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This issue of *Ekonomika preduzeća* begins with three papers in the *Finance* section. A trio of authors, *S. Popović*, *I. Janković* and *V. Lukić*, has analyzed inflation processes in the Eurozone, which is a burning issue, bearing in mind recent inflation trends all over the world. Their findings show that average inflation rates in the majority of member countries significantly differ from EMU average as well as among themselves. Pronounced heterogeneity in inflation processes makes the management of common monetary policy very complicated, putting in question the preparedness of certain members for the single monetary policy. The second paper in this section, written by *D. Vučković*, *B. Savić* and *S. Radić,* examines the effects of COVID-19 pandemic on the performance of selected food companies operating in Serbia, with a focus on assessing the risk of bankruptcy using the Z-Score model and testing the validity of the assumption of continuity of operations expressed by the auditors in the Notes to the financial statements. The results of their research call for more adequate approach of auditors in that respect. In the last paper in this section, a group of authors, including *S. Adžić*, *M. Milunović, A. Vuković* and *N. Marković,* has observed the impact of the COVID-19 pandemic on the financial system of Serbia. According to these authors, the financial sector turned out to be resilient enough to respond to the challenges induced by the COVID-19 crisis, particularly thanks to successfully implemented digitalization and online banking transition.

The first paper in the *Economic Growth and Development* section, written by *I. Domazet, D. Marjanović*, *I. Beraha* and *D. Ahmetagić,* explores the relationship between national innovative capacity and competitiveness. The research included four countries: Serbia and three neighboring European Union member countries (Bulgaria, Hungary, and Romania). The evaluation was conducted using statistical data from international databases (WEF, INSEAD, and WIPO) covering period 2008 to 2018. In the second paper of this section, *N. Crnokrak*, *B. Vlahović* and *K. Radosavljević* provide a comprehensive analysis of the competitiveness of wine export of CEFTA countries to the EU over the period from 2011 to 2020 using the main competitiveness (comparative advantage, export specialization and trade intensity) and market share indices. The share of wine exports in the structure of agro-industrial exports was significant only in the case of Moldova and North Macedonia, amounting to 12.5% and 9%, respectively. These countries contributed to over 80% of total wine exports to the EU, while other CEFTA countries will have to put more efforts in raising the quality of their wine and production processes to become competitive in EU market. In the last paper in this section and this issue of *Ekonomika preduzeća*, a team of authors, including *M. Mitrašević*, *M. Pjanić* and *S. Luković,* has examined the determinants of Serbia's public debt in the period 2000-2019 by applying the ARDL cointegration approach. Among observed determinants, economic growth and gross fixed capital formation tend to have a statistically significant negative long-term effect, while general government final consumption expenditure (% of GDP) and trade openness (% of GDP) show a statistically significant positive long-term effect on the public debt. Their findings could be valuable to policy makers when defining measures aimed at managing and stabilizing public debt.

Prof. Dragan Đuričin, Editor in Chief

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HETEROGENEITY OF INFLATION PROCESSES IN EUROPEAN MONETARY UNION

Heterogenost inflatornih procesa u Evropskoj monetarnoj uniji

Abstract

Paper analyses the extent to which inflation processes in Eurozone member countries are heterogeneous. Eurozone is composed of 19 different countries, are they similar enough to share the common currency? Significant heterogeneity of inflation processes makes the management of common monetary policy very complicated, since it poses contradicting demands, so it will not suit all members. Growing inflation has been very significant problem in the world since the beginning of 2021 and events in the first quarter of 2022 brought even higher, unprecedented rise in inflation rates. How might that influence the management of common monetary policy? Should we fear of new debt crisis in EMU? It was expected that Monetary union will support the integration of labor, product and capital markets, which will further reduce the heterogeneity of inflation processes. Literature review showed significant achievement in inflation convergence when comparing period before and after the advent of Monetary union, however problems occurred in later stages. Our analysis indicates significant departure of inflation process in majority of member countries from EMU average and among themselves. There is no statistically significant convergence of inflation rates, while there is a unit root in the series of standard deviations of inflation differentials. Coefficient of variations shows large differences in inflation rates in a single period, variability of inflation between members is very high, and variations of inflation seem insufficiently correlated. Inflation rates show significant persistence measured by autocorrelation coefficients, and there are differences among member countries showing that their inflation transmission processes differ.

Keywords: *inflation rate, inflation processes, inflation convergence, European monetary union, inflation persistence, common monetary policy*

Sažetak

U radu se analizira u kojoj meri su inflatorni procesi u zemljama članicama evrozone heterogeni. Evrozona se sastoji od 19 zemalja, da li su one dovoljno slične da dele zajedničku valutu? Značajna heterogenost inflatornih procesa komplikuje upravljanje zajedničkom monetarnom politikom jer postavlja kontradiktorne zahteve, tako da ona neće odgovarati svim članicama. Rastuća inflacija je veoma značajan problem u svetu od početka 2021. godine, a događaji u prvom kvartalu 2022. godine doneli su još veći rast stopa inflacije u svetu. Kako bi to moglo uticati na upravljanje zajedničkom monetarnom politikom? Da li treba da se plašimo nove dužničke krize u EMU? Očekivalo se da će Monetarna unija podstaći integraciju tržišta rada, proizvoda i kapitala, što bi dodatno smanjilo heterogenost inflatornih procesa. Pregled ranijih istraživanja pokazuje značajan nivo konvergencije stopa inflacije kada se uporedi period pre i neposredno nakon osnivanja Monetarne unije, međutim problemi se javljaju u kasnijem periodu. Naša analiza je ustanovila značajno odstupanje procesa inflacije u većini zemalja članica od proseka EMU, kao i između njih. U seriji standardnih devijacija inflatornih diferencijala postoji jedinični koren, što znači da nije ostvarena statistički značajna konvergencija stopa inflacije zemalja članica. Koeficijent varijacije za jedan period pokazuju velike razlike u stopama inflacije između članica, takođe zemlje karakteriše visoka i nejednaka varijabilnost inflacije u čitavom posmatranom periodu, a varijacije inflacije ne pokazuju visoku koreliranost. Takođe inflaciju karakteriše značajna postojanost merena koeficijentima autokorelacije, a među zemljama članicama postoje razlike koje pokazuju da se njihovi procesi transmisije inflacije razlikuju.

Ključne reči: *stopa inflacije, inflatorni procesi, konvergencija inflacije, Evropska monetarna unija, postojanost inflacije, zajednička monetarna politika*

Introduction

One of the most important topics today is inflation. At the end of 2021, the inflation rates in developed economies began to grow and reached values that these countries have not experienced in recent history. Most central banks explained that it is only a matter of transient price growth, due to the huge increase in the prices of energy, especially gas and oil, heating and food. The ECB announced that it does not expect further price growth in 2022, so there is no need for major changes in monetary policy. On the other hand, in European monetary union in January 2022, the growth of prices was higher than expected, fueling the suspicion that it may be a more permanent increase in prices. Similar is in other countries. Having in mind that the balance sheets of central banks have drastically increased since 2008, for example the Fed's balance sheet has increased more than 10 times [9], the ECB's balance sheet 6 times [7], the amount of money in circulation has drastically increased. So is it indeed a one-off/transient growth of inflation or it is more permanent phenomenon?

The problem is even more complex in Eurozone, since it is composed of countries which differ significantly. For Eurozone countries to enjoy benefits of membership in Monetary union, it is important to reach a sufficient level of economic performances convergence. That particularly relates to inflation rates and inflation processes. Inflation in member countries must be stable, low and sustainable in long term. Divergence of inflation rates leads to divergence in interest rates, while nominal rates are the same, but real interest rates will be different. It may cause the divergence in real business cycles. Also higher inflation rates together with fixed exchange rate has as a consequence loss in competitivenes, and thus current account problems and disbalances in Monetary union. If inflation processes are significantly heterogeneous, that means that inflation transmission mechanisms differ, so there will be different response to same shocks and monetary policy measures, which leads to further economic divergence. For a country that significantly departures from EMU average, common monetary policy will bring more economic problems and costs than benefits.

Significance of inflation convergence/ homogeneity

In January 1999, eleven[1] European countries formed European monetary union. They gave up their national, independent monetary policy and national currencies. In 2001 Greece managed (at least formally) to satisfy accession criteria and joined Eurozone. These are 12 old members, and very often when analyzing convergence, authors use data for those old members to understand what was going on. Removal of exchange rates on one side and higher price transparency on other side, should have boosted higher competition and trade among members. Integration of financial markets should have led to lower, unique prices and more efficient allocation of resources. Thus it was expected that the single market would increase the productivity, the member countries will converge and became fully integrated. EMU should have fostered economic integration, capital flows, more balanced growth and development, less developed countries should catch-up more developed members. Events in previous decade showed that this paradigm failed.

Since 2007, new wave of enlargement begun with Slovenia entry, followed in 2008 by Cyprus and Malta, than Slovakia in 2009, Estonia in 2011, Latvia in 2014 and Lithuania in 2015. Croatia has ambition to become the 20th member as of beginning of 2023. So monetary union is composed of 19 member countries with different economic and political structures, different economic history, that follow different economic development models, and have different size (geographical, population, economic). But there is no political or fiscal union, nor fully integrated markets, while very important differences exist in the labor markets. This all causes significant differences in inflation rates and processes among member countries.

For members it is very significant to reach nominal convergence. They do not have any more national monetary policy that is focused on countries' specific needs. European central bank manages monetary policy for the Euro zone as a whole. It cannot adjust it to target the specific needs of high or low-inflation countries or countries with higher-

1 Germany, France, Italy, Spain, Austria, Netherlands, Belgium, Finland, Portugal, Ireland and Luxemburg

or lower than average rate of growth. This means it will not suit all member countries, so they will have economic consequences. If a country has higher than average inflation, it will lose competitiveness. Its export will be more expensive and will start to decrease and import will rise. Domestic producers of tradable goods will lose markets and will have to close the production. So goods that were previously produced in a country, now will be imported. With lower export revenues payment problems would arise. Such countries will have to borrow to pay higher import and their debt and current account deficits will increase. Beside, with higher inflation rate, real interest rate will be lower. (ECB sets main refinancing rate at the same level for the Eurozone as a whole). Lower interest rate might trigger new investment cycle increasing demand in the country and thus further raising inflation rate and moving the country away from the business cycles in the rest of Monetary union. It might happen that a specific country is in the phase of growth, while others enter into a phase of falling economic activity, and vice versa. In such cases costs of membership in monetary union will be higher than benefits. Such scenario is already seen in the case of Greece, Portugal, Ireland, Italy and Spain at the end of 2000s and beginning of 2010s.

Literature Review

Monetary union from the start was not an optimal currency area (OCA). OCA literature stresses the conditions for sucessful membership in Monetary union, so that a country has long-term net benefits from its membership. Popović [13] showed that even these conditions were not satisfied, but it was expected that monetary union environment, common currency and monetary policy will facilitate convergence of economic results. When it commes to inflation, it was expected that member countries would "import"monetary stability from Germany. The anouncement and start of Monetary union brought significant reduction of differences between interest rates of the first member countries. However the problems began to rise very soon and the outbreak of financial crisis led to further nominal divergence. Average inflation rate in peripherial countries (mostly from South Europe) was constantly higher than in core countries (mostly from North Europe) untill the outbreak of crisis [8] (Boskovic at al 2013). After that the trend reversed, since peripherial countries had to undertake deflationary adjustment programs.

Aucremanne at al. [2] showed that the establishment of EMU and the single monetary policy influenced inflation dynamics in member countries. ECB brought unprecedented price stability in Eurozone, and to some extend even the decrease in inflation persistence, thanks to monetary policy focused on price stability and thus lower inflation expectations. However, maintaining low inflation persistence in the future requires that ECB is completely oriented towards low inflation goal, but more relaxed monetary policy can lead to rise in inflation expectations and higher inflation persistence. On the other side, price-level convergence happened before EMU, and it seems that EMU did not lead to further convergence. This issue probably should be treated by structural reforms in product and labor markets, depending on underlying causes.

Auray & Eyquem [3] showed that there was significant convergence of inflation rates among countries that formed EMU in 1999, when comparing average inflation rates in the period before financial crisis and before the advent of Monetary union. However, that convergence was not finished in later stages, leading to significant differences in real interest rates. Peripheral countries (mostly from South Europe) witnessed significant reduction of borrowing costs, while they remained relatively constant in core countries (mostly North members). Since ECB rates are the same for the whole euro area, higher inflation in peripheral countries meant substantial reduction in the real rates, from around 2% to 0.42% after the introduction of euro.

Tilford & Odendahl [12] stressed that elimination of exchange rate risk facilitated destabilizing capital flows from core to peripheral countries, further decreasing borrowing costs. That motivated households, companies and governments to spend more and borrow to finance that spending, which increased demand and led to higher differences in inflation rates in booming countries. Unfortunately that capital was not used to finance productive investments, but rather real estate and consumption. In Greece government was overspending, but in Spain and Ireland the private sector. And that suited creditor countries

like Germany or Netherlands. Their growth was based on the export and relied on increased indebtedness of other countries. That caused serious imbalances in Eurozone.

Abdih, Lin & Paret [8] (2018) found that the inflation in Eurozone is highly persistent, which postpones the responsiveness of inflation to changes in economic conditions. Inflation process (for core inflation) is more backward-looking than in the US. Reason is probably slow transmission process from labor market changes to prices (due to wage dynamics, price setting and labor market rigidities). Forward-looking inflation expectations also have significant influence, although lower than backward-looking inflation. According to authors, low inflation rates in Eurozone since 2011 are significantly influenced by high unemployment. Since inflation is very persistent it takes a time for negative shock to fade out. A potential rise in long-term inflation expectations can lead to rise in inflation rate.

Moretti [1] analyzed the determinants of inflation divergence in period 1999-2007. On the sample of 11 euro zone countries she found that product market deregulation had significant influence on inflation rate but not inflation persistence, and labor market regulation contributed to the inflation persistence and significantly decreased responsiveness of inflation to the output gap. Labor market regulation has important influence on slower adjustment of inflation rate to real shocks, while product market deregulation notably decreases inflation rate. She also found that private credit flows have statistically significant positive effect on inflation rate.

Barigozzi, Conti & Luciani [4] studied asymmetry in response of member states to the common monetary policy. Since members of Monetary union have different economic structures, legislation, fiscal policies and public debt, their response to changes in monetary policy might differ, complicating monetary policy decision making. They found that the monetary transmission mechanism across Eurozone is more homogenous after the introduction of euro, however the difference between North and South Europe still exists when it comes to responsiveness of prices and unemployment. Such differences are the consequence of country specific issues and could not be tackled by a common monetary policy, but rather national fiscal policies, regulation and structural reforms. Response of inflation after the advent of Monetary union and introduction of euro is less asymmetric, thanks to integration and higher competition across Eurozone, which made the response of prices to interest rate changes more homogenous. However some asymmetry still remained when it comes to Mediterranean countries, due to less flexible prices and lower market competition. Structural and socio-economic characteristics of individual countries probably caused the asymmetries in labor markets. Countries with more rigid labor market structure (like Italy), make domestic unemployment less responsive to the common monetary policy. On the other side, it seems there are no significant deviations in the responsiveness of member countries' output to the single monetary policy. Remaining differences could not be addressed with the tools of monetary policy, but by national reforms.

According to Lagoa [10] the inflation differentials in Eurozone is one of the factors that explains sovereign debt crisis. Countries with positive inflation differentials suffered from weaker competitiveness and economic growth, while lower real interest rates led to the accumulation of debt. Different inflation rates are largely the consequence of differences in rise of unit labor costs, but also the result of the lack of policy coordination and adequate mechanisms in case of asymmetric shocks. According to the author, managing inflation expectations and controlling labor costs are crucial for inflation convergence. Inflation heterogeneity caused divergent changes in the real exchange rates, but also changes in exchange rates led to divergent inflation dynamics.

Coudert at al. [6] studied heterogeneity within the euro area by measuring the distance between the equilibrium exchange rates' paths. Since countries in monetary union do not have their national currencies any more, their exchange rate path must be in line with one of other countries. Otherwise, unsustainable internal and external imbalances might arise, which would make functioning of monetary union more problematic. Authors found out that member countries in the period before the advent of monetary union were separated clearly into two groups. The first group constitutes mainly of core euro area countries- Germany, France, Belgium, the Netherlands and Ireland which exchange rate paths were

pretty homogenous. The second group is less homogenous, constituted of Austria, Finland, Spain and Italy, while Portugal and Greece have different exchange rate paths (especially Greece, which was an outlier). With the time the differences between and within groups rose, reflecting building up of macroeconomic imbalances in EMU and rising a question whether member countries have sufficient level of similarities to successfully share the same currency.

Sapir [14] stressed that misalignments of real exchange rates are the most visible and problematic consequence of asymmetric shocks in EMU. They are largely the result of the differences in national wage setting and bargaining systems. Those differences are especially large between core and periphery countries. That is why measures are necessary to ensure that wage developments follow productivity developments.

Methodology

We wanted to understand how much inflation processes in European monetary union differ. The best scenario would be full nominal convergence, when inflation rates are very similar, but also when countries are hit with the same shocks, with very similar effects in their economies. That is why we analyzed different characteristics of inflation in member countries- described by relevant statistical variables. We also analyzed autocorrelation coefficients of inflation rates for each member country and EMU, to understand how persistent inflation is- how much time it takes for a temporary shock to inflation to disappear. Unit root test on the series of standard deviations of inflation rates helps to understand if there is a tendency for differences in inflation rates to diminish over time. For each period we analyzed only member countries in that period. This means that in the analysis for the period between January 1999 and December 2001, we included data for 11 countries which were in that period the members. In 2001 Greece entered EMU, so for the period from January 2000 to December 2006 we based our calculation on the sample of 12 countries. In 2007 Slovenia entered Monetary union, so our sample increased to 13, etc. Sample data for the period from January 2015 till the end of 2021 included all 19 member countries.

Characteristics of inflation processes in Eurozone

The main goal of ECB is price stability, defined as inflation below, but close to 2%, in the medium term. This statement clearly says that inflation rates higher than 2% or very low rates are not consistent with the goal of price stability. It is not so easy to assess if ECB was successful in achieving its goal. Descriptive statistics given in the Table 1. show that both average and median inflation do satisfy this criteria.

Table 1: Inflation processes in EMU countries: Descriptive statistics, January 1999-December 2021

	max	min	mean	median	sd	CV
EMU	5	-0.6	1.67	1.9	0.99	59.42
Austria	4.1	-0.4	1.85	1.8	0.87	46.99
Belgium	7.1	-1.7	1.93	1.85	1.27	65.95
Germany	6	-0.7	1.52	1.5	0.94	62.21
Finland	4.7	-0.7	1.61	1.4	1.11	68.76
France	4	-0.8	1.51	1.6	0.90	59.90
Luxemburg	6.3	-1.6	2.16	2.3	1.52	70.43
Netherlands	6.4	-0.7	1.91	1.8	1.26	65.82
Ireland	5.9	-2.9	1.65	1.6	1.98	119.98
Italy	4.3	-1	1.72	1.9	1.14	66.54
Portugal	5.1	-1.8	1.79	1.9	1.49	83.24
Spain	6.6	-1.5	2.05	2.4	1.63	79.86
Greece	5.7	-2.9	1.75	1.95	2.09	119.68
Slovenia	6.9	-1.4	1.70	1.7	1.79	105.46
Cyprus	5.3	-2.9	1.01	0.8	2.03	200.43
Malta	5.7	-0.5	1.72	1.3	1.29	74.67
Slovakia	5.1	-0.9	1.66	1.6	1.56	94.36
Estonia	12	-1.8	2.46	2.8	2.24	90.81
Latvia	7.9	-1.1	1.57	1.55	1.74	110.91
Lithuania	10.7	-1.5	2.03	2	2.17	106.96

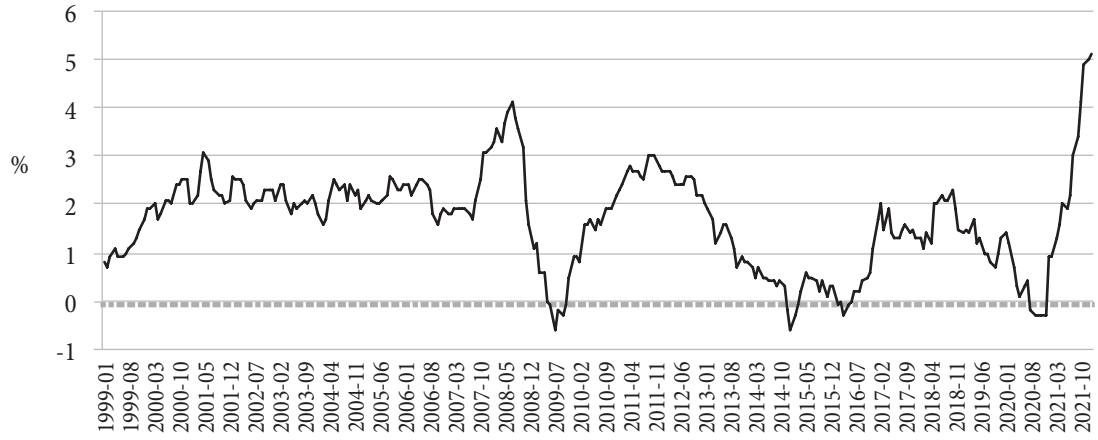
Source: Calculation of authors, based on data from [8]

On the other side, if we look at Figure 1. which gives historical values of inflation, it is observable that in majority of periods inflation was not close to targeted level. In almost 39% of time, inflation rate in Eurozone was higher than 2%. In additionally around 37% of cases inflation was lower than 1.5% (there is no clear, precise definition what close to 2% means, we assumed 1.5% and higher). So in less than 25% of cases, inflation rate was between 1.5 and 2%. Due to a number of shocks that usually hit economies, it is not possibly to manage inflation rate at some fixed level all the time. That is why the goal is set for the medium term, not short term. Short period would require significant switches in monetary policy and would be very harmful for the economy.

In 17 periods (months) Eurozone faced deflation with negative interest rates. In the period before financial crisis, inflation rates were in 60% of the cases above the goal. Inflation reached maximum of 4.1% just before the crisis, in July. Decreasing trend started at the end of this year and inflation very soon reached the bottom of -0.6%. In the second half of 2009 inflation started to recover, reaching 3% in the last quarter of 2011, which again is the level not consistent with the goal of price stability. At the beginning of 2013 rates were brought back to their targeted level, but then the second wave of debt crises hit, lowering inflation rates until they again hit the bottom of -0.6% in January 2015. This was followed by a period of 5 years in which ECB fought with very low inflation (with the exception of some months in 2017 and 2018, but that was not sustainable). The emergence of Covid-19 crisis led to significant fall of inflation, which again turned negative in majority of the second half of 2020. Trend reversed in the beginning of 2021, when inflation started strong rising trend, reaching maximum of 5% in December. Although it was expected that inflation rate in January 2021 would be 1.9%, it reached 5.1% (ECB, 2022a).

