theories in the sharing economy literature was confirmed, which was noted within the critical literature review. Finally, the concept of sharing is closely related to issues of trust and behavior, and within the keywords, *Airbnb* emerged as a typical sharing economy product in the field of tourism. The results of the keyword analysis are partly in line with the results of an analysis of numerous papers in the field of information systems undertaken by Ertz and Leblanc-Proulx [28], where *information systems, distributed computer systems, Internet and human-computer interaction* were singled out. Finally, it is essential to emphasize that within the sample, the keywords were not found in the works of Albinsson and Perera [4], Bardhi and Eckhardt [8], Möhlmann [55], and O'Sullivan [60], so these papers were excluded from further analysis.

The sample of 31 articles produced 4,641 Crossref citations, with an average number of citations per paper of 149.7, while the average citation per author was 76.1 (Table 4). Citation analysis across the selected papers was implemented to identify the papers and authors who provided the greatest contribution and had the most substantial influence on the development of the sharing economy knowledge within the fields of economics, business and management.

The distribution of citations, in terms of their absolute number, indicates that the most influential papers are

Table 4: Distribution of the citations across the selected papers

Paper	Crossref	Cites per year	Cites per author
Albinsson & Perera (2012)	196	24.5	98
Bardhi & Eckhardt (2012)	**655**	**81.8**	**327.5**
Behrend & Meisel (2018)	8	4	4
Belk (2010)	**657**	**65.7**	**657**
Belk (2014)	**878**	**146.33**	**878**
Cadarso et al. (2012)	45	5.63	11.25
Cheng (2016)	221	55.25	221
Christie & Gibb (2015)	4	0.8	2
Cohen & Kietzmann (2014)	282	47	141
DeVore & Weiss (2014)	12	1.71	6
Dredge & Gyimóthy (2015)	130	26	65
Edelman et al. (2017)	133	44.33	44.33
Ert et al. (2016)	**333**	**83.25**	**111**
Forno & Garibaldi (2015)	48	9.6	24
Guyader (2018)	7	3.5	7
Hofmann et al. (2017)	13	4.33	4.3
Laamanen et al. (2015)	30	6	10
Lichtenthaler (2016)	3	0.75	3
Lindblom et al. (2018)	6	3	2
Martin (2016)	**369**	**92.25**	**369**
Martin et al. (2015)	86	17.2	28.67
Mittendorf (2018)	13	6.5	13
Möhlmann (2015)	**323**	**64.6**	**323**
O'Sullivan (2015)	15	3	15
Ravenelle (2017)	32	10.67	32
Roos & Hahn (2017)	2	0.67	1
Skerratt & Hall (2011)	3	0.33	1.5
Sordi et al. (2018)	3	1.5	0.75
Tridimas (2011)	9	1	9
Wang & Nicolau (2017)	118	39.33	59
Wilson & Rezgui (2013)	7	1	3.5

Source: Authors

Belk [13], Belk [12], Bardhi and Eckhardt [8], Martin [50], Ert et al. [27] and Möhlmann [55]. Dividing the number of citations by the number of years of the paper's availability gives a more relevant indicator of the impact of the papers since older papers have a better chance of achieving higher citations. By applying cites per year as a criterion for determining the impact of the papers, a list of the six most important papers was constructed, however, the order (impact) of the papers changed. The most influential work remained Belk [13], followed by Martin [50], Ert et al. [27], Bardhi and Eckhardt [8], Belk [12] and Möhlmann [55]. Finally, the largest number of citations per author, presented in the last column of Table 4, was identified for single-authored papers Belk [13] and Belk [12].

Based on the above, it can be unequivocally concluded that the most authoritative paper in the field of sharing economy is Belk's [13] paper, with 878 citations and 146.33 citations per year. As the author of this paper, Belk Russell, has had the most decisive influence on the development of the research area with a total of 1,535 citations. The results of the citation analysis are in line with the research of Ertz and Leblanc-Proulx [28], which determined that Belk Russell is the author with the highest local citation (citation within the sample) in the research, which was focused on sustainability-related topics and investigated conference papers, books, editorials and book chapters. The results also support the findings within Lima and Carlos Filho's [47] research highlighting that the Belk's study [13] had the largest number of citations, although only citations obtained in the Scopus database were counted. In addition, their research had no limitations in terms of scientific fields and research time-lag (as they covered a wide range of scientific fields and the period from 1978 to January 2017). However, due to the application of different criteria, the list of the remaining most influential papers differs entirely to the study conducted by Lima and Carlos Filho [47], with the sole exception of the work of Möhlmann [55].

The second part of the citation analysis aimed to identify the most important journals in the field of economics, business and management with regards to the topic of the sharing economy (Table 5).

Table 5: Distribution of the citations across the journals

Journal	Crossref
Ecological Economics	500
Journal of Consumer Behaviour	519
International Journal of Hospitality Management	339
Journal of Services Marketing	20
International Journal of Consumer Studies	33
Local Economy	7
Journal of Consumer Research	**1,312**
Transportation Research Part B: Methodological	8
Journal of Business Research	**878**
Organisation & Environment	282
Review of International Political Economy	12
Tourism Recreation Research	130
American Economic Journal: Applied Economics	133
Tourism Management	333
Journal of Quality Assurance in Hospitality & Tourism	48
Journal of Business Strategy	3
Journal of Retailing and Consumer Services	6
Journal of Consumer Marketing	13
Psychology & Marketing	15
Cambridge Journal of Regions, Economy and Society	32
Journal of Business Ethics	2
European Journal of Political Economy	9
Technological and Economic Development of Economy	7
Total	4,641

Source: Authors

Based on the 23 journals analyzed, the greatest contribution to the development of the research area was provided by the *Journal of Consumer Research* and the *Journal of Business Research*, with a cumulative share of 47% of the total number of citations. At the other end of the scale, in the context of importance, are the *Journal of Business Ethics* and the *Journal of Business Strategy*, whose combined share of the total number of citations is only 0.1%.

Comparative analysis of WoS and Scopus databases

In the last part of the research, a comparative analysis of the WoS and Scopus databases was performed to determine coverage, overlap and dispersion of journals and papers across these databases. The intention was to reveal which of the following index bases better covers the field of the

sharing economy and is a more comprehensive source of modern scientific knowledge on the issues researched.

In the first step of the comparative analysis, the distribution of journals across the WoS and Scopus databases was determined (Table 6), followed by the calculation of the Meyer index, traditional overlap and relative overlap.

Using the Meyer index, the coverage of the topic within journals referred to in WoS and Scopus was assessed.

$$Meyer\ index_{WoS\ Sources} = \frac{\Sigma\ WoS\ Sources * Weight}{Total\ Sources} = \frac{18 * 0.5}{23} = 0.39 \quad (7)$$

$$Meyer\ index_{Scopus\ Sources} = \frac{\Sigma\ Scopus\ Sources * Weight}{Total\ Sources} = \frac{5 * 1 + 18 * 0.5}{23} = 0.61 \quad (8)$$

The values of the Meyer index, after weighting, showed that WoS covers 39% of the sharing economy, while Scopus accounts for the remaining 61%. With regards to single journals, WoS had none (0%) and Scopus had 22%, which indicates the undoubtedly greater singularity of the Scopus index base, but also the fact that Scopus is a more comprehensive source of scientific knowledge on the topic. These results are in line with the conclusions of the previous research that also confirmed that Scopus has a broader coverage of social sciences journals [59], tourism journals [65], library and information science journals [1], oncological journals [49] and journals in the field of earth and atmospheric sciences [9]. The greater singularity of the Scopus index base, in terms of having more exclusive journal titles, was also found by Fabregat-Aibar et al. [29], Falagas et al. [31] and Mongeon and Paul-Hus [56].

In order to determine the similarity and mutual coverage of the WoS and Scopus databases within the sharing economy research, traditional and relative overlap were calculated, and the results are included below.