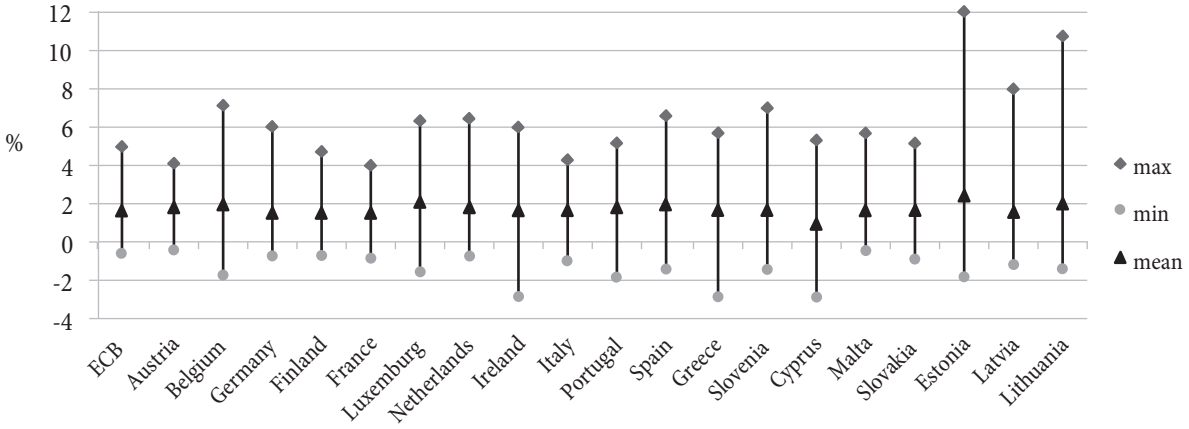
Figure 2. shows average and extreme values of inflation rates in member countries. We can observe the diversity of inflation processes among countries, and clear departure from ECB data. In majority of countries average inflation rates do not differ so much from EMU average. The exceptions are Cyprus, with average inflation of 1.01%, Luxemburg, Spain, Estonia and Lithuania with average inflation rate above 2% and significantly above EMU average. A range of inflation rates is very high, from -2.9% in Greece, Ireland and Cyprus to 12% in Estonia and 10.7% in Lithuania. The problem is in the fact that extreme values of inflation were not realized in same or close periods, which indicate that inflation processes are not much correlated.

Figure 1: Inflation rates (HICP), EMU



Source: [8]

Figure 2: Average and extreme inflation rates in EMU countries, January 1999-December 2021



Source: Calculation of authors, based on data from [8]

Standard deviation (Table 1) shows volatility of inflation rates- on average how dispersed are the data around the mean. Table 1. shows significant differences among member countries, reaching even 2.24 for Estonia, 2.17 for Lithuania, 2.09 for Greece and 2.03 for Cyprus.

We calculated the coefficient of variations (CV), as another measure of dispersion of observed variable. It is the ratio of the standard deviation to the mean and is expressed in percentages. Variable with lower CV is less dispersed (has lower relative variability) than the variable with the higher CV. From the Table 1. it is observable that data for individual countries are very volatile.

We calculated also coefficient of variations for each month, to understand how much are members' inflation rates dispersed around the mean for that month. Results are even worse. For around 10% of time periods CV is between 20 and 30% (there are no periods with CV of inflation rates lower than 20%!). In around 45% of cases, CV is between 30 and 50%, in around 21% it is between 50 and 100%, and in remaining 23% of months CV is higher than $|100\%|$. The differences are extremely high! For instance, in December 2021, while inflation rate in Estonia was 12%, in Malta it was 2.6% and EMU average was 5%. In April 2010, inflation rate in Greece was 4.8%, while in Ireland it was -2.4% and EMU average was 1.6%. And these are not unique examples of differences between the levels of inflation rates in one period. So the inflation processes among EMU members are very heterogeneous. That significantly complicates the management of common monetary policy, since member countries have very different needs. It means that a single monetary policy will not be appropriate for the large part of monetary union. European central bank manages monetary policy at the average level, HICP for Eurozone (which is the goal of ECB) is calculated as the weighted average of HICP for each member country. Weights are calculated as the ratio between the consumption costs of a given country and the total costs of consumption in EMU. So monetary policy is more oriented towards the largest economies (GDP of Germany constitutes around 30% of EMU GDP, France GDP around 20%, Italy and Spain together make 25% of EMU GDP), and it will less suit other smaller economies with inflation rates significantly departuring EMU average. The end of 2021 and the beginning of 2022 brought even larger dispersion of members inflation rates, and it seems that current events promise further rise of differences.

Analysis of heterogeneity of inflation processes in EMU countries- Unit root test

To statistically check heterogeneity of inflation process in Eurozone, we conducted a unit root test on a series of inflation differentials. The logic of analysis is the following. We already explained how important is for the member states' inflation rates to gradually converge towards average EMU inflation. So for each period and for each country, we calculated inflation differentials as the difference between the inflation rate in a given country and the HICP for EMU. After that, we calculated the average inflation differentials for the group of countries that were EMU members in that period. If there was a convergence of inflation rates, the average differences between the observed countries and in relation to the average of Monetary union, will decrease, which means that the average inflation differentials will tend to zero. The variance of the series of average inflation differentials will also tend to zero. If that happened, the series of average inflationary differentials will not have a unit root.

On the other side, if the analysis shows that there is a unit root in the series, it means that the series does not oscillate around some value (it does not tend to that value). That would mean that our series of inflation differentials does not have a constant mean and finite variance. So there was no convergence of inflation rates, as the theory expected. Inflationary processes in the member states are not homogeneous enough, which is a great challenge for the European Central Bank.

When conducting described analysis we faced a problem. The differences in inflation rates in one period are very significant and for some countries inflation differentials were negative, for some positive. So when we calculated average inflation differentials, those differences tended to cancel each other, thus obtained results were not appropriate measure of dispersion if inflation rates in a given month. That is why we chose to conduct described analysis on the series of standard deviations for each month. This series is more appropriate, while it gives a

measure of how the data are dispersed around the mean, and it cannot be negative. Results of our analysis are shown in the Table 2:

Table 2: Unit root test in levels for the series: Standard deviation of inflation rates in Eurozone countries

Null Hypothesis: X has a unit root			
Exogenous: Constant			
Lag Length: 0 (Automatic - based on SIC, maxlag=15)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.391439	0.5866
Test critical values:	1% level	-3.453997	
	5% level	-2.871845	
	10% level	-2.572334	
*MacKinnon (1996) one-sided p-values.			
Augmented Dickey-Fuller Test Equation			
Dependent Variable: D(X)			
Method: Least Squares			
Date: 02/16/22 Time: 13:00			
Sample (adjusted): 1999M02 2021M12			
Included observations: 275 after adjustments			

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X(-1)	-0.043478	0.031247	-1.391439	0.1652
C	0.046309	0.030450	1.520814	0.1295
R-squared	0.007042	Mean dependent var		0.004976
Adjusted R-squared	0.003405	S.D. dependent var		0.111184
S.E. of regression	0.110995	Akaike info criterion		-1.551419
Sum squared resid	3.363325	Schwarz criterion		-1.525115
Log likelihood	215.3201	Hannan-Quinn criter.		-1.540862
F-statistic	1.936103	Durbin-Watson stat		1.915845
Prob(F-statistic)	0.165225			

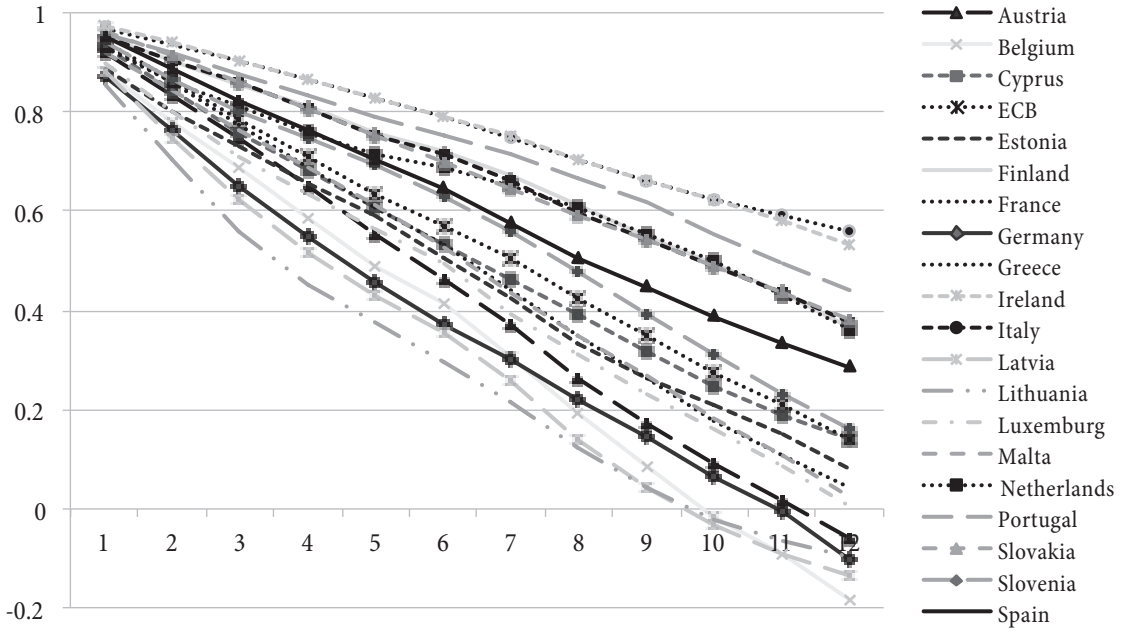
Source: Calculation of authors in Eviews, based on data from [8]

Obtained results show that there is a unit root in the series of standard deviations. The decision was made on the basis of Augmented Dickey-Fuller test, which tests the null hypothesis that a time series has a unit root. ADF τ statistics was found to be equal to - 1.39, while the critical value (with intercept) was τ^k = -2.87 at 5% confidence level. Also p=0.5866, so the probability of rejecting correct null hypothesis is very large. Thus, we cannot reject the null hypothesis that the series *X* has a unit root. Our analysis showed that there was no statistically significant convergence of inflation rates in Eurozone.

In addition, we wanted to analyze the differences in inflation persistence, so the duration of shocks to inflation rates. When inflation rate is hit by a shock which increases it for 1%, how long does it take for that shock to fade out? For those purposes we calculated autocorrelation coefficients of member countries' inflation rates. Larger coefficients for longer lags mean higher inflation persistence and vice versa. Results of analysis are presented in the figure 3:

Obtained results show that inflation processes are characterized by a significant persistence. The first autocorrelation coefficient is large for all countries and the following coefficients slowly decrease. So it takes more time for a shock to fade out. Figure 3. also shows significant heterogeneity of correlograms among countries. Inflation is persistent the most in Greece, Ireland, Italy,

Figure 3: Autocorrelation coefficients of EMU countries inflation rates



Source: Calculation of authors based on data from [8]

Portugal and Spain, while the persistence is the lowest in Slovenia, Germany, Latvia, Belgium and Austria. Why are those differences significant? For instance, if member countries are hit with the same shock, in Latvia the shock to inflation will fade out after 9 months, in Greece and Ireland it will still significantly influence inflation after 9 months, and will not fade out even after 1 year. So the countries do not respond in the same way to one-time shocks. Inflation transmission processes are very different. This additionally complicates the conduct of the single monetary policy.

Concluding remarks

The issue that has occupied economists since the advent of EMU is whether member countries are sufficiently alike to share the common currency. That motivated us to analyze how homogenous inflation processes among member countries are. It was expected that the advent of Monetary union and the introduction of euro would lead to higher integration of labor, product and capital markets, which will further reduce the heterogeneity of inflation processes in Eurozone. So it is significant to analyze country specific inflation dynamics, as well as at the level of Monetary union.

Our analysis showed significant departure of inflation process in majority of members from EMU average and among themselves. There is no statistically significant tendency of inflation differentials to move towards zero. Differences in inflation rates in a single period are very high, measured by coefficient of variations. In the same period, there are countries with very high inflation and countries with negative inflation rate. Also variability of inflation between member countries is very high. Some of them have pretty stable level of prices, while for others HICP is much more volatile. Besides, countries reached extreme values of inflation in different periods, which indicates insufficient correlation of their inflation processes. Inflation rates in general show significant persistence measured by autocorrelation coefficients, but also there is significant difference among member countries showing that their inflation transmission processes differ.

Large and persistent heterogeneity in inflation processes makes the management of common monetary policy very complicated, since it poses contradicting demands, and such monetary policy will not suit all member countries. This issue is very current in the light of the latest developments. Inflation is growing significantly, will it further increase the level of heterogeneity of inflationary processes in EMU? Given that the countries with the highest inflation rates in the monetary union are losing competitiveness and their economic cycles are deviating from the rest of the monetary union, should we fear a new debt crisis in the EMU? Was for some of member countries the decision to join the Monetary union premature, since they were not ready for the single monetary policy? Will they in the long term have lower economic benefits than the costs?

References

1. Abdih, Y., Lin.L., & Paret, AC. (2018). Understanding Euro Area Inflation Dynamics: Why So Low for So Long? *IMF Working Paper.* WP/18/188. Retrieved from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjVv4OAqpP2AhUAh_0HHahtCQkQFnoECAcQAQ&url=https%3A%2F%2Fwww.imf.org%2F-%2Fmedia%2FFiles%2FPublications%2FWP%2F2018%2Fwp18188.ashx&usg=AOvVaw3blvgEVLg7YJhiWKotIq4V
2. Aucremanne, L., Boeckx, J., Dhyne, E., & Smets, J. (2009). What Have we Learned About prices and Inflation in 10Years of Monetary Union? *Centre international de formation européenne "L'Europe en Formation"*. 2009/1 n° 351 | pages 67 à 89. Retrieved from https://www.cairn.info/revue-l-europe-en-formation-2009-1-page-67.htm
3. Auray, S. & Eyquem, A. (2021). Heterogeneity, Convergence and Imbalances in the Euro Area. OFCE. *"Revue de l'OFCE"*. 2021/3 173 | pages 117 à 152. Retrieved from https://www.cairn.info/revue-de-l-ofce-2021-3-page-117.htm
4. Barigozzi, M., Conti, A. & Luciani, M. (2013). Do Euro Area Countries Respond Asymmetrically to the Common Monetary Policy?, *Working papers*. Number 923 – July. Banca D'Italia. Retrieved from https://www.bancaditalia.it/pubblicazioni/temi-discussione/2013/2013-0923/en_tema_923.pdf
5. Bošković, O., Popović, S. & Njegovan, N. (2013). Convergence Process in EMU 12, *Ekonomske teme*, Vol.51(2), p. 235-250, ISSN 0353-8648
6. Coudert, V., Couharde, C., Grekou, C, & Mignon, V. (2019). Heterogeneity within the Euro Area: New Insights into an Old Story. *CEPII Working Paper* No. 2019-05. Retrieved from http://www.cepii.fr/PDF_PUB/wp/2019/wp2019-05.pdf
7. ECB. (2022a). European Central Bank. *Statistical Data Warehouse*, Total Assets/ Liabilities- Eurosystem. Retrieved from https://sdw.ecb.europa.eu/quickview.do?SERIES_KEY=123.ILM.W.U2.C.T000000.Z5.Z01

8. ECB. (2022b). European Central Bank, *Statistical Data Warehouse*. Harmonized Index of Consumer prices. Retrieved from https://sdw.ecb.europa.eu/browse.do?node=9691207
9. FED. (2022). Board of Governers of the Federal Reserve System. Retrieved from https://www.federalreserve.gov/monetarypolicy/bst_recenttrends.htm
10. Lagoa, S. (2017). Determinants of Inflation Differentials in the Euro Area: Is the New Keynesian Phillips Curve Enough? *Journal of Applied Economics*. 20:1, 75-103. Retrieved from https://doi.org/10.1016/S1514-0326(17)30004-1
11. Moretti, L. (2014). The Determinants of Inflation Differentials in the Euro Area, *CFS Working Paper.* No. 451, Goethe University, Frankfurt, Center for Financial Studies. Retrieved from sajta (CFS),https://www.econstor.eu/bitstream/10419/93094/1/779033531.pdf
12. Tilford, S. & Odendahl, C. (2018). Paradigm Shift in the Eurozone? The Market-Based Convergence Rationale. *Intereconomics*, Vol 53, May/June, No. 3. Retrieved from https://www.intereconomics.eu/pdf-download/year/2018/number/3/article/paradigm-shift-in-the-eurozone-the-market-based-convergence-rationale.html
13. Popovic, S., (2013). *Monetarna politika Evropske centralne banke i njene posledice na proces konvergencije*", Doktorska disertacija Ekonomski fakultet Univerziteta u Beogradu, Beograd
14. Sapir, A. (2016). The Eurozone Needs Less Heterogeneity. Retrieved from https://voxeu.org/article/eurozone-needs-less-heterogeneity

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VALIDITY OF THE ASSUMPTION OF CONTINUITY OF OPERATIONS TO COMPILE FINANCIAL STATEMENTS OF COMPANIES IN THE PERIOD OF COVID-19

Validnost pretpostavke o neograničenosti poslovanja za potrebe sastavljanja finansijskih izveštaja preduzeća u periodu Kovid 19

Abstract

The subject of the research is testing the risk of bankruptcy and assessing the validity of the assumption of going concern to compile financial reports of selected companies in the food industry during the period of Covid-19. The analysis included five companies each from different sectors of food and beverage production, which operate in the territory of the Republic of Serbia. For bankruptcy risk, testing selected companies used the Z-score model created by Edward Altman in 1993, which was adapted to developing countries. The research period includes 2019 and 2020. Data for the preparation of the paper were taken from financial reports, notes to financial reports and auditor's reports published on the website of the Serbian Business Registry Agency.

The research results show that the Covid-19 pandemic affected the operations of companies in the food industry and caused the need for a more cautious assessment of the assumption of continuity of operations to compile the company's financial reports by managers and auditors. The research also established that different companies within the same sector can be affected with different intensities, hence it is not possible to isolate the production sector within the food industry that is more significantly exposed to the consequences of the pandemic.

Keywords: *financial reporting, going concern, Altman's model, Covid-19 pandemic, food industry*

Sažetak

Predmet istraživanja je testiranje rizika od bankrota i procena validnosti pretpostavke o neograničenosti poslovanja za potrebe sastavljanja finansijskih izveštaja odabranih preduzeća prehrambene industrije u periodu Kovid-19. Analiza obuhvata po pet preduzeća iz različitih sektora proizvodnje prehrambenih proizvoda i oblasti proizvodnje pića, koja posluju na teritoriji Republike Srbije. Za testiranje rizika od bankrota odabranih preduzeća korišćen je Z-score model kreiran od strane Edvarda Altmana (*Edward Altman*) 1993. godine, koji je prilagođen zemljama u razvoju. Period istraživanja obuhvata 2019. i 2020. godinu. Podaci za izradu rada preuzeti su iz finansijskih izveštaja, napomena uz finansijske izveštaje i izveštaja revizora objavljenih na sajtu Agrencije za privredne registre Republike Srbije.

Rezultati istraživanja pokazuju da je pandemija Kovid-19 uticala na poslovanje preduzeća iz domena prehrambene industrije i uslovila potrebu za opreznijom procenom pretpostavke o stalnosti poslovanja za potrebe sastavljanja finansijskih izveštaja preduzeća od strane menadžera i revizora. Istraživanjem je takođe utvrđeno da različita preduzeća u okviru istog sektora mogu biti pogođena različitim intenzitetom, otuda nije moguće posebno izolovati sektor proizvodnje u okviru prehrambene industrije koji je značajnije izložen posledicama pandemije.

Ključne reči: *finansijsko izveštavanje, pretpostavka o stalnosti poslovanja, Altmanov model, pandemija Kovid-19, prehrambena industrija*

Introduction

In a dynamic and highly competitive business environment, due to the influence of numerous internal and external factors, the business of every company is faced with numerous challenges and risks. The challenge that businesses around the world have been facing for the last three years is the Covid-19 pandemic. The Covid-19 virus has caused serious health and socio-economic consequences. To a large extent, the Covid-19 pandemic has contributed to the increase in the number of insolvent companies, and thus the number of bankrupt companies worldwide. For this reason, there is a need to assess the continuity of business, as the key precondition for the survival, growth, and development of a company.

The subject of the research is testing the risk of bankruptcy of selected companies in the food industry and assessing the validity of the assumption of going concern to compile financial statements in the period of Covid-19. The analysis includes five companies each from the field of food production (meat processing and preservation; production of dairy products and processing and canning of fruits and vegetables) and beverage production areas.

The bankruptcy risk testing of selected food industry companies and the assessment of the validity of the assumption about the continuity of business in the period of Covid-19 were carried out using the Z-score model created by Edward Altman 1993, which was adapted to the common business conditions of developing countries. In addition, the obtained results were compared with the Auditor's Report. The research period includes 2019 and 2020. Namely, the goal is to see if there are significant differences in KPIs in the period before and in the period after the declaration of the pandemic. The following criteria were used when selecting the sample of companies included in the analysis:

- large and medium-sized legal entities classified according to the Accounting Law of the Republic of Serbia;
- whether companies are obliged to legally audited financial statements;
- an explanation in the Notes to the company's financial statements whether the Covid-19 pandemic affected the business;
- availability of data on the site Serbian Business Registry Agency (SBRA).

The data for the research was taken from the financial reports which are published on the website of the Serbian Business Registry Agency (SBRA). The financial statements that were used for the analysis are the balance sheet, income statement, and notes to the financial statements. In addition to the aforementioned financial reports, the auditor's reports for 2019 and 2020 were also used, which were also published on the SBRA website.

The theoretical framework of research

The going concern principle in accounting theory implies that the company will continue to operate in the foreseeable future. This means that the company will not be forced to cease operations and liquidate its assets shortly. Since the lifetime of the company is not predetermined and is unlimited in time, permanent financial reporting is necessary every year [13].

The going concern assumption is contained in the Conceptual Framework for Financial Reporting (2010) issued by the International Accounting Standards Board. Within International Accounting Standards 1 – *The presentation of financial reports* emphasizes the continuity of operations as one of the basic assumptions of financial reporting. According to this standard, management is required to determine the entity's ability to continue operating indefinitely when preparing financial statements.

The principle of continuity of operations is basically an accounting concept, but this issue is mostly considered from the point of view of audit requirements [9, p. 187-196]. That is why the principle of the entity's ability to continue operating is included in one of the International Standards on Auditing. In question is the International Standard on Auditing 570 – *Going concern*.

IAS 570 requires the auditor to consider the correctness of the assumption about the continuity of the audit client's business during the planning and execution of the audit procedures and the assessment of the obtained results.

To assess the existence of doubts about the company's ability to continue operating, the auditor needs to consider management's plans for future operations and obtain sufficient evidence to confirm whether a material uncertainty exists. Events and circumstances that may cause doubt about the principle of continuity of the audit client's business are [12]:

1. financial conditions (balance of net liabilities or net current liabilities, indications that creditors will suspend financial support, unfavorable key financial indicators, etc.);
2. business circumstances (intentions of the management to liquidate the entity or to suspend operations, loss of key management without a secured replacement, loss of the main market, etc.);
3. other events (non-compliance with capital regulations or other legal or regulatory requirements, litigation, lack of insurance or insufficient insurance in case of disasters, etc.).

The Covid-19 pandemic affected the company's operations because it led to the following consequences [4]:

- temporary interruption of work;
- decrease in demand for goods and services;
- lack of resources to operate, including inventory and employees;
- inability to repay loans, leases, or other due debts;
- inability to collect claims;
- reduction of capital due to the devaluation of assets and/or reduced volume of trading;
- loss of the fair value of assets, especially when it was expected that these assets would be realized in the short term.

The aforementioned consequences were also reflected in financial reporting and auditing, especially in the assessment of the assumption of continuity of operations by management and auditors. Auditors should pay special attention to the assessment of the business continuity of the company during the pandemic for two basic reasons. First, the Covid-19 pandemic initially had a negative impact on tourism, hospitality, and similar sectors, but quickly spread to the global economy. For this reason, all companies, to a greater or lesser extent, are exposed to events and conditions that may cause significant doubts regarding the continuity of business. Secondly, the numerous measures of almost all countries in the fight against the spread of the Covid-19 virus have significantly limited the traditional way of conducting audits and challenged auditors to overcome these limitations to adequately carry out the necessary procedures [7, p. 77-93].

The declaration of a pandemic of the Covid-19 virus did not affect the recognition and measurement of assets, capital, and liabilities in the financial statements published for the year 2019, because the pandemic is considered a non-adjusting subsequent event. However, if the management of the company determines that the crisis that occurred in 2020 negatively affects the financial position of the company, then relevant information must be disclosed in the notes to the financial statements. In the notes, it is necessary to describe the consequences of the crisis that occurred after the reporting date, the assessment of the financial effects of the consequences, and the measures taken by the management to eliminate or mitigate the negative effects of the crisis [8].

Auditors must determine whether changes in businesses due to the Covid-19 virus affect their determination of materiality. If the auditors use the same criteria as in the previous period, the report should explain why they are relevant in the current circumstances. Measures implemented to prevent the Covid-19 virus have limited access to audit clients, and thus the way audits are performed has largely changed. Namely, the pandemic caused the application of alternative procedures and greater use of technology [17]. Remote auditing includes the use of cameras, drones, artificial intelligence assessment tools, and other technologies [3, p.14-19].

Fraud risks increase significantly during a crisis. In the conditions of the financial crisis, which encourages an uncertain and unstable business environment, some companies make more cautious assessments, others are prone to aggressive assessments, and others use unethical moves to avoid showing a deteriorating business result, which leads to fraud in financial statements [14]. The crisis caused by the Covid-19 pandemic and the resulting shutdown of the economy has fueled disruptions that increase the likelihood of fraud in the next few years [10].

The Covid-19 pandemic is a "perfect storm" for fraud risk, and auditors should be vigilant [6].

Methodology

Various statistical and econometric methods and models are used to predict financial distress in a company that can threaten the continuity of business and leads to bankruptcy. The most commonly used empirical model for assessing the risk of potential bankruptcy of a company is called the Z-score model [11]. In 1968, Edward Altman created the Z-score model in the United States of America, based on the financial performance of 66 companies, half of which were successful, while the other half went bankrupt.

To develop his first model, Altman used multivariate discriminant analysis of financial indicators. Altman's original model predicts the probability of bankruptcy by combining five financial indicators that are multiplied by the weighting of the influence of each of them. The obtained value of the sum of the weighted indicators (Z-score) determines whether the company has a risk of going bankrupt in the next two years or whether it is a financially healthy company whose operations are safe [5].

In addition to the original model setup, Altman made several modifications to the model. In this paper, the Z-score model created in 1993 was used to test the risk of the cessation of operations of selected companies. The model is adapted to manufacturing and non-manufacturing industrial companies, as well as companies operating in developing countries. The modified Z-score model is represented by the following function [1]:

$$Z'' = 6{,}56\times X_1 + 3{,}26\times X_2 + 6{,}72\times X_3 + 1{,}05\times X_4$$

Where Z represents the dependent variable, i.e. the value of the discriminant function, and the independent variables of $X1$ to the $X4$ the following relations:

X_1 = *working capital / total asset;*

X_2 = *retained earnings / total asset;*

X_3 = *earnings before interest and taxes / total asset;*

X_4 = *market value of equity / book value of total debt.*

To reduce the influence of the activity to which the company belongs, variable X_5 was excluded from the model, given that the ratio of sales revenue to total assets differed significantly depending on the sector of activity [2]. According to this model, companies with a Z″-score index value greater than 2.60 operate in the so-called "safe zone", while companies with a Z″-score index value less than 1.10 operate in the problematic "bankruptcy zone". If companies achieve a value of the Z″-score index in the interval from 1.11 to 2.59, it is a "grey zone" of financial stability.

Results

Sector: Processing and canning of meat and meat products

It includes the processing and canning of meat and the production of meat products. The companies, which were selected for analysis within this branch, are shown in Table 1.

According to Altman's 1993 model, the calculated value of the Z-score of the index indicates that the companies "Neoplanta", "Carnex" and "Mesokombinat" are financially stable, i.e. operating in a safe zone. The implied probability that any of the mentioned companies will find themselves in bankruptcy in the next two years is small. The company "Yuhor" operates in the bankruptcy zone, with a high probability of bankruptcy in the next two years, while the company "IM Topola" operates in the gray zone of financial security. Table 2 shows the calculated values of the Z″-score index and the estimated probability of bankruptcy, after which the situation in each of the selected companies is explained.

Table 1. Basic data on companies within the meat processing branch

Name of company	Year of establishment	Company category	Changes in the result in 2020 compared to 2019
Neoplanta	1980	Large legal entity	Increase in net loss
Yuhor	1902	Large legal entity	Increase in net profit
Carnex	1958	Large legal entity	Increase in net profit
IM Topola	1972	Medium legal entity	Increase in net profit
Mesokombinat	1961	Medium legal entity	Increase in net profit

Source: Processing by the authors based on data taken from the SBRA website

Although enterprise "Neoplanta" operates in the safe zone, it has had a deterioration in financial performance as well as value Z″-score index 2020 (4.90) compared to 2019 (7.33). In the Notes to the financial statements of this company, it is stated that the Covid-19 pandemic had a negative impact on the business of the company. Additional pressure on the operations of the company "Neoplanta" during the pandemic was the increase in the prices of raw materials, as well as the consequences of the African swine fever. New circumstances imposed the need for business transformation, which required additional investments. In the following period, the company expects a negative short-term effect on income and cash inflows, but not a disruption of the company's ability to invest in the foreseeable future. According to the auditor's opinion, the financial statements give an objective and true presentation, in all materially significant aspects, and were compiled by the assumption of the going concern.

The value of the Z″- score index, as well as most of the financial indicators of "Carnex" is smaller in 2020 compared to 2019. The exception is the improvement in rentability (X3), due to the increase in profit before interest and taxes. Sales took place smoothly on the domestic market, as well as abroad, with minor logistical problems related to the transportation of goods. The company, in the previous period, had no problem in providing the necessary raw materials and materials for the production process, because a significant part of the raw materials is procured on the domestic market. However, in the event of an extension of the duration of the Covid-19 pandemic, the risk for business is the number of available feedlots on the territory of Serbia. Given that the company "Carnex" fulfills its obligations on the maturity date not expect liquidity problems, the principle of continuity of operations continues to be applied. The auditor for the company's financial statements in 2020 issues an unqualified opinion, which is by the obtained values Z″-score index.

The company "Yuhor" with realized Z″-score index of -0.84 in 2019, i.e. -0.70 in 2020, is financially unstable and operates in the bankruptcy zone. In the Notes to the financial statements, it is emphasized that the Covid-19 pandemic and the measures taken to prevent it did not affect the company's financial performance, nor is it expected to have a significant impact on operations in the future. Current liabilities exceed current assets, which management explains in the Notes as a consequence of short-term financial liabilities with related legal entities. Given that the company made a net profit in 2020, the management of the company believes that there is no uncertainty regarding liquidity and that the company will be able to regularly settle its due obligations, which also means that the financial statements were prepared following the principle of going concern. In the report, the auditor expresses a positive opinion of the business

Table 2. Values of the Z″ score index of companies within the meat processing branch

	Neoplanta		Carnex		Yuhor		IM Topola		Mesokombinat	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
NWC[1]	853894	763385	6105768	4722168	-1016923	-1015055	49006	177980	70691	95904
Retained profit	1495607	1572807	5442046	4308251	22118	58198	261885	299068	297188	270617
EBIT	-55498	-187980	682926	803998	30205	87014	96211	93440	16388	33316
Total equity	4204792	4004254	11024208	9870855	1617658	1631960	452592	485980	301913	341431
Revenues from sales	4645801	4528355	8843772	8453506	4685004	5155489	1836478	2011469	975251	995097
Total assets	5033951	5305730	16242649	14999039	4442158	4624762	1734322	1818627	611476	611476
Total liabilities	829159	1301476	5218441	5128184	2824500	2992802	1281730	1332647	309563	270045
X_1	0.1696	0.1439	0.3759	0.3148	-0.2289	-0.2195	0.0283	0.0979	0.1156	0.1568
X_2	0.2971	0.2964	0.3350	0.2872	0.0050	0.0126	0.1510	0.1644	0.4860	0.4426
X_3	-0.0110	-0.0354	0.0420	0.0536	0.0068	0.0188	0.0555	0.0514	0.0268	0.0545
X_4	5.0712	3.0767	2.1125	1.9248	0.5727	0.5453	0.3531	0.3647	0.9753	1.2643
Z" score	**7.3319**	**4.9027**	**6.0589**	**5.3830**	**-0.8385**	**-0.6998**	**1.4212**	**1.9063**	**3.5470**	**4.1653**
Probability (%)	**0.0654**	**0.7372**	**0.2331**	**0.4573**	**69.8142**	**66.8141**	**19.4476**	**12.9401**	**2.8005**	**1.5287**

Source: Author's processing based on data from financial reports taken from the SBRA website

1 Net working capital

of the company, without indicating the possibility of bankruptcy in the future. Since in 2020, the probability of bankruptcy in the next two years amounted to 66.81%, the question arises of the adequacy of the opinion expressed by the auditor and the application of the assumption of going concern.

The bankruptcy of the company within two years is also possible for the company "IM Topola" because it operates in the gray zone of financial security, i.e. the Z″-score value index in 2019 was 1.42, and in 2020 it was 1.91. The Covid-19 pandemic and restrictive measures had an impact on the company's operations in the segment of procurement of raw materials and export of finished products. In the company itself, measures have also been introduced to ensure the safety of employees at the workplace and prevent the spread of the virus. In addition, the supply of basic raw materials functioned without a hitch. Preventive measures to prevent the spread of the virus and a secure procurement channel enabled the continuity of sales activities. Business obligations and loan obligations are settled regularly and, based on the conducted analysis the company is expected to be able to fulfill obligations on the due date in the foreseeable future. Based on the above, the financial statements were prepared in accordance with the principle of continuity of operations. The auditor's opinion on the operations of the company "IM Topola" is positive, although the company has certain problems in business because the probability of bankruptcy in the next two years according to the data for 2020 is 12.94%.

The business of the company "Mesokombinat" is financially stable as indicated by the obtained Z″-score index whose value in 2019 was 3.55, and in 2020 it was 4.17. During the state of emergency, the Covid-19 pandemic led to a drop in production and sales by around 5%, primarily due to the closure of catering facilities. In June 2020, the situation stabilized, which made it possible to return the economic activities of the company to regular flows. The management estimates that through rational business operations, it will be able to achieve positive results and will be able to secure enough liquid assets to finance its operations in the future, as well as that the pandemic will not call into question the company's ability to operate according to the principle of continuity. According to the auditor's opinion, the company's financial statements were prepared on all materially significant issues according to IFRS. The auditor draws attention to the note attached to the financial statements, which states that the situation with the Covid-19 pandemic will not call into question the company's ability to continue operations on a going concern basis, stressing that his opinion has not been modified regarding this issue.

Sector: Production of dairy products

It includes the production of milk, cheese, ice cream, and other frozen edible dough. The considered companies are shown in Table 3.

Analyzing companies within the branch of dairy products production, it is observed that the company "Imlek" belongs to the bankruptcy zone and has the highest probability of going bankrupt in the next two years. The company "Mlekara Kuc" is in the gray zone of financial security, while the companies "Somboled", "Mlekara Sabac" and "Lazar" are in the safe financing zone. Table 4 shows the calculated values of the Z″ score index and the estimated probability of bankruptcy, after which the situation in each of the selected companies is explained.

In 2019, the company "Imlek" had a Z″-score index of 2.22, which is a value that indicates the gray zone of financial security. The worse financial condition of the company in 2020 was also reflected in the value of the

Table 3. Basic data on companies within the branch production of dairy products

Name of company	Year of establishment	Company category	Changes in the result in 2020 compared to 2019
Imlek	1976	Large legal entity	Reduction in net profit
Somboled	1934	Large legal entity	Increase in net profit
Mlekara Sabac	1931	Medium legal entity	Reduction in net profit
Mlekara Kuc	1993	Medium legal entity	Reduction in net profit
Lazar	1998	Medium legal entity	Reduction in net profit

Source: Processing by the authors based on data taken from the SBRA website

Z″ score index, which was reduced to 0.98, whereby the company was placed in the bankruptcy zone. The probability that bankruptcy proceedings will be initiated against the company "Imlek" in the next two years has increased from 9.82% (in 2019) to 27.31% (in 2020). The Covid-19 pandemic did not have a significant impact on the company's sales and procurement market, except that part of the company's administrative activities were reoriented to work from home. In the Notes to the financial statements, it is stated that the reason for the worsening financial condition of the company is significant damage to the factory in Belgrade due to a fire that occurred in September 2018. The auditor expresses a positive opinion about the business of the company, without pointing out the current problems in the business and the possibility of bankruptcy in the coming period.

The company "Somboled" operates successfully, which confirms obtained value of the Z″-score index, which was 8.76 in 2019, and 8.49 in 2020. The implied probability of starting bankruptcy over the company "Somboled" in the next two years is insignificant. After the outbreak of the pandemic, the company implemented measures aimed at rationalizing costs, increasing employee productivity, and increasing revenue. Thanks to the implemented measures, the difficult business conditions caused by the Covid-19 pandemic did not have a negative effect on the company's operations. As the company's liquidity is stable, the management estimates that the company's operations under assuming the continuity of business will not be threatened in the future. The auditor for the company's financial statements issues an unqualified opinion, which is adequate according to the obtained values of the Z″-score index.

The company "Mlekara Sabac" operates in a safe zone of financial security. However, in 2020 compared to 2019, there was a decrease in net profit, deterioration of financial indicators, as well as the value of the Z″-score index. During April and May 2020, due to the new business conditions caused by the Covid-19 pandemic, there was a drop in demand for products on the market by about 35% and 11%, respectively. After that, the situation stabilized in the domestic market, while the production of products intended for the foreign market was reduced due to the low tourist season. Of the adopted economic measures of the government to reduce the negative effects caused by the pandemic, the company used direct grants from the budget in the form of non-reimbursable funds that were used for the payment of salaries and compensation of employees for May, June, July, August and September 2020. Despite the difficult business conditions, the management of the company estimated that the business activities will not be suspended, i.e. the assumption of unlimited business operations is fulfilled.

Bankruptcy of the company within two years is possible for the company "Mlekara Kuc", because it operates in the gray zone of financial security, i.e. the value of the Z″-score index in 2019 was 1.17, and in 2020 it was 1.68. The company was negatively affected by the

Table 4. Values of the Z″ score index of companies within the branch production of dairy product

	Imlek		Somboled		Mlekara Sabac		Mlekara Kuc		Lazar	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
NWC	5698914	1946382	2694463	3041184	593275	693155	-10745	100885	125106	94991
Retained profit	4380367	1402535	2571238	3090910	149988	207111	306182	319157	578529	614943
EBIT	5631052	1970221	597423	615249	95470	89649	58306	32792	54381	46830
Total equity	8632510	10205253	4008980	4528652	1118475	1175598	321362	334337	585816	622230
Revenues from sales	20983528	22134894	8181509	8510992	3708894	3718668	2003755	1950534	1444844	1413499
Total assets	45408092	45359322	5349802	6148971	2247995	2738875	1503665	1416027	1070647	1128929
Total liabilities	36775582	35154069	1340822	1620319	1129520	1563277	1182303	1081690	484831	506699
X_1	0.1255	0.0429	0.5037	0.4946	0.2639	0.2531	-0.0071	0.0712	0.1169	0.0841
X_2	0.0965	0.0309	0.4806	0.5027	0.0667	0.0756	0.2036	0.2254	0.5404	0.5447
X3	0.1240	0.0434	0.1117	0.1001	0.0425	0.0327	0.0388	0.0232	0.0508	0.0415
X4	0.2347	0.2903	2.9899	2.7949	0.9902	0.7520	0.2718	0.3091	1.2083	1.2280
Z" score	**2.2176**	**0.9790**	**8.7607**	**8.4902**	**3.2739**	**2.9163**	**1.1629**	**1.6823**	**4.1381**	**3.8959**
Probability (%)	**9.8180**	**27.3091**	**0.0157**	**0.0205**	**3.6477**	**5.1354**	**23.8139**	**15.6791**	**1.5702**	**1.9920**

Source: Author's processing based on data from financial reports taken from the SBRA website

Covid-19 pandemic, because many employees were sick, which led to a decrease in efficiency and productivity. The pandemic has caused a drop in demand for more expensive products in the catering and hotel industry due to the ban on gatherings, while the demand for the company's products in markets and basic food stores has increased. The management of the company believes that the property, financial and profitability position of the company enables the survival of the company for a long period of time and that the state of the economy and future measures of economic and monetary policy will not have a significant negative impact on the future financial position and results of the company's operations. The auditor expresses a positive opinion about the operations of the company "Mlekara Kuc", without indicating the possibility of bankruptcy in the coming period, which is not in accordance with the obtained research results, which show that the probability of bankruptcy in the next two years, according to the data for 2020, is 15.68%.

With the realized value of the Z''-score index of 4.14 in 2019 and 3.90 in 2020, the operations of the company "Lazar" are financially stable and belong to the safe financing zone. The implied probability of starting bankruptcy in the company in the next two years is negligible, that is, according to the data for 2019 and 2020, it was 1.57% and 2%, respectively. The Covid-19 pandemic had no significant negative effects on the operations of the company "Lazar". Of the economic measures adopted by the state to reduce the negative effects caused by the pandemic, the company used deferred payment of taxes and contributions to wages. The financial statements, as stated in the Notes to the financial statements, have been prepared under the assumption of going concern. Based on the audit of the financial statements, the auditor expresses a positive opinion about the business of the company, which is in accordance with the research results.

Sector: Processing and canning of fruits and vegetables

It includes the processing and canning of potatoes, the production of fruit and vegetable juices, and other processing and canning of fruits and vegetables. The selected companies for analysis from this branch of the food industry are shown in Table 5.

Based on the value Z''-score index, the business operations of "Nektar", "Polimark", "Bahus" and "Geneza" are financially safe, while the probability of starting bankruptcy over the mentioned companies in the next two years is insignificant. Business operations of "Friglo" are risky, with a high probability of bankruptcy. Table 6 shows the calculated values of the Z''-score index and the estimated probability of bankruptcy, after which the situation in each of the selected companies is explained.

Company "Nektar" operates in a safe zone of financial security. However, in 2020, compared to 2019, there was a decrease in net profit, deterioration of financial indicators, as well as the value of the Z''-score index. After learning about the outbreak of the Covid-19 pandemic, the company took measures to protect customers and employees by ensuring safe working conditions and providing services without disruption. During the course of 2020, the company "Nektar" used the benefits of the Government of the Republic of Serbia, delaying payment of taxes and contributions on the wages of employees for the months during which the state of emergency lasted. According to the auditor's opinion, the financial reports show the objective and true financial condition of the company, as well as the results of its operations.

Table 5. Basic data on enterprises within the branch of fruit and vegetable processing

Name of company	Year of establishment	Company category	Changes in the result in 2020 compared to 2019
Nektar	1998	Large legal entity	Reduction in net profit
Polimark	1989	Medium legal entity	Increase in net profit
Bahus	1991	Medium legal entity	Increase in net profit
Geneza	1994	Medium legal entity	Increase in net profit
Friglo	2016	Medium legal entity	Increase in net profit*

Source: Processing by the authors based on data taken from the SBRA website
*2019. in 2020, the company had a net loss, while in 2020 it made a net profit

The company "Polimark" operates successfully, which confirms obtained value of the Z''-score of the index, which was 19.86 in 2019, and 17.13 in 2020. The Covid-19 pandemic did not affect the decrease in turnover and profitability of the company's operations. Although in the coming period he expects the price of raw materials to rise, as well as the extension of payment terms, the management believes that the profitability and liquidity of the company will not be threatened, as well as that the company will have adequate funds to continue operating according to the principle of continuity. The auditor expressed a qualified opinion because the company did not recognize revenues arising from contracts concluded with customers, in accordance with the requirements of IFRS 15 - *Revenues from Contracts with Customers*.

With the realized value of the Z''-score index of 2.84 in 2019 and 3.75 in 2020, the company "Bahus" operates in the safe zone of financial security. When considered individually, indicators of liquidity (X_1), profitability (X_2), rentability (X_3), and financial structure (X_4) also improved in 2020 compared to 2019. The management of the company performed an analysis of the impact of the Covid-19 pandemic on the business of the company, based on which it concluded that there is no risk regarding the continuation of the business, i.e. the principle of going concern is not threatened. According to the auditor's opinion, the company's financial statements were prepared on all materially significant issues in accordance with IFRS.