Table 6: The WoS and Scopus distribution of the journals

WoS*	Scopus**
Ecological Economics	Ecological Economics
Journal of Consumer Behaviour	Journal of Consumer Behaviour
International Journal of Hospitality Management	International Journal of Hospitality Management
Journal of Services Marketing	Journal of Services Marketing
International Journal of Consumer Studies	International Journal of Consumer Studies
	Local Economy
Journal of Consumer Research	Journal of Consumer Research
Transportation Research Part B: Methodological	Transportation Research Part B: Methodological
Journal of Business Research	Journal of Business Research
Organisation & Environment	Organisation & Environment
Review of International Political Economy	Review of International Political Economy
	Tourism Recreation Research
American Economic Journal: Applied Economics	American Economic Journal: Applied Economics
Tourism Management	Tourism Management
	Journal of Quality Assurance in Hospitality & Tourism
	Journal of Business Strategy
Journal of Retailing and Consumer Services	Journal of Retailing and Consumer Services
	Journal of Consumer Marketing
Psychology & Marketing	Psychology & Marketing
Cambridge Journal of Regions, Economy and Society	Cambridge Journal of Regions, Economy and Society
Journal of Business Ethics	Journal of Business Ethics
European Journal of Political Economy	European Journal of Political Economy
Technological and Economic Development of Economy	Technological and Economic Development of Economy

* journals indexed in WoS with an impact factor in Economics, Business or Management
** journals indexed in Scopus (Q1 or Q2)
Source: Authors

$$\%TO_{Sources} = 100 * \left(\frac{|WoS_{Sources} \cap Scopus_{Sources}|}{|WoS_{Sources} \cup Scopus_{Sources}|} \right)$$
$$= 100 * \frac{18}{23} = 78\% \quad (9)$$

In the case of journals as a source of literature on the topic, the overlap is 78% and indicates high similarity between the index databases. This data shows that the sampled journals referred to in WoS and Scopus match in 78% of cases, which implies that a search of any of the index databases would identify at least 78% of literature sources on the sharing economy. Interestingly, the traditional overlap of WoS and Scopus in Sánchez et al.'s [65] study of wine tourism, was only 34%.

$$\%Overlap_{WoS_{Sources}} = 100 * \left(\frac{|WoS_{Sources} \cap Scopus_{Sources}|}{|WoS_{Sources}|} \right)$$
$$= 100 * \left(\frac{18}{18} \right) = 100\% \quad (10)$$

$$\%Overlap_{Scopus_{Sources}} = 100 * \left(\frac{|WoS_{Sources} \cap Scopus_{Sources}|}{|Scopus_{Sources}|} \right)$$
$$= 100 * \left(\frac{18}{23} \right) = 78\% \quad (11)$$

Finally, the values of relative overlap indicate that the Scopus index base fully covers WoS resources, while the WoS index base covers 78% of the sources of the Scopus index base for the topic. The complete coverage of WoS journals by the Scopus index base was also acknowledged by López-Illescas et al. [49] for the oncological discipline, while lower percentages of coverage of 84% and 65% were found by Gavel and Iselid [35] and Sánchez et al. [65] respectively.

In the second step of the comparative analysis, attention is focused on the distribution of papers across the WoS and Scopus databases (Table 7).

The evaluation of coverage, overlap and dispersion of articles across the WoS and Scopus index bases was performed using the same indicators as previously: Meyer index, traditional overlap and relative overlap.

$$Meyer\ index_{WoS_{Articles}} = \frac{\Sigma\ Articles * Weight}{Total\ Articles}$$
$$= \frac{25 * 0.5}{31} = 0.40 \quad (12)$$

$$Meyer\ index_{Scopus_{Articles}} = \frac{\Sigma\ Articles * Weight}{Total\ Articles}$$
$$= \frac{6 * 1 + 25 * 0.5}{31} = 0.60 \quad (13)$$