The company "Geneza" is also in the safe financing zone because the obtained value of the Z''-score index of this company is higher than the threshold value of 2.6. The value of the Z''-score index, as well as other financial indicators of the company "Geneza" is higher in 2020 compared to 2019. In the Notes to the financial statements, it is pointed out that the financial statements were prepared under the assumption that the company will operate for an unlimited period, as well as that the Covid-19 pandemic did not affect the company's operations. The auditor's opinion about the operations of the company "Geneza" is positive, which is in accordance with the research results.

Unlike the previously analyzed companies within the branch of fruit and vegetable processing and canning, the company "Friglo" has the worst financial performance. With the realized value of the Z''-score index of 2.84 in 2019, i.e. 0.81 in 2020, the company "Friglo" is financially unstable and operates in the bankruptcy zone. The Covid-19 pandemic affected the business of this company by reducing imports and exports, as well as by making it difficult to find a carrier for international transport. The decision on limiting the price and margin of basic foodstuffs [16] adopted by the Ministry of Trade affected the prices of this company. The financial statements, as stated in the Notes to the financial statements, have been prepared under the assumption of going concern. In the Report, the auditor expresses a positive opinion about the business of the company, without indicating the possibility of bankruptcy in the following period, which

Table 6. Values of the Z'' score index of companies within the branch of fruit and vegetable processing

	Nektar		Polimark		Bahus		Geneza		Friglo	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
NWC	4402670	3577909	2600890	3147127	85304	175593	327112	407210	-966951	305680
Retained profit	7904199	7183740	4014466	4536626	290346	321368	736559	844130	6304	10400
EBIT	908123	555690	773212	952910	29019	40287	87355	131401	-139511	28443
Total equity	8023540	7303077	4183681	4704742	338991	370013	778019	885590	-148379	-145700
Revenues from sales	6386764	5914942	3743184	4053473	817519	629985	902328	964936	1023427	1277907
Total assets	15637849	15569983	4547158	5244589	814075	843920	1113767	1226614	2611993	2569237
Total liabilities	7614309	8266906	363477	539847	475084	473907	335748	341024	2760372	2714937
X_1	0.2815	0.2298	0.5720	0.6001	0.1048	0.2081	0.2937	0.3320	-0.3702	0.1190
X_2	0.5055	0.4614	0.8829	0.8650	0.3567	0.3808	0.6613	0.6882	0.0024	0.0040
X_3	0.0581	0.0357	0.1700	0.1817	0.0356	0.0477	0.0784	0.1071	-0.0534	0.0111
X_4	1.0537	0.8834	11.5102	8.7150	0.7135	0.7808	2.3173	2.5969	-0.0538	-0.0537
Z" score	**4.9914**	**4.1790**	**19.8587**	**17.1281**	**2.8389**	**3.7470**	**7.0428**	**7.8678**	**-2.8360**	**0.8117**
Probability (%)	**0.6751**	**1.5083**	**0.0000**	**0.0000**	**5.5260**	**2.3046**	**0.0873**	**0.0383**	**94.4590**	**30.7522**

Source: Author's processing based on data from financial reports taken from the SBRA website

is not in accordance with the obtained research results. The probability of bankruptcy of the company "Friglo" in the next two years was 94.46% in 2019, while in 2020 it was reduced to 30.75%. Based on the decrease in the probability of bankruptcy, as well as the improvement of other financial indicators in 2020 compared to 2019, it can be concluded that this company had significant problems in business even before the outbreak of the Covid-19 pandemic.

Sector: Production of beverages

It includes the production of distilled alcoholic beverages, grape wine, beverages and other fruit wines, non-distilled fermented beverages, beer, malt, soft drinks, mineral water, and other bottled water. The companies selected for analysis are shown in Table 7.

All companies that are the subject of analysis within the branch production of beverages in 2019 and 2020 had a Z″-score index greater than the threshold value of 2.6, which shows that their business is financially stable. The implied probability that one of the mentioned companies will find itself in bankruptcy in the next two years is insignificant. Table 8 shows the calculated values of the Z″ score index and the estimated probability of bankruptcy, after which the situation in each of the selected companies is explained.

The company "Heineken Srbija" operates in a safe zone of financial security. However, in 2020, compared to 2019, there was a decrease in net profit, deterioration of all financial indicators, as well as the value of the Z″-score index. Despite the decrease in results, the company achieved its business plans in 2020, while the management estimates that there are no indications of non-fulfillment of plans in the foreseeable future. Given that the company implemented the plan for 2020, it is concluded that the Covid-19 pandemic did not significantly affect the business, but the management states that if the pandemic continues, the consequences may affect the volume of business, cash flows, and profitability. On the day of issuing the financial statements, the company "Heineken Srbija" fulfilled its obligations on the due date, therefore it continues to apply the principle of continuity of operations as a basic assumption for the preparation of financial statements. The

Table 7. Basic data on companies within the branch beverage production

Name of company	Year of establishment	Company category	Changes in the result in 2020 compared to 2019.
Heineken Srbija	2007	Large legal entity	Reduction in net profit
Apatinska pivara	1756	Large legal entity	Increase in net loss*
Rubin	1955	Large legal entity	Reduction in net profit
Valjevska pivara	1860	Medium legal entity	Increase in net loss
Voda Vrnjci	1969	Medium legal entity	Increase in net loss*

Source: Processing by the authors based on data taken from the SBRA website
*2019. in 2020, the company had a net loss, while in 2020 it made a net profit

Table 8. Values of the Z″ score index of companies within the sectorbeverage production

	Heineken Srbija		Apatinska pivara		Rubin		Valjevska pivara		Voda Vrnjci	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
NWC	1078090	469030	900623	1021090	1151606	1682787	179266	194688	473688	552563
Retained profit	1984823	1051058	7662795	7662795	2789338	2849125	0	0	985407	990869
EBIT	1824331	1253429	726207	-55414	242101	169451	-15976	-32010	72946	-67559
Total equity	7215948	6494646	11601795	11376975	6819547	6181094	910389	1159355	1609772	1541438
Revenues from sales	11339648	10671551	10494576	9284860	2951351	2400628	508264	521978	1118709	922639
Total assets	11060268	10166429	16257484	15744098	10071883	8857149	1093496	1535714	1761381	1785894
Total liabilities	3844320	3671783	4655689	4367123	3252336	2676055	183107	376359	151609	244456
X_1	0.0975	0.0461	0.0554	0.0649	0.1143	0.1900	0.1639	0.1268	0.2689	0.3094
X_2	0.1795	0.1034	0.4713	0.4867	0.2769	0.3217	0.0000	0.0000	0.5595	0.5548
X_3	0.1649	0.1233	0.0447	-0.0035	0.0240	0.0191	-0.0146	-0.0208	0.0414	-0.0378
X_4	1.8770	1.7688	2.4920	2.6051	2.0968	2.3098	4.9719	3.0804	10.6179	6.3056
Z″ score	**4.3038**	**3.3254**	**4.8167**	**4.7239**	**4.0161**	**4.8488**	**6.1977**	**3.9260**	**15.0151**	**10.2051**
Probability (%)	**1.3337**	**3.4709**	**0.8028**	**0.8803**	**1.7704**	**0.7777**	**0.2030**	**1.9340**	**0.00003**	**0.0037**

Source: Author's processing based on data from financial reports taken from the SBRA website

auditor for the company's financial statements expresses an unqualified opinion, which is in accordance with the obtained values of the Z″-score index.

The business of the company "Apatinska pivara" is financially stable as indicated by the obtained Z″-score index, the value of which was 4.82 in 2019, and 4.72 in 2020. Due to the taken measures aimed at limiting the spread of the Covid-19 virus, the company's business activities are limited. For this reason, in 2020 compared to 2019, the company had a significant drop in sales revenue and profit before taxation and interest, which led to a negative business result. In the Notes to the financial statements, the management points out that due to the unpredictability of the pandemic, it is unable to quantitatively assess the future consequences of the pandemic on the company's operations. In addition to difficult business conditions, the application of the principle of business continuity is not questioned, because the company has adequate resources to continue business in the foreseeable future. The auditor for the operations of the company "Apatinska pivara" expresses a positive opinion, without indicating the loss realized due to difficult business conditions during the period of Covid-19.

The presented data show that the company "Rubin" with a Z″-score index of 4.02 in 2019 and 4.85 in 2020 operates in a safe zone of financial stability. The Covid-19 pandemic had a negative impact on all business segments of the "Rubin" company during 2020 and the beginning of 2021. Due to the closure of catering establishments, the consumption of the company's products was reduced, which resulted in a drop in sales revenue by around 19% and profit before taxation and interest by around 30% in 2020 compared to 2019. During the period of Covid-19, the company was engaged in the development of new products, primarily canned products, to adapt to the new market situation. The effects of the launch of new products will be considered only after the publication of the financial statements for 2021. The company, in the observed period, applies the principle of continuity of operations as a basic assumption for compiling general-purpose financial reports. According to the auditor's opinion, the company's financial statements give an objective and true presentation, of all materially significant issues, by IFRS.

The obtained Z″-score index values of 6.20 in 2019 and 3.93 in 2020 indicate that the company "Valjevska pivara" belongs to the safe zone of financial security. The impact of the Covid-19 pandemic on the company's operations was significant, as stated in the Notes to the financial statements. To overcome the challenges in business caused by the pandemic, the company used the possibility of deferred payment of taxes and contributions to wages and the right to use funds within the framework of fiscal benefits and direct government grants. The implementation of measures to prevent the spread of the virus and the procurement of basic raw materials without interruption during 2020 enabled the continuity of sales activities, which confirms the value of sales revenue, which has increased compared to 2019. Liabilities from the business are settled regularly and based on the conducted analyses, the management expects to be able to continue to settle them regularly in the foreseeable future. Based on the above, the financial statements were prepared by the principle of continuity of operations. The auditor expressed a qualified opinion, due to the impossibility of determining whether real estate, plant, and equipment were presented truly and fairly. In addition, the company did not calculate the provision for severance pay by IAS 19 - *Employee benefits* and did not record the allowance for receivables for expected credit losses in accordance with the requirements of IFRS 9 - *Financial instruments*.

The company "Voda Vrnjci" has a successful and financially secure operation, which confirms Z″ -score index value that was 15.02 in 2019, and 10.21 in 2020. In 2020, the consequences of the resulting crisis, caused by the spread of the Covid-19 virus, affected the business operations of companies in all segments. For this reason, the company had a net loss in 2020 compared to 2019 when it had a net profit. The value of the Z″-score index, as well as most of the company's financial indicators, is also lower in 2020 compared to 2019. The placement of products to catering establishments, as well as to key and local customers in the trade sector was significantly reduced, which led to a drop in sales revenue by 18% in 2020 compared to 2019. The company accepted the Government's measures that related to financial benefits and direct grants to business entities in the private sector. In 2021, sales growth compared

to 2020 is planned as well as the introduction of new products into the company's production program, which will enable greater participation of the company both in the domestic and foreign markets. Results achieved in 2021 will be able to be seen only after the publication of the financial statements for 2021. Although it is assumed that the pandemic will affect the company's operations in 2021 as well, the management does not expect that the principle of business continuity will be threatened. Based on the audit of the financial statements, the auditor expresses a positive opinion of the company's operations but draws attention to the note attached to the financial statements, which states that the pandemic could have a significant impact on the company's operations.

Conclusion

The Covid-19 pandemic has affected the operations of most selected companies in the food industry. The new business circumstances imposed the need to transform the business, ensure the safety of employees at the workplace and prevent the spread of the virus. Companies, which marketed a large part of their products to the catering and hotel sector, had a drop in sales due to the complete interruption of catering facilities during the state of emergency, and later due to the ban of gatherings of people in larger groups. In the case of certain companies, the pandemic has caused difficulties in the procurement of raw materials and the export of finished products. However, the Covid-19 pandemic did not have significant negative effects on business activities, sales volume, and profitability of certain food industry companies in the Republic of Serbia. Consequently, the research results show that if we analyze the same branch of the food industry, there are companies whose operations are more or less significantly affected by the events and conditions during the period of Covid-19. The extent to which the pandemic will affect the company's operations primarily depends on its financial stability and the results of its business in the previous period. For this reason, it is not possible to single out a special sector of the food industry in which business operations of companies are at risk to a greater extent during the period of Covid-19.

The management of all companies, in the Notes to the financial statements, states that the companies have adequate resources to continue operations for the foreseeable future and that the Covid-19 pandemic has not called into question the application of the going concern assumption. However, in the case of certain companies, it was determined using the Z"-score model that there is a high probability of initiating bankruptcy proceedings in the next two years, while this was not stated in the Notes to the financial statements. The auditor's report also expresses a positive opinion of the financial statements of some companies, without indicating the possibility of bankruptcy in the future. The foregoing points to the need for a more adequate assessment of the assumption of continuity of operations by the auditor, as a basic assumption to compile financial statements.

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Literature

1. Altman, E. I. (2002). *The Use of Credit Scoring Models and the Importance of a Credit Culture*. Retrieved from: http://pages.stern.nyu.edu/~ealtman/3-%20CopCrScoringModels.pdf (20.11.2021).
2. Altman, E.I., Hartzell, J., Peck, M. (1995). *Emerging Markets Corporate Bonds: A Scoring System*, Salomon Brothers Inc. New York.
3. Appelbaum, D., Shaun, B., Vasarhelyi, M. (2020). Auditing and accounting during and after the COVID-19 crisis. *CPA Journal*, 90 (6), 14–19. Retrieved from: https://www.cpajournal.com/2020/07/08/auditing-and-accounting-during-and-after-the-covid-19-crisis/ (accessed 25.12.2021).
4. Association of Chartered Certified Accountants. (2020). *The impact of Covid-19 on Audit and Assurance – challenges and considerations*. Retrieved from file:///C:/Users/hp/Downloads/The%20impact-of-Covid-19-on-Audit-and-Assurance-challenges-and-considerations.pdf (accessed 22.12.2021).
5. Bešlić, D. (2016). *Revizorska procena stečajnog rizika klijenta*, doktorska disertacija. Univerzitet u Novom Sadu, Ekonomski fakultet.
6. Dohrer, B., Mayes, C. (2020). 4 key COVID-19 audit risks for 2020 year ends. *Journal of Accountancy*. Retrieved from: https://www.journalofaccountancy.com/issues/2020/aug/key-coronavirus-audit-risks-for-2020-year-ends.html (26.12.2021).

7. Đorđević, M., Đukić, T. (2021). Auditors' responsibility in assessing going concern assumption affected by Covid-19, *Ekonomske teme,* 59 (1), 77-93.
8. International Federation of Accountants. (2020). *Financial Reporting Implications of COVID-19.* Retrieved from https://www.ifac.org/knowledge-gateway/supporting-international-standards/discussion/financial-reporting-implications-covid-19 (accessed 09.03.2022).
9. Jakšić, D. i Mijić, K. (2017). Determinante revizorskog izveštavanja o narušenosti stalnosti poslovanja klijenta. *Anali Ekonomskog fakulteta u Subotici*, 53, (37), 187-196.
10. Karpoff, M. J. (2021). The future of financial fraud. *Journal of Corporate Finance*, 66. Retrieved from: https://doi.org/10.1016/j.jcorpfin.2020.101694 (accessed 15.03.2022).
11. Neogradi, S. (2014). Rejting i empirijski modeli. *Zbornik radova Međunarodne majske konferencije o strategijskom upravljanju Fakulteta tehničkih nauka*. Symposium conducted at the meeting in Bor. Retrieved from: https://www.researchgate.net/ (27.11.2021).
12. Picker, R., Clark, K., Dunn, J., Kolitz, D., Livne, G., Loftus, J., Van der Tas, L. (2019). *Applying IFRS Standards*, John Wiley and Sons Ltd, Chichester.
13. Rodić, J., Andrić, M., Vukelić, G. i Vuković, B. (2017). *Analiza finansijskih izveštaja*, Ekonomski fakultet, Subotica.
14. Savić, B. (2012). Manipulacije finansijskim izveštajima: uzrok ili posledica ekonomsko-finansijske krize?, *Zbornik radova sa 43. simpozijuma Saveza računovođa i revizora Srbije „Ekonomsko-finansijska kriza i računovodstveni sistem"*, Symposium conducted at the meeting in Zlatibor.
15. Serbian Business Registry Agency. Retrieved from: https://fin.apr.gov.rs/JavnaPretraga.
16. Official Gazette of the Republic of Serbia, No. 57/2020. Retrieved from: https://www.paragraf.rs/glasila/rs/sluzbeni-glasnik-republike-srbije-57-2020.html.
17. Vukoja, B. (2020). Financijski izvještaji i revizija pod utjecajem pandemije virusa Covid 19 i moguće implikacije. 8. Međunarodni simpozij na FINra, *Finansije, računovodstvo i menadžment u kriznom period*. Symposium conducted at the meeting in Tuzla, BandH.

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DETERMINING THE IMPACT OF COVID-19 PANDEMIC ON THE FINANCIAL SYSTEM OF SERBIA

Utvrđivanje uticaja pandemije kovid-19 na finansijski sistem Srbije

Abstract

The coronavirus disease has induced financial stress by destabilizing national economies, financial capital markets, financial management, financial markets, and commodity prices. The aim of the authors is to determine the impact of COVID-19 on the financial system of Serbia. For the purposes of this exploratory study, the authors developed a research scale "Impact of COVID-19 on Financial System" and conducted a quantitative survey () to understand and explain the problems and perspectives of the finance industry during the outbreak of the COVID-19 pandemic. The overall result of the success of the measures taken during the pandemic leads us to the conclusion that the financial sector in Serbia managed to survive during the pandemic with great efforts. The financial industry preserved its position mainly due to the successful digitalization and online banking transition. The authors concluded that the financial system in Serbia was efficient and sustainable during the COVID-19 pandemic and that the Serbian financial system could maintain its strong position even after the end of the COVID-19 pandemic.

Keywords: *COVID-19, financial system, finance industry, digitalization, Serbia.*

Sažetak

Bolest uslovljenja koronavirusom izazvala je finansijski stres destabilizacijom nacionalnih ekonomija, tržišta kapitala, finansijskog upravljanja, finansijskih tržišta i cena proizvoda. Cilj autora je utvrđivanje uticaja kovida-19 na finansijski sistem Srbije. Za potrebe ove eksploratorne studije, autori su razvili istraživačku skalu „Uticaj kovida-19 na finansijski sistem" i sproveli kvantitativno istraživanje (N = 51) kako bi razumeli i objasnili probleme i izglede finansijske industrije tokom kovid-19 pandemije. Sveukupan rezultat uspeha mera preduzetih tokom pandemije navodi nas na zaključak da je finansijski sektor u Srbiji uz velike napore uspeo da preživi pandemiju. Finansijska industrija sačuvala je svoju poziciju uglavnom zahvaljujući uspešnoj digitalizaciji i prelasku na onlajn bankarstvo. Autori zaključuju da je finansijski sistem u Srbiji bio efikasan i održiv tokom pandemije kovid-19 i da bi finansijski sistem Srbije mogao da zadrži svoju snažnu poziciju i nakon okončanja pandemije kovid-19.

Ključne reči: *kovid-19, finansijski sistem, finansijska industrija, digitalizacija, Srbija.*

Introduction

The epidemic caused by the SARS-CoV-2 virus and COVID-19 disease has created an unprecedented crisis that has not been seen in the last hundred years. The SARS-CoV-2 coronavirus has contributed to the most important transition in the world order, destabilizing the global and national economies. Inevitably, some sectors would be more impacted by COVID-19 than others. This paper intends to examine the impact of COVID-19 on the financial sector and to determine its current and future sustainability, especially given the lessons the financial sector needed to learn after the year 2008 crisis.

How did central banks of developed and less developed economies respond to the COVID-19 pandemic, what was the role of the financial institutions in the economic policy, how did the stock exchanges react, and what was the primary concern of finance managers regarding the cash holding level? These are some topics covered in the literature review along with a description of the policy-mix approach of the Government of Serbia and the Central Bank of Serbia policies to mitigate the effects of the COVID-19 on the economy. In the methodology section, we described the aims of this research, the applied methods, and the sample. In the results section, we performed the statistical reliability tests of the scale we created called "Impact of COVID-19 on Financial System", following by the results of our survey in order to draw conclusions. The findings of this study show that the sustainability of Serbia's financial system was not threatened during the COVID-19 pandemic.

Finance Industry Issues Caused by the COVID-19 Pandemic

Having a better-equipped health system and more competent institutions are not enough to cope with the transmission of viruses such as COVID-19 in a country. The mechanism of response to the virus outbreak was more critical than the country's systemic preparedness [23]. Government initiatives were the most important ones. Even in the initial process of the COVID-19 epidemic, less-developed nations did better. However, healthcare interventions are confined to general preventive measures in the absence of medicine and enough vaccines. Primary measures include [19] the restriction of movement, the quarantine of exposed persons, the minimization of social interaction, sanitation and personal hygiene measures, and the proper use of personal protection equipment. Moreover, the country's readiness in the health system was crucial for the survival of a nation, but the readiness in the business and financial system was of the importance of the survival and sustainability of the social system, as well.

The SARS-CoV-2 coronavirus has contributed to the most important transition in the world order, destabilizing, among others, the global economy and the financial capital markets, the national economy, social stability, industry, risk management, financial management, and financial markets. COVID-19 has created great volatility and drastically affected travel, tourism, supply chains, hospitality, consumption, production, operations, valuations, security, financial stress, and the prices of all products, including fossil fuel and renewable energy sources [6]. Markets have not reacted well to natural disasters and terrorist acts. Therefore, the COVID-19 crisis warns investors, decision-makers, and the population at large that economic harm can be caused by present health disasters on a scale previously unparalleled [10]. Inevitably, some sectors would be more impacted by COVID-19 than others. Yet COVID-19 would also have an immense effect on domestic consumption in virtually every country. A theoretical model [15] that illustrates that as the prevalence of major pandemics rises, the risk of a collapse of the banking sector of a developed country increases, pointed out that as the pandemic increases, the optimal bank reserves increase.

In advanced economies, central banks responded rapidly and aggressively to the COVID-19 pandemic, implementing within weeks the full spectrum of crisis instruments. The primary aim of the initial response was to relieve financial stress and ensure a smooth flow of credit to the private sector [5]. The condition in less developed countries was much worse because of poor economies and the reduction of central banks' power [24]. Under the COVID-19 crisis, central banks are starting to lose their institutional and financial freedom, and monetary

issues in the real economy are likely to be decided not by the market, but primarily by the needs of the sovereign government. Those measures could provoke a global economic crisis [3]. The central bank's stabilization loans are the most critical tool of the state that makes it possible to save banks and all other sectors of the economy from bankruptcy [24]. However, central banks' trend of aggressively reducing interest rates much more than a prior record low has placed additional pressure on banks' interest margins [12].