The values of the Meyer index, after weighting, showed that even in the case of published papers, the Scopus index base covers most of the area of the sharing economy (60%) compared to the WoS index base (40%). Moreover, WoS had no unique articles in comparison to Scopus, which had 19% single articles (unique papers). These data confirm the previous conclusion that Scopus

Table 7: The WoS and Scopus distribution of the papers

WoS	Scopus
Albinsson & Perera (2012)	Albinsson & Perera (2012)
Bardhi & Eckhardt (2012)	Bardhi & Eckhardt (2012)
Behrend & Meisel (2018)	Behrend & Meisel (2018)
Belk (2010)	Belk (2010)
Belk (2014)	Belk (2014)
Cadarso et al. (2012)	Cadarso et al. (2012)
Cheng (2016)	Cheng (2016)
	Christie & Gibb (2015)
Cohen & Kietzmann (2014)	Cohen & Kietzmann (2014)
DeVore & Weiss (2014)	DeVore & Weiss (2014)
	Dredge & Gyimóthy (2015)
Edelman et al. (2017)	Edelman et al. (2017)
Ert et al. (2016)	Ert et al. (2016)
	Forno & Garibaldi (2015)
Guyader (2018)	Guyader (2018)
Hofmann et al. (2017)	Hofmann et al. (2017)
Laamanen et al. (2015)	Laamanen et al. (2015)
	Lichtenthaler (2016)
Lindblom et al. (2018)	Lindblom et al. (2018)
Martin (2016)	Martin (2016)
Martin et al. (2015)	Martin et al. (2015)
	Mittendorf (2018)
Möhlmann (2015)	Möhlmann (2015)
O'Sullivan (2015)	O'Sullivan (2015)
Ravenelle (2017)	Ravenelle (2017)
Roos & Hahn (2017)	Roos & Hahn (2017)
	Skerratt & Hall (2011)
Sordi et al. (2018)	Sordi et al. (2018)
Tridimas (2011)	Tridimas (2011)
Wang & Nicolau (2017)	Wang & Nicolau (2017)
Wilson & Rezgui (2013)	Wilson & Rezgui (2013)

Source: Authors

is a more comprehensive source of literature on the topic of the sharing economy. Similar Meyer index values were also found by Fabregat-Aibar et al. [29] when examining the coverage of socially responsible funds-related literature by Scopus and WoS, while the greater singularity of the Scopus index base at the article level in the field of social sciences was in line with Norris and Oppenheim [59] and Sánchez et al. [65].

$$\%TO_{Articles} = 100 * \left(\frac{|WoS_{Articles} \cap Scopus_{Articles}|}{|WoS_{Articles} \cup Scopus_{Articles}|}\right) = 100 * \frac{25}{31} = 81\% \quad (14)$$

The high level of similarity between the WoS and Scopus databases in the field of the sharing economy was also confirmed by the traditional high overlap of articles (81%). This data shows that a search of any of the index databases (WoS and Scopus) finds at least 81% of the sampled papers on the topic of sharing economy. The similarity of the index databases at article level in the field corresponds to the percentage of diversity of these databases in the field of wine tourism [65]. Thus, it could be concluded that the level of WoS and Scopus match may differ significantly depending on research area.

$$\%Overlap_{WoS_{Articles}} = 100 * \left(\frac{|WoS_{Articles} \cap Scopus_{Articles}|}{|WoS_{Articles}|}\right) = 100 * \left(\frac{25}{25}\right) = 100\% \quad (15)$$

$$\%Overlap_{Scopus_{Articles}} = 100 * \left(\frac{|WoS_{Articles} \cap Scopus_{Articles}|}{|Scopus_{Articles}|}\right) = 100 * \left(\frac{25}{31}\right) = 81\% \quad (16)$$

Finally, the values of relative overlap indicate that the Scopus index database refers to all papers from WoS, while WoS covers 81% of the papers in the Scopus index database on the topic. The comprehensive coverage of WoS articles by the Scopus index base was also acknowledged by López-Illescas et al. [49] in the field of oncology, while lower coverage percentages of 73.3% and 60% were found by Fabregat-Aibar et al. [29] and Sánchez et al. [65]. Interestingly, Sánchez et al. [65] found that WoS covers only 37% of articles on wine tourism referred to in Scopus, which is accounted for by the fact that Scopus encircles journals which specialize in wine tourism, with a large number of papers that were not referred to in WoS.