Financial markets have had a major role in the economic policy during the pandemic. Monetary policy measures have focused on quantitative easing, with large injections of capital into the financial sector and even into the corporate sector [29]. The greatest rise in liquidity demands ever witnessed was experienced by American banks in March 2020. Lending has risen by more than 50 times the average over the last three weeks of March [17]. After the Lehman bankruptcy, companies drew heavily on bank credit lines too, with lending rising by 10 times the average. In stark contrast to what occurred during the 2008 recession, anxiety over liquidity placed no pressure on banks. With the huge growth in deposits, which increased by around $1 trillion overall during the crisis weeks, twice as much as the net rise in lending, these banks were able to finance the liquidity demands. The lion's share of these liquidity demands has been faced by large banks. A similar situation was in Poland too, where the largest banks were the most resilient during the current health crisis [14]. However, Germany witnessed quite opposite practice. In contrast to the large banks, Germany's regional banks, i.e. 379 public savings banks and 842 cooperative banks, extended lending, as they did in the 2008 crisis [9].

The COVID-19 pandemic has a major effect on the cash holding level of companies in sectors severely affected by the pandemic as the managers of affected companies increase the cash holding level to protect companies from contingencies [25]. The pandemic outbreak reduces the financial effectiveness of microfinance institutions; however, it increases the social effectiveness of microfinance institutions [30]. Equity investments in start-ups and small medium-sized businesses slumped sharply, resulting in a 60% drop in the overall investment volume [4]. Although debt markets are heavily affected by the global financial crisis, entrepreneurial financing is much more vulnerable to the massive disruption caused by the Covid-19 crisis. By its very nature, the insurance sector is inherently well suited to cope with big industry loss incidents, such as the COVID-19 pandemic [12].

World financial markets have suffered significant losses as a result of the shocks triggered by the COVID-19 pandemic. On the 20th of February, financial prices began to decline, with a concurrent decline in all global markets. In the four weeks that followed, financial prices lost between a third and 40 percent of their value, falling more quickly than in 1929 [29]. For instance, in what is called the March 9 Black Monday incident, stock markets such as the Dow Jones lost approximately 3000 points in one day, while the FTSE collapsed by around 5 percent and saw a staggering loss of US$ 90 billion in one day [20]. The stocks began to rise again around March 23rd, but meanwhile, on March 8th, the price of oil plummeted by 24% [29]. Multiple manufacturers have ceased manufacturing gold due to the coronavirus pandemic, which has led to a lack of gold. It is almost impossible to purchase a gold ducat or gold bar in Europe [28]. The rise in the price of gold was subsequently influenced by the spike in demand. The pandemic caused a flight to liquidity or a "dash for cash". This took the form of a flight to US$ on currency markets. In comparison to the US$, all currencies have lost value. GBP traded at US$1.15 on 20 March 2020, its lowest value since 1985 [29].

A policy-mix strategy is required during times of crises. To mitigate the economic consequences of the COVID-19, the Ministry of Finance and the National (Central) Bank of Serbia have implemented a number of fiscal and monetary expansion measures in their respective jurisdictions, totaling RSD 608.3 billion or € 5.2 billion [27]. The Program of Economic Measures for Reducing the Negative Effects of the Covid-19 Pandemic and Supporting the Serbian Economy was launched by the Ministry of Finance. Tax policy changes, direct support to SMEs with the three monthly minimum salaries, efforts to preserve liquidity for the private sector through favorable loans from the Development Fund, and a direct

distribution of € 100 to every adult residents are all part of the program [18]. Domestic and international commercial and multilateral loans from financial institutions and foreign governments, as well as the issue of government securities and Eurobonds, will be used to support pandemic economic measures. To stimulate credit and economic growth, the National Bank of Serbia decreased the key policy rate twice, concluding with the key policy rate at 1.50 percent, the deposit facility rate at 0.50 percent, and the lending facility rate at 2.50 percent [27]. Additional dinar and foreign currency liquidity was provided to the local banking system. Excess liquidity is at an all-time high. Finally, the Central Bank decides to impose a debt payment moratorium of at least 90 days. Fees would be prohibited for banks and lessors. More than 90 percent of debtors (businesses, entrepreneurs, individuals, and other entities) took advantage of the moratorium [28].

According to one study [2], the incentive measures of the Government of Serbia and the Central Bank of Serbia during pandemic have been almost completely annulled by the threats caused by the Covid-19 pandemic. According to another study [22], the overall impact of COVID-19 on the business operations of SMEs is perceived as negative, with the most negative impact associated with market operations of product/service firms, the less negative impact recorded in the segments of logistics and business activities organization, and the least negative impact recorded in the segment of financial organization. After the present epidemic ends, predicting Serbia's economic future will be extremely difficult. There will almost undoubtedly be a slowdown in economic growth, as well as a probable increase in unemployment, supply chain disruptions, and a loss in purchasing power [18]. The focus of operations should be redirected to establishing a favorable environment for domestic entrepreneurship and private investment growth [13]. To create value rather than redistribute it, investments should focus on the circular and regenerative economy, health care, infrastructure (physical and conceptual), science, and education [8].

An unforeseen disruption to global business has been generated by the COVID-19 pandemic, but crises also force change. Almost all staff of financial services firms have operated remotely from their homes since lock-downs started [12]. The application of new financial technologies will likely accelerate [29]. IT technology modernization is critical to surviving and competing in current economy [26]. Thus, the present role of finance and accounting can be digitalized nearly in its entirety [16]. Therefore, when we recover from COVID-19, one of the first activities for finance practitioners would be to scrutinize any manual activity that still requires physical human contact or manual processing and to consider automated alternatives. From the Covid-19 pandemic, all facets of the environmental, social, and governance movement should emerge stronger [7]. Changes in the way capital markets perceive social and environmental requirements and, more broadly, business behavior will pave the way for a more sustainable approach in the future.

Methodology

The aim of current research is twofold. The first aim is to develop a Likert-type research scale that can be used to analyze the impact of COVID-19 on the sustainability of financial systems. Based on the available literature on the topics of the finance industry issues during the pandemic, we adapted the "Impact of COVID-19 on Business" scale [1] and developed a research scale "Impact of COVID-19 on Financial System". The second aim is to develop a quantitative survey and to collect data from Serbia about the impact of COVID-19 on the sustainability of the financial system and the problems and perspectives of the finance industry players during and after the COVID-19 pandemic. In addition to the Likert-scale questionnaire, we asked the participants to evaluate the measures of the Central Bank of Serbia and the Government of Serbia, to single out the most efficient bank during pandemics, as well as to give their opinion on which banks were more efficient in this period, large or small.

The quantitative research was conducted in the form of a survey in the period from mid-December 2020 to mid-February 2021. The questionnaire in the Serbian language was posted online on the Google Forms platform. We adopted a snowball sampling technique, with the help of social media and personal contacts. The final number of qualified participants and valid responses consisted of

those who have worked in the financial sector during the pandemic and of those who have known about the impact of the pandemic on the financial sector was 51 (N=51). We planned a considerably larger sample, but we did not count on the clause of the communication restriction with the external public built into the financial institutions' employment contracts. This limiting circumstance contributed to a smaller number of questionnaires and a longer survey time. More than 60% or 32 participants were located in the capital of Serbia, Belgrade. A tight majority or 51% held managerial positions; ⅔ were females. Almost 60% of participants earned a bachelor's degree; almost two-thirds of them worked in large organizations. Finally, 18 participants, or 35% have worked in a bank, following with the 10 participants, or 20% who have worked in an insurance company. The rest of 45% or 23 participants have worked in various finance positions in the corporate sector.

Results

We modified the current scale "Impact of COVID-19 on Business" [1] based on the analysis of the topics raised in the literature section and formed the scale "Impact of COVID-19 on Financial System", which consists of 20 five-point Likert-type questions (Figure 1).

Our first task would be to apply statistical tests on the scale. Primary, we tested the internal consistency of our scale. The calculated Cronbach's Alpha coefficient in SPSS was 0.945. Therefore, we can conclude that the internal consistency of our scale "Impact of COVID-19 on Financial System" with twenty items is truly excellent since the values above 0.8 are preferable [21]. Secondly, we performed the Factor analysis. The scale was adequate for the analysis since the Kaiser-Meyer-Olkin measure of sampling adequacy was 0.846, above the recommended value of 0.6, and Bartlett's test of Sphericity was signifi-

Figure 1. Impact of COVID-19 on Financial System Scale

1	Our organization proved resilient during the pandemic
2	We did not experience any disturbances or problems during the pandemic
3	During the pandemic, our efficiency increased
4	During the pandemic, our profitability increased
5	The level of digitalization in our organization is really satisfactory
6	We had no liquidity problems during the pandemic
7	Our level of capital was satisfactory during the pandemic
8	During the pandemic, we had no problems with credit activity
9	During the pandemic, the quality of our loans was satisfactory
10	Lowering the reference interest rate as a measure of the Central Bank's monetary policy during the pandemic helped our business
11	Providing additional dinar and foreign currency liquidity to the banking sector as a measure of the Central Bank's monetary policy during the pandemic helped our business
12	Moratorium in repayment of debtors' obligations as a measure of the Central Bank's monetary policy during the pandemic helped our business
13	Government measures during the pandemic helped our business
14	During the pandemic, our revenues increased
15	We innovated our business model during the pandemic
16	We successfully started new businesses during the pandemic
17	During the pandemic, our organization managed to achieve new forms of cooperation with other organizations
18	The leadership of our organization was effective during the pandemic
19	During the pandemic, we introduced the practice of working from home
20	There were no layoffs during the pandemic in our organization

Table 1. Pattern matrix

	Component	
	1	2
During the pandemic, our profitability increased	**1,001**	**-0,313**
We did not experience any disturbances or problems during the pandemic	**0,939**	-0,116
We successfully started new businesses during the pandemic	**0,870**	0,025
During the pandemic, our efficiency increased	**0,863**	-0,078
During the pandemic, we had no problems with credit activity	**0,824**	0,045
During the pandemic, the quality of our loans was satisfactory	**0,818**	-0,064
Our level of capital was satisfactory during the pandemic	**0,767**	0,189
We had no liquidity problems during the pandemic	**0,729**	0,057
Our organization proved resilient during the pandemic	**0,686**	0,204
We innovated our business model during the pandemic	**0,651**	0,249
During the pandemic, our organization managed to achieve new forms of cooperation with other organizations	**0,610**	**0,308**
During the pandemic, our revenues increased	**0,577**	0,110
There were no layoffs during the pandemic in our organization	**0,483**	0,177
The level of digitalization in our organization is really satisfactory	**0,416**	0,138
Moratorium in repayment of debtors' obligations as a measure of the Central Bank's monetary policy during the pandemic helped our business	-0,067	**0,863**
Providing additional dinar and foreign currency liquidity to the banking sector as a measure of the Central Bank's monetary policy during the pandemic helped our business	0,025	**0,784**
Lowering the reference interest rate as a measure of the Central Bank's monetary policy during the pandemic helped our business	0,008	**0,784**
Government measures during the pandemic helped our business	0,028	**0,712**
The leadership of our organization was effective during the pandemic	0,198	**0,664**
During the pandemic, we introduced the practice of working from home	0,220	**0,416**

Extraction Method: Principal Component Analysis.
Rotation Method: Oblimin with Kaiser Normalization.[a]
a. Rotation converged in 5 iterations.

Table 2. Results of the Likert scale in a descending order

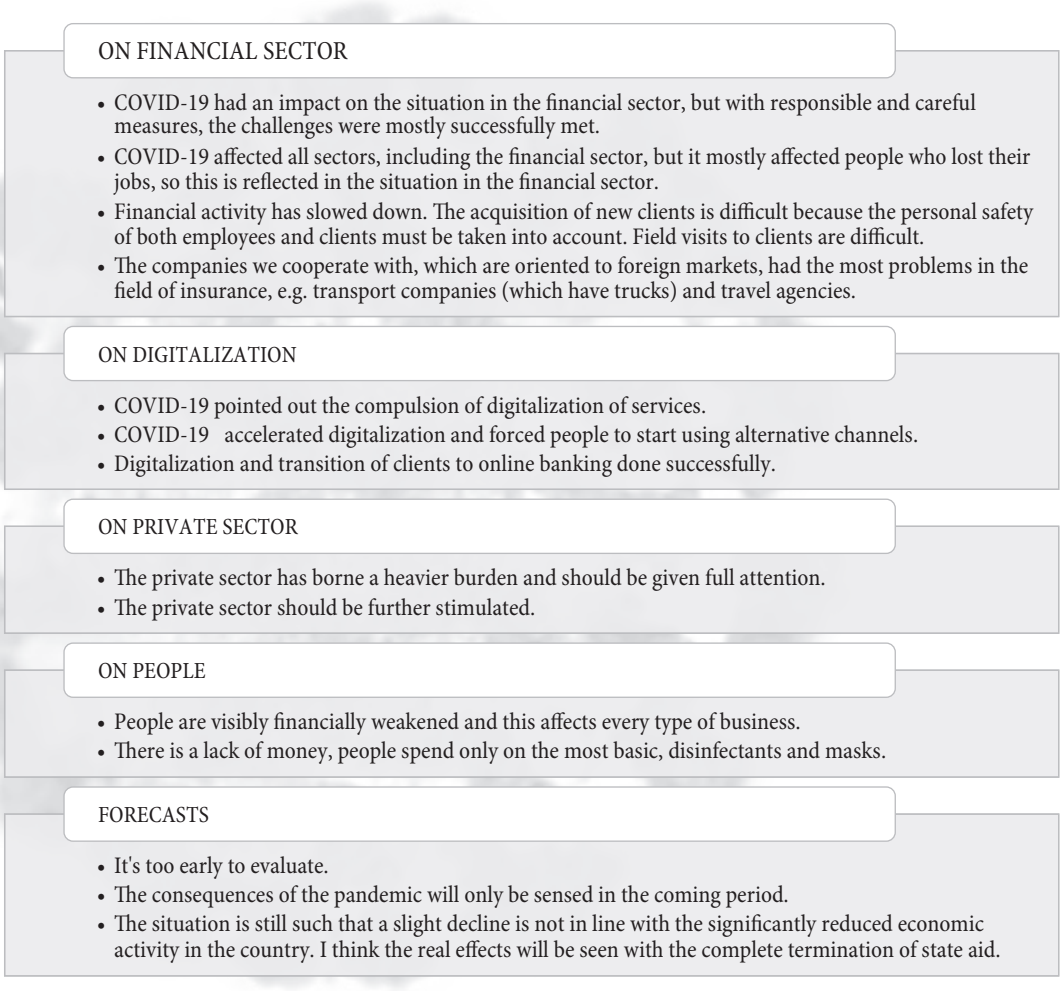
	Mean	Std. Deviation
There were no layoffs during the pandemic in our organization	3,90	1,49
Our organization proved resilient during the pandemic	3,71	1,20
During the pandemic, we introduced the practice of working from home	3,69	1,46
The level of digitalization in our organization is really satisfactory	3,63	1,23
We had no liquidity problems during the pandemic	3,47	1,36
Our level of capital was satisfactory during the pandemic	3,43	1,37
The leadership of our organization was effective during the pandemic	3,37	1,25
During the pandemic, we had no problems with credit activity	3,33	1,34
Grand Average	*3,09*	*0,88*
During the pandemic, the quality of our loans was satisfactory	3,08	1,23
Lowering the reference interest rate as a measure of the Central Bank's monetary policy during the pandemic helped our business	3,02	1,09
Government measures during the pandemic helped our business	2,90	1,25
We did not experience any disturbances or problems during the pandemic	2,90	1,17
Providing additional dinar and foreign currency liquidity to the banking sector as a measure of the Central Bank's monetary policy during the pandemic helped our business	2,88	0,97
Moratorium in repayment of debtors' obligations as a measure of the Central Bank's monetary policy during the pandemic helped our business	2,86	1,15
We innovated our business model during the pandemic	2,84	1,24
We successfully started new businesses during the pandemic	2,78	1,21
During the pandemic, our organization managed to achieve new forms of cooperation with other organizations	2,69	1,29
During the pandemic, our efficiency increased	2,67	1,32
During the pandemic, our profitability increased	2,37	1,20
During the pandemic, our revenues increased	2,20	1,11

cant, since $p < .05$ [21]. The existence of four components with eigenvalues above 1, explaining a total of 73.8% of the variance, was discovered by Principal component analysis. Nevertheless, an elbow is shown by the steep curve of the Scree map between the second and third components. This criterion is far more appropriate than the eigenvalue criterion to obtain precise results [11]. As seen in Table 1, the rotated solution with the Oblimin rotation procedure yielded two interpretable components or factors. More than 60% of the variance was explained by the two-component solution, with component 1 contributing to 50.67% and component 2 contributing to 9.88% of the variance. A strong positive correlation between these two components ($p = .524$) was observed.

Finally, we present the most important research output, the Likert questionnaire scale results (Table 2). The grand average impact of COVID-19 on the financial system, or the average mark of all participants on all questions, is rated at 3.09.

In addition to the Likert-scale questionnaire, people who took a part in our survey valued (marking from 1 to 10) measures of the Central Bank of Serbia at 5.82 and measures of the Government of Serbia at 5.31. A finding that larger banks were more efficient than small ones can be accepted as an indication, given that only one-third of respondents answered this question. Raiffeisen was voted as the best bank with 8 votes, followed by Banca Intesa with 7. A third place was shared by Erste Bank and "none" with 3 votes each. Other mentioned banks with a minimum number of voices were: Credit Agricole, OTP, Procredit, and Komercijalna banka with 2 votes each, followed by EFG, MTS, NBS, Unicredit, Sberbank, and Poštanska štedionica with 1 voice each. Finally, we present our respondents' most insightful remarks (Figure 2).

Figure 2. Concluding remarks of the respondents



Discussion and Conclusion

Our respondents rated the central bank measures slightly higher than the government measures. However, although the score closer to 6 (5.82) is higher than the rounded 5 (5.31), it is obvious that the measures were not highly rated and that these measures did not improve the business of the financial sector during the COVID-19 pandemic, but only preserved it, which was probably the state intention from the beginning. The overall assessment of the success of all measures taken during the pandemic was 3.09, which is slightly above half. Such a result leads us to the conclusion that the financial sector, with great efforts, managed to achieve sustainability in this time of crisis. The measure rated with the highest score of 3.90 was the measure that was actually not implemented (Table 2). Namely, by not firing workers during the pandemic, financial organizations maintained a positive organizational climate and managed to achieve resiliency, which was rated at 3.71. Being resilient during a crisis was quite important. The assessments of the following two measures reveal to us how jobs have been preserved. These are working from home, which is rated at 3.69, and comprehensive digitalization, rated at 3.63. All the previously mentioned measures can be evaluated with a very good grade because all of them can be expressed with a grade that is close to 4. It could be seen that the financial sector had no problems with liquidity, nor with the level of capital or with lending activity, because all these measures were rated above average. We can conclude that Serbian financial institutions did not experience a recurrence of the crisis in 2008, just as Western banks did not experience it as well. Leadership in unstable times strives for excellence, which is shown by a rather satisfactory score of 3.37 obtained for the efficiency of leaders in the financial sector of Serbia during COVID-19. Grades below the average score, but higher than 3, are the grades regarding the quality of loans of financial institutions (3.08) and the central bank measures to lower the reference interest rate (3.02). The measures of the government of the Republic of Serbia received a score lower than 3, so we can conclude that the measures of the central bank corresponded more to the sustainability of the financial system during the pandemic than the government measures. Such results are in line with the rates from our sample for government and bank measures. However, the following grade of 2.90 is evidence that the financial sector had problems and disturbances in its work during the pandemic. Other central bank measures were assessed as less successful. The measure of providing additional liquidity was rated at 2.88, and the moratorium in repayment of debtors' obligations was rated at 2.86. Based on low scores of 2.84, 2.78, and 2.69, respectively, it is obvious that financial institutions have not innovated their business model, nor started new businesses or achieved cooperation with other organizations. Finally, the lowest scores were achieved for increase in efficiency (2.67), increase in profitability (2.37), and increase in revenue (2.20) indicating that these increases did not occur at all.

Applying factor analysis, we generated a Pattern matrix (Table 1) consisting of two components or two factors. The first component consists of fourteen measures or impacts on the sustainability and the efficiency of the financial sector derived from the internal operations of financial organizations. Starting with the increased internal profitability, which fully correlates with business success at the time of coronavirus, and ending with the level of digitalization with a correlation of 0.416, these fourteen items form a set that can be used in an unchanged form in the future research of the impact of COVID-19 on the financial system. This set can be named as a set of internal operational measures at the time of the pandemic. The next component of six items contains external measures or impacts on the sustainability and efficiency of the financial sector, as this set contains government measures and central bank measures. This set of external measures for potential future research should be amended per specific measures in the observed financial market. It is interesting that in the second set there are items from the first set with a correlation greater than 0.3. These items are the impact on profitability with a negative correlation of -0.313 and the new forms of cooperation with other organizations with a positive correlation of 0.308. The interpretation is that there is a certain probability that some state measures could harm the profitability of some financial organizations, while cooperation with other organizations may result in a positive synergetic effect.

The second set also includes leadership, which is certainly conditioned by the reduction of the number of components in factor analysis from five to two, for simpler analysis, but leadership, as such, should certainly be retained as part of the scale and as part of potential research.

To conclude, with a help of the remarks of our respondents, COVID-19 has had an impact on the situation in the financial sector, but thanks to the responsible and careful internal measures, as well as the external measures, primarily by the central bank, the challenges have been largely met. The financial activity has slowed down, but the private corporate sector has borne a heavier burden during the current crisis. The finance industry sustains because COVID-19 successfully accelerated digitalization and transition of clients to online banking. COVID-19 affected all sectors, including the financial sector, but it mostly affected people who lost their jobs. Our final conclusion is that the financial system in Serbia was effective and sustainable during the COVID-19 pandemic. The system has successfully dealt with the current pandemic, and as vaccination accelerates, we can assume that the sustainability of the financial system will be successfully maintained until the end of the pandemic outbreak.

References

1. Adžić, S., & Al-Mansour, J. (2021a). Business analysis in the times of COVID-19: Empirical testing of the contemporary academic findings. *Management Science Letters*, *11*(1), 1–10. https://doi.org/10.5267/j.msl.2020.8.036
2. Adžić, S., & Al-Mansour, J. (2021b). The Negative Impact of Covid-19 on Firms: Insights from Serbia. *Eastern European Economics, 59*(5), 472–486. https://doi.org/10.1080/00128775.2021.1 953387
3. Andryushin, S. A. (2020). Monetary-crediting policy of central banks before and after COVID-19. *Aktual'nye Problemy Èkonomiki i Prava*, *14*(2), 223–234. https://doi.org/10.21202/1993-047X.14.2020.2.223-234
4. Brown, R., & Rocha, A. (2020). Entrepreneurial uncertainty during the Covid-19 crisis: Mapping the temporal dynamics of entrepreneurial finance. *Journal of Business Venturing Insights*, *14*, e00174. https://doi.org/10.1016/j.jbvi.2020.e00174
5. Cavallino, P., & Fiore, F. D. (2020). Central banks' response to Covid-19 in advanced economies. *BIS Bulletin*, *21*. https://www.bis.org/publ/bisbull21.htm
6. Chang, C.-L., McAleer, M., & Wong, W.-K. (2020). Risk and Financial Management of COVID-19 in Business, Economics and Finance. *Journal of Risk and Financial Management*, *5*. https://doi.org/10.3390/jrfm13050102
7. Crabb, J. (2020). Sustainable finance will emerge stronger from Covid-19 rebalancing. *International Financial Law Review*.
8. Đuričin, D., & Vuksanović-Herceg, I. (2021). The great reset of Serbia's economy during and after the COVID-19 crisis. *Ekonomika Preduzeca*, *69*(3–4), 117–136. https://doi.org/10.5937/EKOPRE2103117D
9. Flogel, F., & Gartner, S. (2020). The COVID-19 Pandemic and Relationship Banking in Germany: Will Regional Banks Cushion an Economic Decline or is A Banking Crisis Looming? *Tijdschrift Voor Economische En Sociale Geografie*, *3*, 416. https://doi.org/10.1111/tesg.12440
10. Goodell, J. W. (2020). COVID-19 and finance: Agendas for future research. *Finance Research Letters*, *35*, 101512. https://doi.org/10.1016/j.frl.2020.101512
11. Green, S., & Salkind, N. J. (2013). *Using SPSS for Windows and Macintosh: Analyzing and Understanding Data* (7th ed.). Pearson Education.
12. Heussner, R., Ma'ilei, S., & Weston, S. (2020). How COVID-19 has impacted the financial services sector. *International Tax Review*.
13. Jakopin, E. (2020). Effects of structural changes in the economy of the Republic of Serbia: Old problems, new reform challenges. *Ekonomski Horizonti*, *22*(3), 191–208. https://doi.org/10.5937/ekonhor2003191J
14. Korzeb, Z., & Niedziółka, P. (2020). Resistance of commercial banks to the crisis caused by the COVID-19 pandemic: The case of Poland. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *15*(2), 205–234. https://doi.org/10.24136/eq.2020.010
15. Lagoarde-Segot, T., & Leoni, P. L. (2013). Pandemics of the poor and banking stability. *Journal of Banking & Finance*, *37*(11), 4574–4583. https://doi.org/10.1016/j.jbankfin.2013.04.004
16. Lapinskiene, V. (2020). Lessons learnt from COVID-19: Building a resilient finance function. *International Tax Review*.
17. Li, L., Strahan, P. E., & Zhang, S. (2020). Banks as Lenders of First Resort: Evidence from the COVID-19 Crisis. *Review of Corporate Finance Studies*, *9*(3), 472.
18. Martin, V. (2020). The response of the monetary and fiscal policies on COVID 19 in Serbia. *Bankarstvo*, *49*(2), 70–114. https://doi.org/10.5937/bankarstvo2002070M
19. Mijović, B. (2020). COVID-19: Lessons learned. *Scripta Medica*, *51*(1), 1–5. https://doi.org/10.5937/scriptamed51-25824
20. Mugano, G. (2020). The economy nexus of the COVID-19 pandemic. *Sociološki Pregled*, *54*(3), 737–760. https://doi.org/10.5937/socpreg54-27700
21. Pallant, J. (2016). *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS* (6th ed.). McGraw-Hill Education.
22. Paunović, B., & Aničić, Z. (2021). Impact of the COVID-19 crisis on SMEs and possible innovation responses. *Ekonomika Preduzeća*, *69*(3–4), 169–184. https://doi.org/10.5937/EKOPRE2103169P
23. Petrović, D., Petrović, M., Bojković, N., & Čokić, V. P. (2020). An integrated view on society readiness and initial reaction to COVID–19: A study across European countries. *PLOS ONE*, *15*(11), e0242838. https://doi.org/10.1371/journal.pone.0242838
24. Podtserkovnyi, O., & Vozniakovska, K. (2020). Ensuring the Central Bank Discretion in Issuing Stabilization Loans in Times of Covid-19 Pandemic. *Garantizar la discreción del banco central en la emisión de préstamos de estabilización en tiempos de la pandemia del Covid-19.*, *9*(2), 65.

25. Qin, X., Huang, G., Shen, H., & Fu, M. (2020). COVID-19 Pandemic and Firm-level Cash Holding—Moderating Effect of Goodwill and Goodwill Impairment. *Emerging Markets Finance and Trade*, *56*(10), 2243–2258. https://doi.org/10.1080/1540496X.2020.1785864
26. Sheth, J. (2020). Business of business is more than business: Managing during the Covid crisis. *Industrial Marketing Management*, *88*, 261–264. https://doi.org/10.1016/j.indmarman.2020.05.028
27. Topić-Pavković, B. (2020). The Central Banks' policy response to COVID-19 pandemic. *Politeia*, *10*(19), 11–28. https://doi.org/10.5937/politeia0-26720
28. Vesić, T., Petronijević, J., & Ravić, N. (2020). Crisis risk in the 21st century and their impact on the banking sector. *Trendovi u Poslovanju*, *8*(2), 31–38. https://doi.org/10.5937/trendpos2002031V
29. Wójcik, D., & Ioannou, S. (2020). COVID-19 and Finance: Market Developments So Far and Potential Impacts on the Financial Sector and Centres. *Tijdschrift Voor Economische En Sociale Geografie*, *111*(3), 387–400. https://doi.org/10.1111/tesg.12434
30. Zheng, C., & Zhang, J. (2021). The impact of COVID-19 on the efficiency of microfinance institutions. *International Review of Economics & Finance*, *71*, 407–423. https://doi.org/10.1016/j.iref.2020.09.016

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INNOVATIVE CAPACITY AS A DRIVING FORCE OF NATIONAL COMPETITIVENESS

Inovacioni kapacitet kao pokretačka snaga nacionalne konkurentnosti

Abstract

Each national economy has specific characteristics that determine its innovative capabilities to a greater or lesser extent. National innovation capacity can be a source of prosperity and growth for the national economy. Measuring national innovation capacity is very important because it provides knowledge about the dynamics of inventions in economic activities. By measuring the innovative capacity of the economy, indicators are obtained that are significant for the creation of development policy and are an important element in evaluating the success of its implementation. The connection between innovation and competitive advantage is direct and positive because the innovative capacities of companies can create, support, and make sustainable competitiveness both in the domestic and foreign markets.

This paper aims to determine whether there is a relationship between national innovative capacity and competitiveness. To allow for data mutual comparability and generalization, the research included four countries: Serbia and three neighboring European Union member countries (Bulgaria, Hungary, and Romania). The evaluation was conducted using statistical data from international databases (WEF, INSEAD, and WIPO) covering 2008 to 2018. The findings indicate a positive relationship between a country's competitiveness and innovative capacity, as measured by the Global Innovation Index and the Global Competitiveness Index. In the cases of Serbia and Bulgaria, there was a strong correlation between national competitiveness and the country's innovation index. In Hungary and Romania, on the other hand, the correlation coefficient is low. The paper's originality is reflected in the analysis and comparison of the innovation capacities four Eastern European countries (Serbia, Bulgaria, Hungary and Romania), which are rarely the subject of research in innovation.

Keywords: *innovation, competitiveness, national innovative capacity, development.*

Sažetak

Svaka nacionalna privreda ima specifične karakteristike koje u većoj ili manjoj meri određuju njene inovacione sposobnosti. Nacionalni inovacioni kapaciteti može biti izvor prosperiteta i rasta za nacionalnu ekonomiju, a merenje nacionalnog inovacionog kapaciteta je veoma važno, jer daje saznanja o dinamici inovacija (pronalazaka) u privrednim aktivnostima. Merenjem inovativnog kapaciteta privrede dobijaju se indikatori koji su značajni za kreiranje razvojne politike i važan su element u proceni uspešnosti njenog sprovođenja. Veza između inovacija i konkurentske prednosti je direktna i pozitivna jer inovativni kapaciteti preduzeća mogu stvoriti, podržati i učiniti održivom konkurentnost kako na domaćem tako i na inostranom tržištu.

Ovaj rad ima za cilj da utvrdi da li postoji veza između nacionalnog inovativnog kapaciteta i konkurentnosti. Da bi se omogućila međusobna uporedivost i generalizacija podataka, istraživanje je obuhvatilo četiri zemlje: Srbiju i tri susedne zemlje članice Evropske unije (Bugarsku, Mađarsku i Rumuniju). Evaluacija je sprovedena korišćenjem statističkih podataka iz međunarodnih baza podataka (WEF, INSEAD i WIPO) koji pokrivaju period od 2008. do 2018. Nalazi ukazuju na pozitivan odnos između konkurentnosti i inovativnog kapaciteta zemlje, mereno Globalnim indeksom inovacija i Globalnim indeksom konkurentnosti. U slučajevima Srbije i Bugarske, postojala je jaka korelacija između nacionalne konkurentnosti i indeksa inovativnosti zemlje, dok je u Mađarskoj i Rumuniji ovaj koeficijent korelacije nizak. Originalnost rada ogleda se u analizi i poređenju inovacionog kapaciteta četiri istočnoevropske zemlje (Srbije, Bugarske, Mađarske i Ruminije), koje su retko predmet istraživanja u oblasti inovacija.

Ključne reči: *inovativnost, konkurentnost, nacionalni inovacioni kapacitet, razvoj.*

Introduction

Innovation is one of the most important factors in achieving competitiveness and gaining a country's competitive advantage. In today's globally interconnected world economy, innovation creates novel solutions to social and economic difficulties, challenges, or opportunities [20], [15]. The ability of an industry to innovate determines a country's competitiveness. National economies gain a competitive advantage through innovative and knowledge-intensive activities [17]. The significance of understanding the role of innovation in competitiveness has long been recognized. Academic researchers and policymakers have been focusing on determining what drives a country's innovation capacity in their search for strategies to boost countries' competitiveness.

This paper aims to determine whether there is a relationship between national innovative capacity and competitiveness. To allow for data mutual comparability and generalization, the research included four countries: Serbia and three neighboring European Union member countries (Bulgaria, Hungary, and Romania). The evaluation was conducted using statistical data from international databases (WEF, INSEAD, and WIPO) covering 2008 to 2018.

The findings add to the existing body of knowledge on innovation in four transition countries, which are not frequently the subjects of research in the fields of research, development, and innovation, and to which the generalizations reached in research conducted in developed countries do not apply.

The paper is structured into five sections. Following the introduction, the second section defines the concepts of national competitiveness and innovative capacity, discusses the relationship between innovation, national competitiveness, and economic growth, and presents previous research findings on the relationship between innovative capacity and a country's competitiveness. Section three presents the research methodology and data sources, while section four presents empirical findings for each country included in the analysis. Section five summarizes the findings on a correlation between a country's national innovation capacity and competitiveness as measured by the Global Index of Innovation and the Global Index of Competitiveness in the cases of Serbia, Bulgaria, Hungary, and Romania.

Literature review

In 1990, Michael Porter's famous Competitive advantage of nations sparked a debate among academics and policymakers about the importance of national competitiveness in achieving economic growth [31]. The term has evolved, gaining prominence in the context of promoting economic development. Despite widespread use, neither the definition of national competitiveness nor the simple theory of competitiveness has been agreed upon. It has been examined from various perspectives to identify new sources of growth. National competitiveness is associated with prosperity and economic growth [19], [28]. National competitiveness refers to a country's ability to generate wealth, or the ability of a country to compete on a global scale [6]. The World Economic Forum's Global Competitiveness Report analyses and compares factors that improve national competitiveness, defining it as "the set of institutions, policies, and factors that determine a country's level of productivity," pointing out that a more competitive economy will most likely grow faster in the long run [40]. If the economy is more competitive, it will lead to an increase in production and, therefore, exports [18]. National competitiveness can have meaning if viewed as a relative concept used to make comparisons [2]. In the research presented in this paper, competitiveness is defined as the ability of an economy to profitably create, produce, and distribute goods and services in international trade.

Innovation is required to achieve sustainable development in today's highly globalized environment. Economic growth is determined by an economy's innovativeness [37], [16]. The creation and application of new knowledge through innovation is a fundamental source of economic growth. Innovations, R&D expenditures, and technological investments increasingly influence competitiveness and prosperity [29], while growth based on innovation is the primary strategy for increasing competitiveness [1]. Innovation and productivity are key factors in increasing competitiveness, given that competitive performance depends on the formation of intellectual capital and

society's ability to innovate [14], [7]. Competitiveness stems from developing locally differentiated capabilities through innovation, which is required to maintain growth in a globally competitive environment [5].

There is compelling evidence of a link between innovation, national competitiveness, and economic growth. Doğan [12] examined the effect of innovation factors on competitiveness for European Union members and candidate countries, revealing the positive impact of knowledge and technology output, along with creative output. Countries with science-technology-innovation-focused global competitiveness strategies have long-term competitiveness and growth [36]. Ciocanel & Pavelescu [9] used econometric analysis to prove the existence of a cause-effect relationship between innovation and competitiveness. The main findings of a 2007-2018 empirical analysis of 16 emerging countries [25] show that innovative activities positively impact competitiveness.

The role of innovation in competitiveness and economic growth has sparked discussion about what factors influence an economy's innovation intensity [13]. A country's innovative capacity is the primary driving force behind its economic performance; it measures the institutional structures and support systems that sustain innovative activity [24]. In their research, the authors stress the importance of taking a holistic approach to increasing innovative capacity rather than focusing on single factors [33]. The efficiency of the national innovation ecosystem in OECD countries is largely determined by public expenditures, ICT investments, and education level [32]. In high-income and upper-middle-income countries, the institutional environment, human capital and research, supporting infrastructure, and business environment impact innovation performance [39].

Various approaches have been used to assess an economy's capacity for innovation. International ratings are often used to determine an economy's innovation capacity. Rusnak & Prokhorchuk have assessed the Ukrainian economy's capacity for innovation using the Global Innovation Index, the Bloomberg Innovation Index, the Global Competitiveness Index, the Innovation Union Scoreboard, and the Global Talent Competitiveness Index that evaluate innovation potential, technological and innovation competitiveness [34]. The global competitiveness index is the most comprehensive indicator of a country's competitiveness, as it quantifies macro and micro competitiveness positions [11].

There is convincing evidence of a link between innovation and national competitiveness [3], [36], [30], [4]. Many studies have been conducted on the relationship between national innovative capacity and competitiveness. Innovation potential significantly contributes to the competitiveness of the EU-developed countries' national economies [27]. Cvetanović & Sredojević have investigated the relationship between global competitiveness and the level of innovativeness of the world's twenty-five most innovative economies, finding that countries with global competitiveness strategies focused on science, technology, and innovation have long-term competitiveness and growth [10]. Considering an econometric model that determines the impact of national innovation potential on competitiveness, Chang & Chang attempted to build a correlation model between international connections and national innovative capacity to improve national competitiveness [8].

Research methodology

The paper aims to determine whether there is a relationship between national innovative capacity and competitiveness as measured by the Global Index of Innovation and the Global Index of Competitiveness. Because it examines the relationships between variables measured on an interval or ratio scale, the paper employs a quantitative research design. At the same time, data analysis employs a wide range of statistical methods, techniques, and tests, with measurement, causal relationships, and an attempt to arrive at generalizations serving as its foundation [4], [35]. The research included four countries so that the results could be compared and generalized. In addition to Serbia, three European Union neighboring countries - Bulgaria, Hungary, and Romania were analyzed. Furthermore, the comparative approach was chosen because it is based on comparison logic, which emphasizes that we can only better understand social phenomena by comparing them in two or more empirical research cases or situations [4].

The data on the investigated phenomena were obtained through desk research, which included a search of statistical databases on the Internet containing data on the four countries studied. The databases were used to gather secondary data on the researched phenomena. The decision to conduct research using secondary data was based on the numerous benefits that these data provide. These benefits include their immediate availability, the ability to access the same, mutually comparable data for many different countries, and the data's quality and representativeness. These data have already been collected using rigorous methodologies. They do not have the bias that can appear in primary data due to the researcher's refusal to provide answers or the researcher's biased role, the ability to collect data quickly on the changes of the researched phenomena over a specific period, and the availability of similar data on the investigated occurrences in several countries. One significant advantage is that it does not necessitate the lengthy collection process inherent in primary data collection, giving the researcher more time to devote to their more detailed analysis [35], [41], [4]. Furthermore, an important criterion for selecting secondary data sources was their up-to-datedness, i.e., the selection should contain the most recent data related to the researched phenomena [22].

However, because not all secondary data sources have the previously listed advantages, it was necessary to define the criteria for selecting secondary data sources. The basic selection criteria were reliability and validity, the reputation of the data source and the methodology used to collect the data, their up-to-datedness, i.e., the availability of the most recent data on the investigated phenomena, and the availability of data for all four countries included in the analysis [26]. To avoid the possibility of different measuring instruments for the same phenomenon in the national statistics of the countries included in the analysis, national statistics data were not chosen, but rather statistical data provided by international organizations.

The following international databases were chosen as secondary data sources:

1. World Economic Forum (Global Competitiveness Index),
2. Cornell University, Institut Européen d'Administration des Affaires and World Intellectual Property Organization (Global Innovation Index).

Following the research objective, the variables in Table 1 were extracted from international statistical databases.

The listed variables were chosen for secondary data analysis from 2008 to 2018 to achieve two goals. First, collect data on the trend of the investigated phenomena, i.e., their variations over a medium-term period. Second, build a model that defines the relationships between the variables in the analysis [41].

Traditional regression models were used to analyze the data. Univariate and multivariate regression models were used, with the assumptions on which they are based previously checked. In the case of a violation, the data was transformed appropriately, and the verification was carried out using correlation analysis.

Empirical findings

The main objective of this paper was to confirm the existence of a correlation between national competitiveness and innovation. For verification, data from the Global Competitiveness Index and the Global Innovation Index were used. The research findings are presented for each country included in the analysis.

The data used in the analysis are presented in Table 2.

The Pearson correlation coefficient was calculated to statistically test the relationship between competitiveness and innovation. This correlation coefficient calculation was chosen because it shows the relationship between two variables, determines its direction and strength, and considers the quantitative methodology of this research,

Table 1. Variables included in the research, their types, and sources

Independent variable	Dependent variable	Source
National competitiveness	National economy's innovativeness	• Global Competitiveness Index • Global Innovation Index

Table 2. Data on competitiveness and innovation

Country	Serbia		Bulgaria		Hungary		Romania	
Year/index	GCI*	GII**	GCI*	GII**	GCI*	GII**	GCI*	GII**
2008	3.90	-	4.03	2.12	4.22	2.88	4.10	2.44
2009	3.77	2.57	4.02	2.85	4.22	3.34	4.11	2.92
2010	3.84	2.68	4.13	3.26	4.36	3.54	4.16	3.22
2011	3.88	36.31	4.16	38.42	4.36	48.12	4.08	36.83
2012	3.87	40.00	4.27	40.70	4.30	46.50	4.07	37.80
2013	3.77	37.87	4.31	41.33	4.25	46.93	4.13	40.33
2014	3.90	35.89	4.30	40.74	4.28	44.61	4.37	38.08
2015	3.89	36.47	4.32	42.16	4.25	43.00	4.32	38.20
2016	3.97	33.75	4.44	41.42	4.20	44.71	4.30	37.90
2017	4.14	35.34	4.46	42.84	4.33	41.74	4.28	39.16
2018	60.90	35.46	63.60	42.65	64.30	44.94	63.50	37.59

Note: GCI* = Global Competitiveness Index; GII** = Global Innovation Index
Source: World Economic Forum (2008-2018); Cornell University, Institut Européen d'Administration des Affaires and World Intellectual Property Organization (2008-2018).

the continuous nature of the collected data, and their measurement on a ratio scale. The statistical assumptions on which the Pearson correlation coefficient is based were checked before calculating, i.e., whether the relevant variables were measured on an interval or ratio scale, whether there is a linear relationship between the variables, whether the variables follow a normal distribution, and whether atypical points are excluded [23], [38]. Among the checking techniques used was an insight into the nature of the variables, descriptive statistics of the variables, distribution diagrams, histograms, and the Shapiro-Wilk test. A correlation in the range of 0.10 to 0.29 is considered a small correlation, a correlation in the range of 0.30 to 0.49 is considered a medium correlation, and a correlation in the range of 0.50 to 1 is considered a large correlation, according to Cohen's criteria [21].

However, to analyze the presented data, it was also necessary to address the issue of the various methodologies used to present the data. Since 2018, the World Economic Forum has used a different methodology for reporting the country's overall competitiveness index than in the past, and Cornell University, the Institut Européen d'Administration des Affaires, and the World Intellectual Property Organization have done the same for reporting data on the country's global innovation since 2011. Due to the incomparability of the data due to the use of different methodologies, an analysis of the correlation between competitiveness and innovation was performed for the 2011-2017 period in which both indices' data were presented using the same methodology, while data for years that did not include this period were excluded from the analysis.