It can therefore be concluded that Scopus is a more comprehensive index base in terms of journals and papers as sources of literature on the topic of the sharing economy. Essentially, Scopus covers the topic more comprehensively and accordingly, is a more comprehensive source of contemporary scientific knowledge about the sharing economy in comparison to WoS. However, the Scopus index base's greater coverage should not necessarily be considered as being of greater importance and impact, as journals and papers which refer exclusively to Scopus cannot boast a significant number of citations, with the exception of *Tourism Recreation Research* (Table 5) and Dredge and Gyimóthy [24] (Table 4). The low-citation impact of journals and papers on the topic of the sharing economy corresponds to the results of research conducted by Barnett and Lascar [9] in the field of earth and atmospheric sciences and López-Illescas et al. [49] in the field of oncology.

Finally, since all of the sampled WoS journals and papers on the topic are referred to in Scopus, and since journals and papers from Scopus are characterized as having a low citation impact, it is concluded that in terms of this discipline, WoS acts as a subset of Scopus, which complements the research conducted by López-Illescas et al. [49] in the field of oncology.

Conclusion

The paper presents a contemporary bibliometric analysis of literature on the topic of sharing economy within the fields of economics, business and management. Using a two-stage approach: evaluative bibliometric analysis and comparative analysis of WoS and Scopus databases, the following conclusions were made:

In the sharing economy discipline within the predefined research field, Europe is leading geographical area led by the UK, a country that has managed to undertake the dominant role of USA. The dominance of Europe follows the Ertz and Leblanc-Proulx research [28] findings, while

the dominance of UK collides with the findings from the same study;

Within the research area, there is a large scientific production dispersion established by Lima and Carlos Filho [47], which indicates that the sharing economy is far from the stage of maturity and completeness;

There was a slight increase in the share of co-authored papers in comparison to the results of previous research (e.g. Lima and Carlos Filho [47]), thus indicating a growing collaboration of authors within this field;

The dominant research niches within the sharing economy knowledge were the application of this concept in consumption, sustainable development, management and tourism, with a pronounced implementation of various theories within the sharing economy bibliography pointed out by Hossain [42];

The most authoritative paper in the field of sharing economy was Belk [13], while author of this paper, Belk Russell, had the strongest influence on the development of the research field. Although the conclusion was made in line with research conducted by Ertz and Leblanc-Proulx [28] and Lima and Carlos Filho [47], the list of remaining most influential papers differs completely to the previous studies, except for Möhlmann [55];

Among the journals in the field of economics, business and management, the greatest contribution to the development of the research field, in terms of the largest share in the total number of citations, was achieved by the *Journal of Consumer Research* and the *Journal of Business Research*;

Scopus database covers the research issue more comprehensively, which in no way diminishes the importance of the WoS database, represented in this study as an outstanding subset of Scopus, supporting the earlier arguments acknowledged in the field of oncology [49].

The theoretical contribution of the paper comes as a result that, to the best of the authors' knowledge, it represents the first bibliometric analysis of contemporary sharing economy literature from an economic perspective exclusively. Also, the paper complements the existing research related to the WoS and Scopus databases comparison that has been made in other disciplines [31], [56], [59]. Moreover, practical implication of the study relates to the enhanced understanding of the concept of sharing and therefore encourages its wider application in practice and solving practical problems.

The main limitation of the research, which at the same time unequivocally indicates the potential direction of future research was reflected in the fact that the paper did not conduct content analysis and social network analysis (SNA) that would provide deeper insight into the intellectual structure, particularly level of collaboration between the authors within the analyzed phenomena.

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