1. Correlation between competitiveness and innovation in the case of Serbia

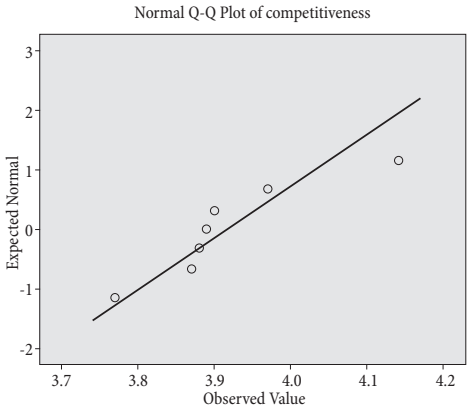
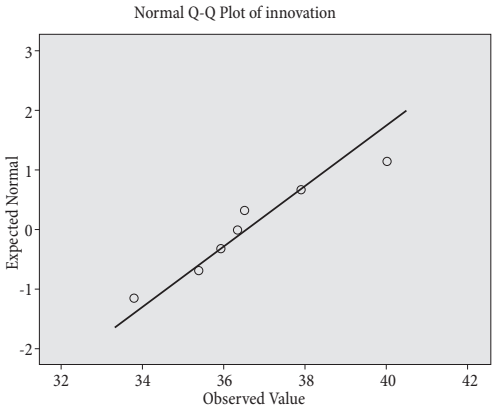
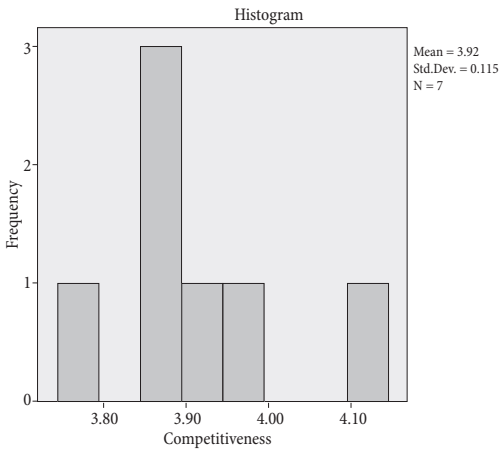
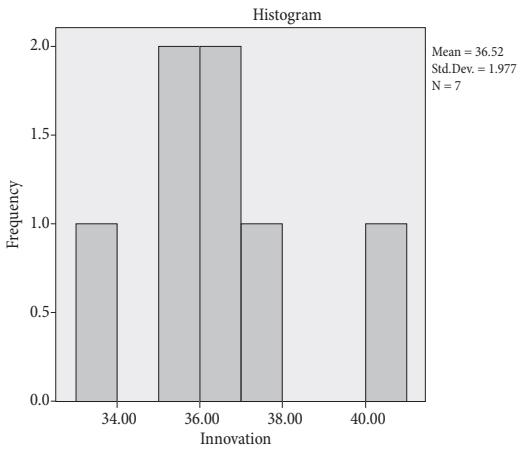
Table 3 shows descriptive statistics for the data collected in the case of Serbia obtained using the Descriptive and Explore options in the computer package IBM SPSS, as well as the Shapiro-Wilk test result.

The previously presented data did not meet the statistical assumptions for calculating the Pearson correlation coefficient in their original form because, as demonstrated by histograms, distribution diagrams, and the results of the Shapiro-Wickle test, there was no normality of the distribution and atypical points were present. As a result, to calculate the Pearson correlation coefficient, data were transformed using the logarithm according to the formula:

$$\text{New variable} = \text{LOG10 (old variable)} \qquad (1)$$

This transformation was done in the computer package IBM SPSS using the *Transform* and *Compute* options. An analysis of the transformed data revealed the existence of a correlation between innovativeness and competitiveness in the case of Serbia $r = 0.563$, $n = 7$, $p = 0.188$, with a coefficient of determination $r^2 = 0.316969$. According to Cohen's criteria, this correlation is high, implying that the variables innovation and competitiveness account for 31.69% of the common variance in Serbia. However,

Table 3. Descriptive statistics and Shapiro-Wilk test results in the case of Serbia

Variable	Competitiveness (n = 7)	Innovation Index (n = 7)
Mean (Std. Error)	3.9171 (0.04330)	36.5186 (0.74708)
Std. Deviation	0.11456	1.97660
Variance	0.013	3.907
Skewness	1.218	0.651
Kurtosis	2.595	1.053
Distribution diagram		
Histogram		
Shapiro-Wilk test	W = 0.883, df = 7, p = 0.240	W = 0.960, df = 7, p = 0.816

Source: Authors' research

due to the small sample size (n 30), this correlation was not statistically significant (p > 0.050).

2. *Correlation between competitiveness and innovation in the case of Bulgaria*

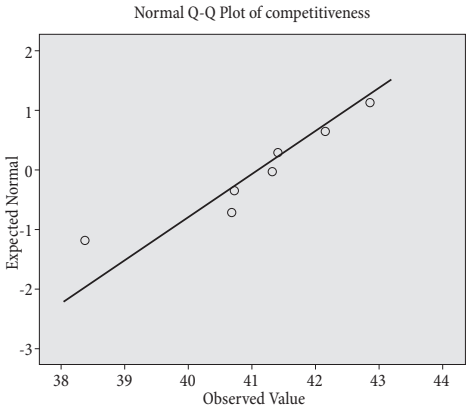
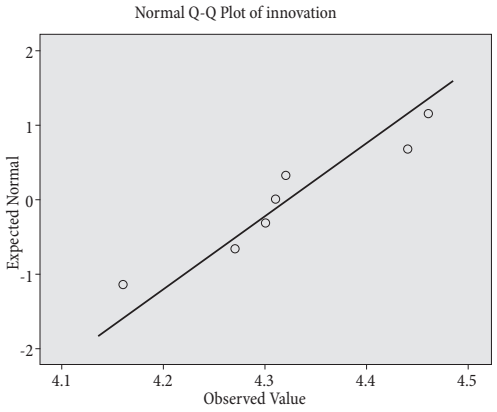
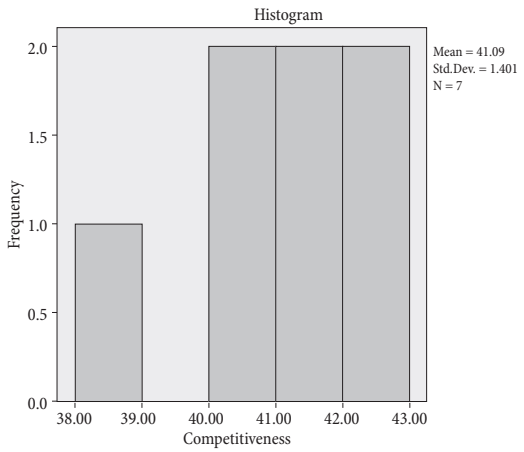
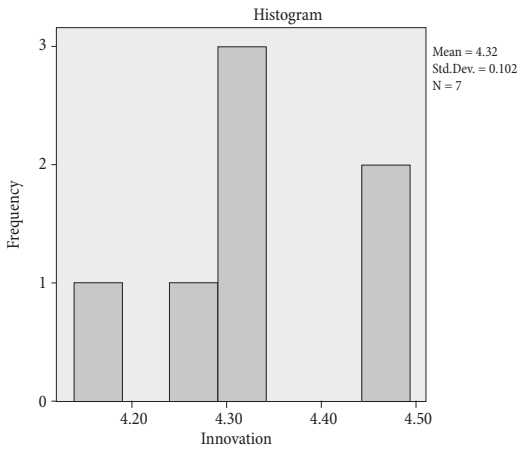
Table 4 shows descriptive statistics for the data collected in the case of Bulgaria obtained using the *Descriptive* and *Explore* options in the computer package IBM SPSS, as well as the Shapiro-Wilk test result.

The previously presented data did not meet the statistical assumptions for calculating the Pearson correlation coefficient in their original form because, as demonstrated by histograms, distribution diagrams, and the results of the Shapiro-Wickle test, there was no normality of the distribution and atypical points were present. As a result, to calculate the Pearson correlation coefficient, data were transformed using the logarithm according to the formula:

$$\text{New variable} = \text{LOG10 (old variable)} \qquad (2)$$

This transformation was done in the computer package IBM SPSS using the *Transform* and *Compute* options. An analysis of the transformed data revealed the existence of a statistically significant correlation between innovation and competitiveness in the case of Bulgaria (r = 0.861, n = 7, p = 0.013, with a coefficient of determination r^2 = 0,741321. According to Cohen's criteria, this correlation

Table 4. Descriptive statistics and Shapiro-Wilk test results in the case of Bulgaria

Variable	Competitiveness (n = 7)	Innovation Index (n = 7)
Mean (Std. Error)	41.0871 (0.52954)	4.3229 (0.03859)
Std. Deviation	1.40103	0.10210
Variance	1.963	0.010
Skewness	-1.052	-0.065
Kurtosis	2.039	-0.016
Distribution diagram		
Histogram		
Shapiro-Wilk test	W = 0.920, df = 7, p = 0.473	W = 0.931, df = 7, p = 0.557

Source: Authors' research

is high, which means that in the case of Bulgaria, the variables innovation and competitiveness account for 74.13% of the common variance.

3. *Correlation between competitiveness and innovation in the case of Hungary*

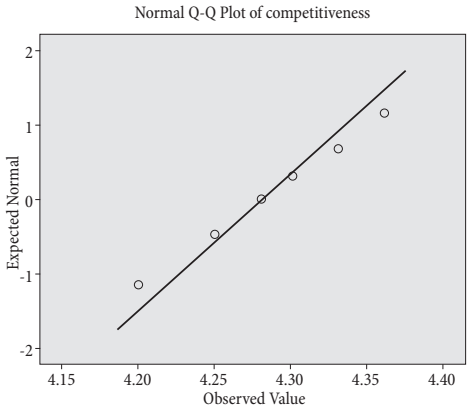
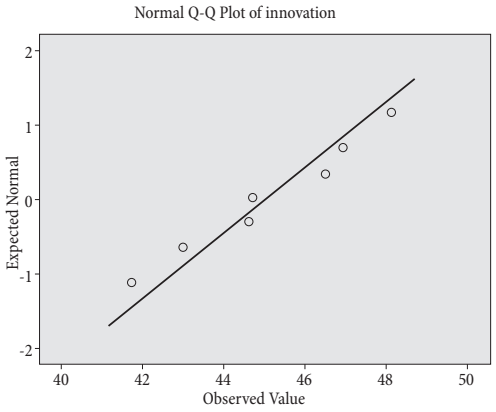
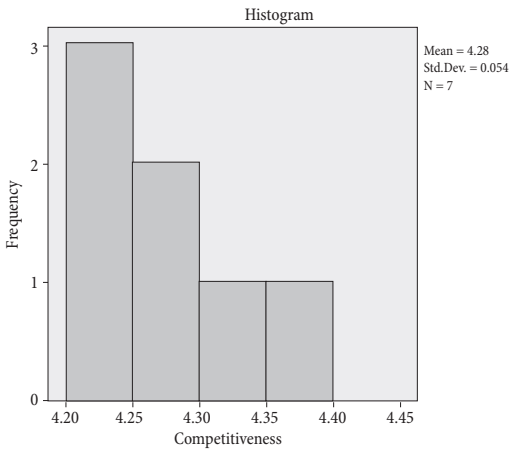
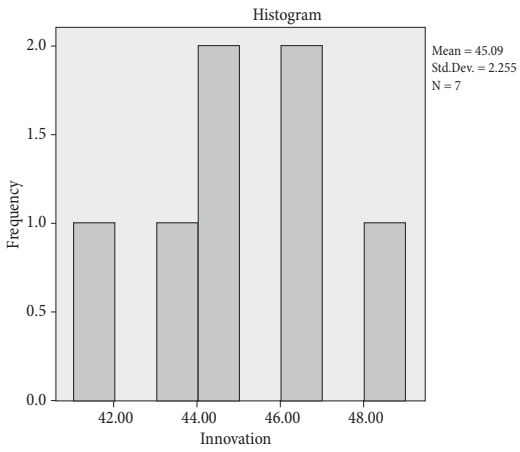
Table 5 shows descriptive statistics for the data collected in the case of Hungary obtained using the *Descriptive* and *Explore* options in the computer package IBM SPSS, as well as the Shapiro-Wilk test result.

The previously presented data did not meet the statistical assumptions for calculating the Pearson correlation coefficient in their original form because, as demonstrated by histograms, distribution diagrams, and the results of the Shapiro-Wickle test, there was no normality of the distribution and atypical points were present. As a result, to calculate the Pearson correlation coefficient, data were transformed using the logarithm according to the formula:

$$\text{New variable} = \text{LOG10 (old variable)} \qquad (3)$$

This transformation was done in the computer package IBM SPSS using the *Transform* and *Compute* options. An analysis of the transformed data revealed the existence of a correlation between innovation and competitiveness in the case of Hungary r = 0.175, n = 7, p = 0.707, with a coefficient of determination r^2 = 0,30625. According to

Table 5. Descriptive statistics and Shapiro-Wilk test results in the case of Hungary

Variable	Competitiveness (n = 7)	Innovation Index (n = 7)
Mean (Std. Error)	4.2814 (0.02040)	45.0871 (0.85245)
Std. Deviation	0.05398	2.25536
Variance	0.003	5.087
Skewness	0.006	-0.199
Kurtosis	-0.471	-0.987
Distribution diagram		
Histogram		
Shapiro-Wilk test	W = 0.981, df = 7, p = 0.966	W = 0.967, df = 7, p = 0.877

Source: Authors' research

Cohen's criteria, this correlation is small, and in the case of Hungary, the variables innovation and competitiveness account for 30.624% of the common variance.

4. Correlation between competitiveness and innovation in the case of Romania

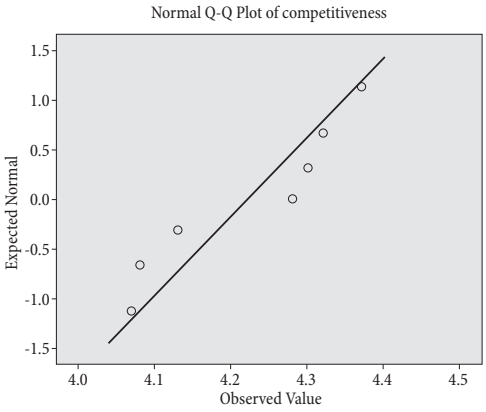
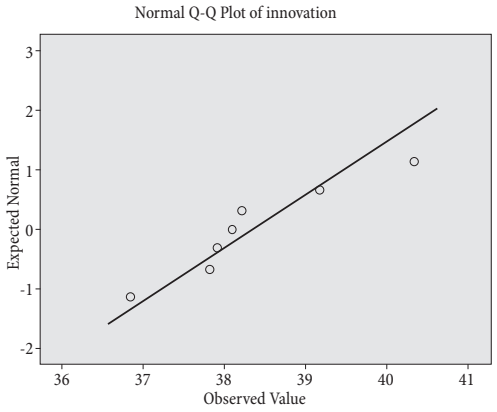
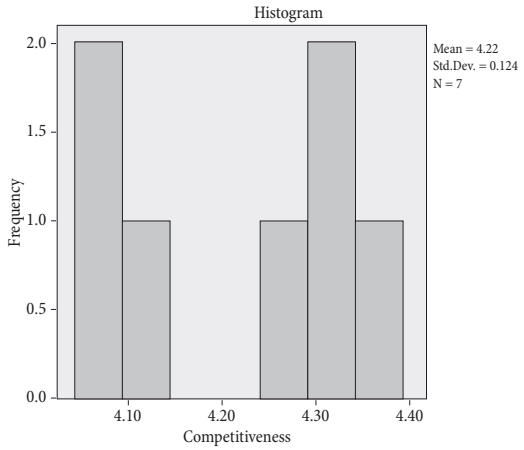
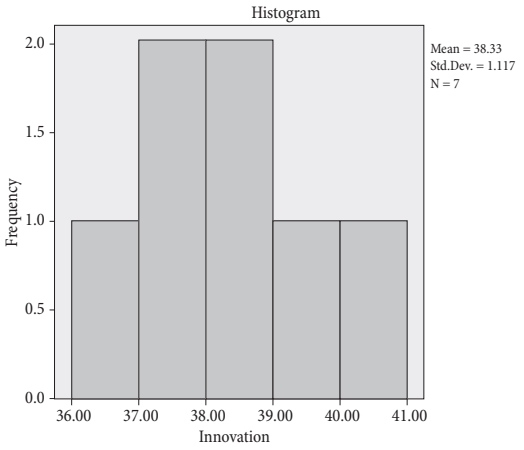
Table 6 shows descriptive statistics for the data collected in the case of Hungary obtained using the *Descriptive* and *Explore* options in the computer package IBM SPSS, as well as the Shapiro-Wilk test result.

The previously presented data did not meet the statistical assumptions for calculating the Pearson correlation coefficient in their original form because, as demonstrated by histograms, distribution diagrams, and the results of the Shapiro-Wickle test, there was no normality of the distribution and atypical points were present. As a result, to calculate the Pearson correlation coefficient, data were transformed using the logarithm according to the formula:

$$\text{New variable} = \text{LOG10 (old variable)} \quad (4)$$

This transformation was done in the computer package IBM SPSS using the *Transform* and *Compute* options. An analysis of the transformed data revealed the existence of a correlation between innovation and competitiveness in the case of Romania r = 0.105, n = 7, p = 0.823, with a coefficient of determination r^2 =

Table 6. Descriptive statistics and Shapiro-Wilk test results in the case of Romania

Variable	Competitiveness (n = 7)	Innovation Index (n = 7)
Mean (Std. Error)	4.2214 (0.04698)	38.3286 (0.42213)
Std. Deviation	0.12429	1.11685
Variance	0.015	1.247
Skewness	-0.260	0.835
Kurtosis	-2.218	1.103
Distribution diagram		
Histogram		
Shapiro-Wilk test	W = 0.868, df = 7, p = 0.178	W = 0.928, df = 7, p = 0.534

Source: Authors' research

0,11025. According to Cohen's criteria, this correlation is small, and in the case of Romania, the variables innovation and competitiveness account for 11.025% of the common variance.

Table 7 provides a comparative presentation of the obtained results in all four countries and a summary of the hypothesis testing.

Data and previous analyses presented in the cases of Serbia, Bulgaria, Hungary, and Romania shows that the hypothesis concerning a correlation between innovation and competitiveness was not refuted. The following points are to be considered:

- the values of the Pearson correlation coefficients obtained according to Cohen's criteria can be considered high in the case of Serbia (r = 0.563, r > 0.500) and Bulgaria (r = 0.861, r > 0.500);
- the values of the Pearson correlation coefficients obtained according to Cohen's criteria can be considered low in the case of Hungary (r = 0.175, r < 0.300) and Romania (r = 0.105, r < 0.300);
- the correlation between innovation and competitiveness is statistically significant only in the case of Bulgaria (r = 0.861, p = 0.013, p < 0.050).

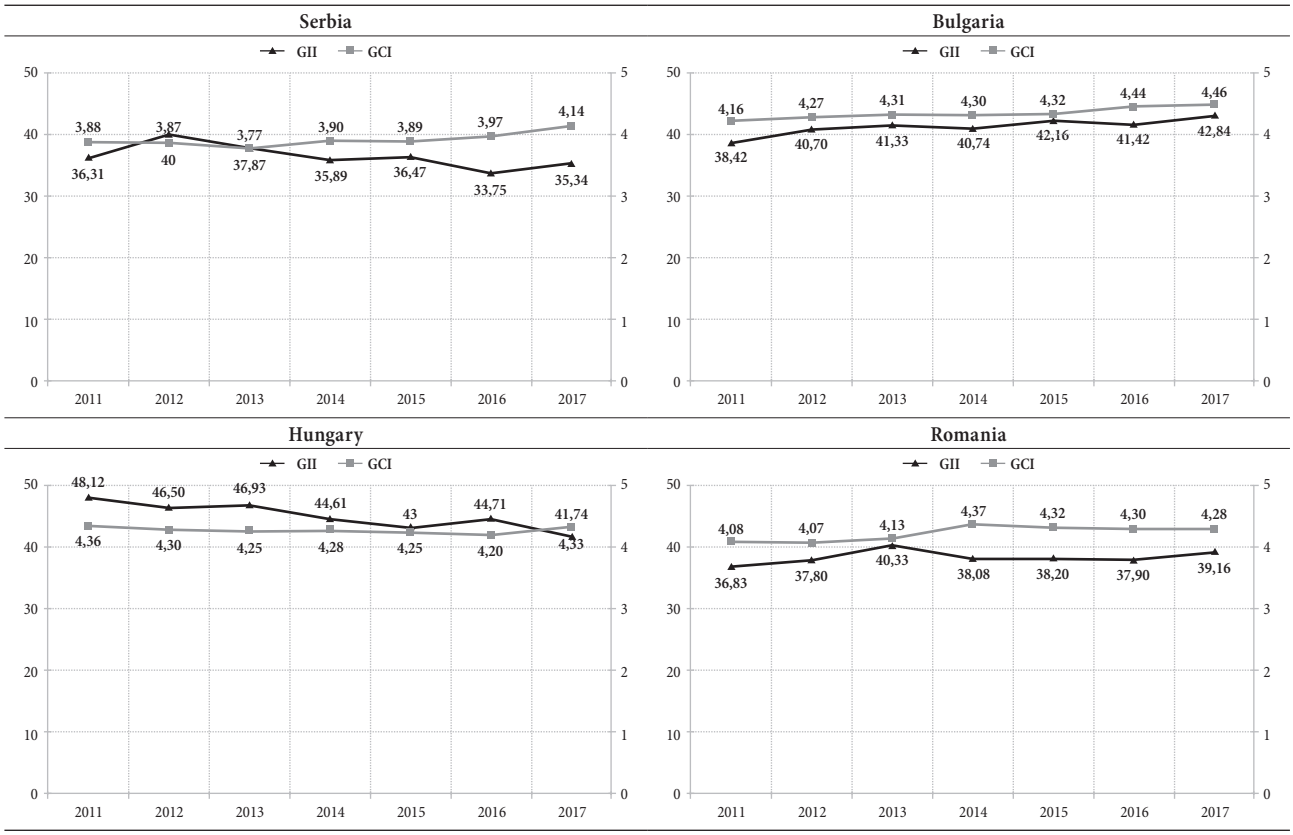
The hypothesis of a correlation between a country's level of competitiveness and its innovation index was not rejected in any of the analyzed countries. Figure 1 depicts the competitiveness and innovation ratios for the four countries.

Table 7. A comparison of testing on the correlation between competitiveness and innovation

	Serbia	Bulgaria	Hungary	Romania
The result of the test	Has not been rejected	Has not been rejected	Has not been rejected	Has not been rejected
Pearson correlation coefficient r calculated size	0.563	0.861	0.175	0.105
The values of Pearson's correlation coefficient r	High	High	Low	Low
Pearson correlation coefficient r statistical significance	Doesn't exist	Exists	Doesn't exist	Doesn't exist

Source: Authors' research

Figure 1. The relationship between competitiveness and innovation in Serbia, Bulgaria, Hungary, and Romania



Source: World Economic Forum (2008 - 2018); Cornell University, Institut Européen d'Administration des Affaires and World Intellectual Property Organization (2008 - 2018)

Based on the findings, the countries studied can be divided into two groups. The first is Serbia and Bulgaria, where a high-value correlation coefficient was found between the economy's competitiveness and the country's innovation index. Hungary and Romania fall into the second category, with a low correlation coefficient found between the economy's competitiveness and the country's innovation index.

When interpreting these findings, the significant overlap between the economy's competitiveness and the country's innovation index should be considered, which can be determined by analyzing the methodologies used to create the World Economic Forum's Competitiveness Index and the Global Innovation Index.

Conclusions

From the economic, intellectual, and social perspectives, innovation has always been a significant factor in society's relative success. Nowadays, as the global economy has shifted from a model of independent, relatively loosely connected economies to a much deeper connection in the global community, the phenomenon of innovation has taken on greater significance. Given that innovative capacity represents the ability to produce and commercialize the flow of innovative technologies over time and is an important factor affecting competitiveness, particularly in developed, modern economies, it is reasonable to conclude that such economies are on the verge of

exhausting the possibility of further growth based on capital investment and that investing in innovation is a sustainable solution for those countries. The ability of the economy to ensure the efficiency of production that will result in greater economic growth, guarantee the rate of return on invested funds in the economy, and provide the population with a high level of income and consumption is a basic indicator of a country's competitiveness and accordingly of its prosperity.

The research findings indicate that there is a correlation between the national innovation capacity of the economy and the competitiveness of the country's economy as measured by the Global Index of Innovation and the Global Index of Competitiveness in the case of Serbia, but also in the cases of the other three analyzed countries (Bulgaria, Hungary, and Romania). Numerous other authors who have previously analyzed the impact of innovation on the competitiveness of an economy have also found a positive relationship between innovation and economic competitiveness [3], [36], [30], [5]. Accordingly, the findings of the empirical research are consistent with those of previous studies and empirical research. The results are based on the definition of competitiveness as an economy's ability to create, produce, and distribute products and services in international trade while making a profit. Profit arises from the growth of companies operating within a given national economy based on their ability to differentiate products and services. Innovations can be defined as creative processes that can contribute to such growth by improving existing production processes and lowering production costs, an existing product or adding new value to the service or replacing it with new ones that offer greater value to the consumer, or by improving marketing or management.

The results obtained by testing the hypothesis are significant for decision-makers because they demonstrate the close relationship between the national economy's competitiveness and innovation, the intertwining and connection of these two phenomena. This means that investments in innovation, research and development should increase the national economy's competitiveness, but that competitiveness and innovation are inextricably linked.

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References

1. Asheim, B.T. (2019). Smart specialization, innovation policy and regional innovation systems: what about new path development in less innovative regions. *Innovation: The European Journal of Social Science Research*, 32 (1), 8–25.
2. Berger, T. (2008). Concepts of national competitiveness. *Journal of International Business and Economics*, 9 (1), 91–111.
3. Bogdan, A., Florin, C., & Pavelescu, M. (2015). Innovation and competitiveness in European context. *Procedia Economics and Finance*, 32, 728-737.
4. Bryman, A. (2012), *Social research methods*. New York: Oxford University Press.
5. Cantwell, J. (2006). Innovation and competitiveness. In Fagerberg, J., Mowery, D.C., & Nelson, R.R. (eds.), *Oxford handbook of innovation*, 543-567. Oxford: Oxford University Press.
6. Capobianco-Uriarte, M., Casado-Belmonte, M., Marín-Carrillo, G.M., & Terán-Yépez, E. (2019). A Bibliometric Analysis of International Competitiveness (1983–2017). *Sustainability*, 11 (7).
7. Carayannis, E., & Grigoroudis, E. (2014). Linking innovation, productivity, and competitiveness: implications for policy and practice. *Journal of Technological Transformation*, 39, 199–218.
8. Chang, S.H., & Chang, H.Y. (2013). Study on national innovation capacity and international connection. *Innovation: Management, Policy & Practice*, 15 (4), 452–462.
9. Ciocanel, A.B., & Pavelescu, F.M. (2015). Innovation and Competitiveness in European Context. *Procedia Economics and Finance*, 32, 728–737.
10. Cvetanović, S., & Sredojević, D. (2012). The concept of national innovation system and economy's competitiveness. *Economic Themes*, 50 (2), 167-185.
11. Despotović, D., Cvetanović, S., & Nedić, V. (2014). Innovativeness and competitiveness of the Western Balkan countries and selected EU member states. *Industrija*, 42 (1), 27-45.
12. Doğan, E. (2016). The Effect of Innovation on Competitiveness. *Istanbul University Econometrics and Statistics e-Journal*, 24, 60-81.
13. Domazet, I. (2018). Improving competitiveness and economic development through FDI. In Roy, K. & Kar, S. (eds.), *Developmental State and Millennium Development Goals: Country Experiences*, 169-189. India: World Scientific Publishing Co.
14. Domazet, I., Marjanović, D., & Ahmetagić, D. (2022). The Impact of High-Tech Products Exports on Economic Growth: The Case of Serbia, Bulgaria, Romania and Hungary. *Ekonomika preduzeća*, 70 (3-4), 191-205.
15. Domazet, I., Marjanović, D., Ahmetagić, D., & Antonijević, M. (2022). Does the Increase in the Number of Registered Patents Affect Economic Growth? Evidence from Romania and Bulgaria. *Economic Analysis: Applied Research in Emerging Markets*, 55 (2), 49-65.

16. Domazet, I., Marjanović, D., Ahmetagić, D., & Bugarčić, M. (2021). The Impact of Innovation Indicators on Increasing Exports of High Technology Products. *Ekonomika preduzeća*, 69 (1-2), 31-40.
17. Đuričin, S., & Beraha, I. (2021). Identifying Medium-sized Agricultural Enterprises with the Greatest Potential for Innovation Development. *Ekonomika poljoprivrede*, 68 (1), 213-227.
18. Đuričin, D., & Lončar, D. (2020). Shaping the future of Serbia's economy: the new growth model and related economic policy platform. *Ekonomika preduzeća,* 68 (1-2), 1-21.
19. Đuričin, D., & Vuksanović Herceg, I. (2021). The Great Reset of Serbia's Economy During and after the Covid-19 Crisis. *Ekonomika preduzeća,* 69 (3-4), 117-136.
20. Edler, J., & Fagerberg, J. (2017). Innovation Policy: What, Why, and How. *Oxford Review of Economic Policy*, 33 (1), 2–23.
21. Ellis, P.D. (2010). *The essential guide to effect sizes: an introduction to statistical power, meta-analysis and the interpretation of research results*. Cambridge: Cambridge University Press.
22. Hanke, J. E., & Wichern, D. (2014). *Business forecasting*. Harlow: Pearson Education Limited.
23. Ho, R. (2006). *Handbook of univariate and multivariate data analysis and interpretation with SPSS*. Boca Raton, FL: Chapman and Hall/CRC - Taylor & Francis Group.
24. Hu, M-C., & Mathews, J.A. (2005). National innovative capacity in East Asia. *Research Policy*, 34 (9), 1322-1349.
25. Khyareh, M.M., & Rostami, N. (2022). Macroeconomic Conditions, Innovation and Competitiveness. *Journal of the Knowledge Economy*, 13, 1321–1340.
26. Lancaster, G. (2005). *Research methods in management - a concise introduction to research in management and business consultancy*. Oxford: Elsevier/Butterworth-Heinemann.
27. Lomachynska, I., & Podgorna, I. (2018). Innovation potential: impact on the national economy's competitiveness of the EU developed countries. *Baltic Journal of Economic Studies*, 4 (1), 262-270.
28. Marjanović, D., & Domazet, I. (2018). *Unapređenje makro konkurentnosti: fiskalni aspekti*. Beograd: Institut ekonomskih nauka.
29. Pece, A.M., Oros Simona, O.E., & Salisteanu, F. (2015). Innovation and Economic Growth: An Empirical Analysis for CEE Countries. *Procedia Economics and Finance*, 26, 461-467.
30. Petrariu, R. I., Bumbac, R., & Ciobanu, R. (2013). Innovation: a path to competitiveness and economic growth. The case of CEE countries. *Theoretical and Applied Economics*, 20 (5), 15-26.
31. Porter, M. (1990). *The Competitive Advantage of Nations*. New York: Free Press.
32. Prokop, V., Hajek, P., & Stejskal, J. (2021). Configuration Paths to Efficient National Innovation Ecosystems. *Technological Forecasting and Social Change*, 168.
33. Proksch, D., Haberstroh, M.M., & Pinkwart, A. (2017). Increasing the national innovative capacity: Identifying the pathways to success using a comparative method. *Technological Forecasting and Social Change*, 116, 256–270.
34. Rusnak, A., & Prokhorchuk, S. (2018). Innovative Capacity of Ukraine's Economy in the International Context. *Baltic Journal of Economic Studies*, 4 (3), 264-270.
35. Saunders, M., Lewis, P., & Thornhill, A. (2016). *Research methods for business students*. Harlow: Pearson Education.
36. Sener Ş., & Sarıdoğan, E. (2011). The Effects of Science-Technology-Innovation on Competitiveness and Economic Growth. *Procedia - Social and Behavioral Sciences*, 24, 815- 828.
37. Szabo, R., Vuksanović Herceg, I., Hanák, R., Hortovanyi, L., Romanová, A., Mocan, M., & Đuričin, D. (2020). Industry 4.0 Implementation in B2B Companies: Cross-Country Empirical Evidence on Digital Transformation in the CEE Region. *Sustainability, 12(22).*
38. Verma, J.P., & Abdel-Salam, A.G. (2019). *Testing statistical assumptions in research*. Hoboken, NJ: John Wiley & Sons.
39. Wang, X., Wang, Z., & Jiang, Z. (2021). Configurational differences of national innovation capability: a fuzzy set qualitative comparative analysis approach. *Technology Analysis & Strategic Management*, 33 (6), 599-611.
40. World Economic Forum (2015). *Global Competitiveness Report*. Geneva: World Economic Forum.
41. Zikmund, W.G., Babin, B.J. Carr, J.C., & Griffin, M. (2010). *Business research methods*. Boston, MA: South-Western Cengage Learning.

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COMPETITIVENESS OF WINE EXPORT FROM CEFTA COUNTRIES IN THE EU MARKET

Konkurentnost izvoza vina iz zemalja CEFTA regiona na tržištu EU

Abstract

The objective of this paper is to examine the competitiveness of wine export of CEFTA parties (excluding Kosovo), in the period from 2011 to 2020. The CEFTA group exported wine worth a total of 2.3 billion USD during the analyzed period, with significant differences in export value among certain parties. Moldova and North Macedonia generated over 80% of the wine export value. Competitiveness of wine export was analyzed by calculating two sets of indicators. The first set includes three competitiveness indices: revealed comparative advantage index, export specialization index and trade intensity index. The second set of factors relates to the analysis of market share and changes in the market share. With the purpose of identifying causes of changes in the market share, one of them being the competitiveness effect, the authors employed the method of constant market share analysis. The leading exporter, Moldova, although not predominantly focused on the European Union as the main export market, is competitive in the EU market and achieves specialization in exporting wine to the EU market, as well as an increase in trade intensity and market share. Other analyzed CEFTA countries have recorded a decrease in market shares and variable performance regarding export specialization, revealed comparative advantage and trade intensity.

Keywords: *competitiveness of wine export, CEFTA, EU, market share.*

Sažetak

Cilj rada je istraživanje konkurentnosti izvoza vina zemalja članica CEFTA grupacije (bez Kosova), u vremenskom periodu od 2011. do 2020. godine. Grupacija je u analiziranom periodu izvezla vina u ukupnoj vrednosti 2,3 milijarde USD sa značajnim razlikama u vrednosti izvoza među pojedinim zemljama-članicama. Moldavija i Severna Makedonija generišu preko 80% vrednosti izvoza vina. Analiza konkurentnosti izvoza vina spovedena je izračunavanjem dve grupe pokazatelja: prva grupa su tri indeksa konkuretnosti: indeks otkrivene konkurentske prednosti (Revealed Comparative Advantage Index), indeks izvozne specijalizacije (Export Specialization Index) i indeks intenziteta trgovine (Trade Intensity Index). Druga grupa faktora tiče se analize tržišnog učešća i promena u tržišnom učešću. U cilju pronalaženja uzroka promena u tržišnom učešću, među kojima je i efekat konkurentnosti, korišćena je metoda analize konstantnog tržišnog učešća (Constant Market Share). Najveći izvoznik, Moldavija, iako nije dominantno okrenuta Evropskoj uniji kao glavnom izvoznom tržištu, konkurentna je na tržištu EU i ostvaruje specijalizaciju izvoza vina za tržište EU, kao i rast intenziteta trgovine i tržišnog učešća. Ostale analizirane zemlje CEFTA grupacije ostvaruju smanjivanje tržišnih udela i promenjivu uspešnost po pitanju specijalizacije izvoza, otkrivenih konkurentskih prednosti i intenziteta trgovine.

Ključne reči: *konkurentnost izvoza vina, CEFTA, EU, tržišno učešće.*

Introduction

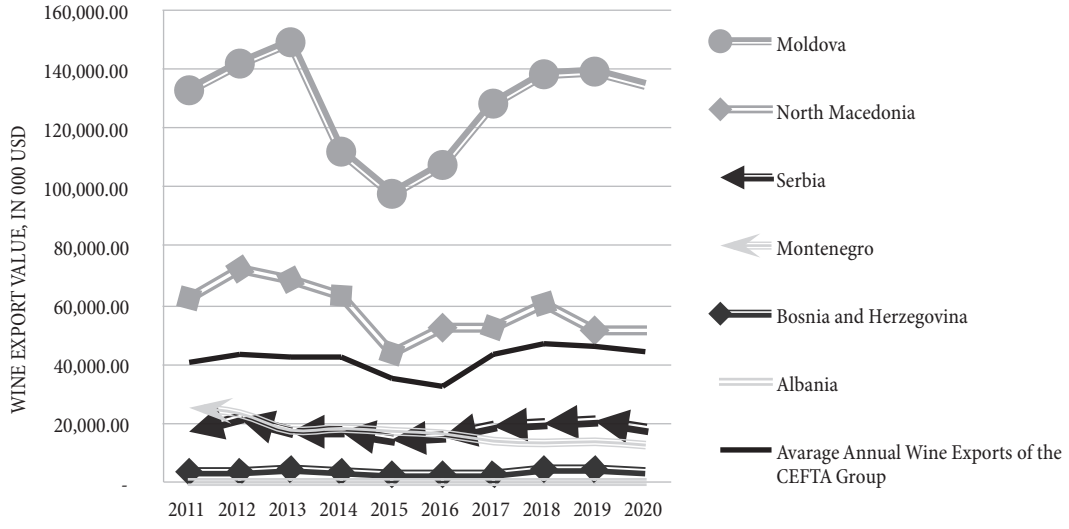
Wine exports depend on a number of factors, primarily national production, shifts in international market demand, as well as competitiveness compared to the leading wine-exporting countries in the world. The wine industry of CEFTA countries is significantly export-oriented [36]. The total export of wine in the analyzed ten-year period amounted to 2.3 billion USD, with significant differences in export value among certain parties of the CEFTA group. The analysis encompasses Moldova, Serbia (excluding Kosovo), Montenegro, Bosnia and Herzegovina, North Macedonia and Albania.

In the observed ten-year period, the export value of wine from Moldova was about 1.3 billion USD, about 579 million USD from North Macedonia, whereas other countries were exporting wine below the average: Serbia and Montenegro 178 and 171 million USD respectively, Bosnia and Herzegovina 3.5 million USD and Albania approximately 160 thousand USD. Figure 1 shows the relationship between the value of wine exported annually from individual countries signatories to the CEFTA Agreement and the average annual value of wine exports of the CEFTA group. In the 2011–2020 period, exports of wine from Moldova accounted for 57% of the total wine exports of CEFTA countries. Moldova recorded its maximum wine exports in 2013, amounting to 149.5 million USD, whereas the year with the poorest export in the analyzed ten-year period was 2015, with exports amounting to 97.7 million USD. The second largest wine-exporting country of the CEFTA group is North Macedonia, with exports accounting for more than a quarter of exports within the group. On average, North Macedonia exported wine worth 57.9 million USD annually. During the analyzed period, this country recorded the highest wine exports in 2012 (72.5 million USD), and the lowest, the same as Moldova, in 2015 (43.7 million USD).

Other countries, parties to the CEFTA Agreement, exported wine in values below the group average. In the analyzed period, Serbia and Montenegro generated approximately similar total values of exports, 178 million USD and 171 million USD respectively, but the export trend was different. Exports of wine from Serbia recorded annual variations, with an average annual value of exports amounting to 17.8 million USD, achieving above-average export value in the 2017-2020 period. Montenegro experienced a declining trend in wine exports, with values being halved by the end of the analyzed period. Namely, the export of wine from Montenegro amounted to 25.5 million USD in 2011, and to 12.5 million USD in current prices in 2020.

The relative importance of wine exports for the individual countries of the CEFTA group can be observed through data on the share of wine exports in the total exports of agri-food products (HS classification, 01-24) of the countries concerned.

Figure 1: Wine export value of CEFTA countries and average export value at group level (2011 to 2020)



Source: Authors' calculations based on UN COMTRADE and ITC statistics.

Exports of wine from Montenegro account for 26% of the export value of agri-food products from this country. Moldovan wine exports account for 12.5% of the export value of agri-food products, and wine exports from North Macedonia account for 9% of the country's food exports. Wine exports have no significant share in the value of food exports from the Republic of Serbia, Bosnia and Herzegovina and Albania, and account for approximately 1% (2020).

Major wine export destinations of CEFTA countries

CEFTA countries place their wines in different markets. The main export destinations of wines from CEFTA countries differ depending on the country. As presented in Table 1, in the 2011–2020 period, wine from Moldova was mostly exported to the markets of Belarus, the Russian Federation, Romania, Ukraine and Poland.

North Macedonia exported the largest amounts of wine to another party of the CEFTA group, Serbia, as well as Montenegro. A significant share of exports from North Macedonia and Bosnia and Herzegovina was intended for EU members, Germany and Croatia. Wines from Serbia are mostly exported to the markets of the Russian Federation, Bosnia and Herzegovina and Montenegro. Data for Kosovo and Albania are unavailable.

The objective of this paper is, inter alia, to analyze the competitiveness of wine export from CEFTA countries in the European Union market. The share of CEFTA countries in wine imports to the EU market recorded a relative growth trend in the period from 2011 to 2020. Namely, the share of wine imports from CEFTA countries to the EU was 0.41% in 2011, and increased to 0.66% in 2020, as presented in Figure 2.

Literature review

Numerous authors have examined the competitiveness of the agri-food sector in the global or regional markets, most of them by way of the index of comparative advantages. For example, Bojnec and Ferto [7] analyzed export competitiveness of agri-food products in international markets for 23 leading European countries and concluded

Table 1: Major export destinations of wine from CEFTA countries (000 USD) and share in total exports (2011–2020)

Export of wine from Moldova							
Export destinations	All export destinations	*Belarus*	*Russian Federation*	*Romania*	*Ukraine*	*Poland*	Other export destinations (85)
Export 2011–2020 value in 000 USD	1281961	293074	192332	97196	92623	87421	519315
Share in total exports (%)	1.00	0.23	0.15	0.08	0.07	0.07	0.59
Export of wine from North Macedonia							
Export destinations	All export destinations	*Serbia*	*Germany*	*Croatia*	*Areas NES*	*Bosnia and Herzegovina*	Other export destinations (49)
Export 2011–2020 value in 000 USD	578655	161140	127960	86495	52358	23913	126789
Share in total exports	1.00	0.28	0.22	0.15	0.09	0.04	0.22
Export of wine from Serbia							
Export destinations	All export destinations	*Russian Federation*	*Bosnia and Herzegovina*	*Montenegro*	*Czech Rep.*	*Croatia*	Other export destinations (49)
Export 2011–2020 value in 000 USD	178426	55078	48661	29906	10074	6567	28140
Share in total exports	1.00	0.31	0.27	0.17	0.06	0.04	0.16
Export of wine from Montenegro							
Export destinations	All export destinations	*Serbia*	*Bosnia and Herzegovina*	*Russian Federation*	*China*	*Areas NES*[3]	Other export destinations (38)
Export 2011–2020 value in 000 USD	171406	75999	33061	19119	13118	9324	20785
Share in total exports	1.00	0.44	0.19	0.11	0.08	0.05	0.12
Export of wine from Bosnia and Herzegovina							
Export destinations	All export destinations	*Croatia*	*Germany*	*Areas NES*	*Serbia*	*China*	Other export destinations (30)
Export 2011–2020 value in 000 USD	34959	19332	4202	2779	2550	2078	4018
Share in total exports	1.00	0.55	0.12	0.08	0.07	0.06	0.11

Source: Authors' calculations based on UN COMTRADE and ITC statistics

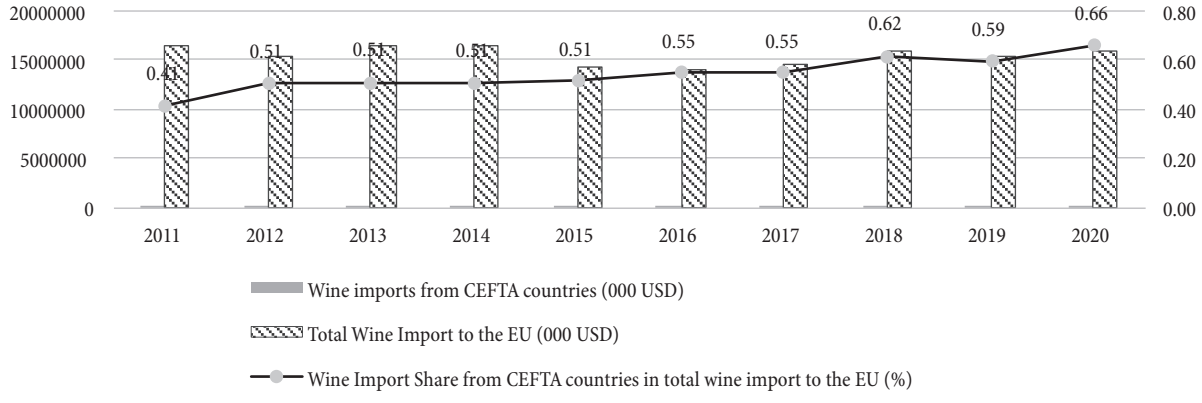
that most of them had comparative advantages. In contrast, export specialization per country was identified for a smaller number of agri-food products with comparative advantages. Another research by the same duo of authors [8] looked into the drivers of the duration of comparative advantages of agri-food products in the EU and concluded that factors with positive influence are the level of economic development and agri-food export diversification, as well as being a new EU member state. In a study of the effects of Western Balkan countries joining the EU, it is shown that becoming a "new" member state has a positive impact on trade intensification, while almost all countries recorded a decrease in the comparative advantages of agri-food products after their respective accession [32].

Research into the export competitiveness of agri-food products and especially of wine, which include the CEFTA member states, are few. Measuring the revealed comparative advantage (RCA) in research by OECD shows that CEFTA economies are the most specialized and hence the most competitive in intermediate and final goods exports in low-technology industries, and in intermediate goods exports in medium-low technology industries [25]. Another study [30] aims to point out the unexploited potential of CEFTA economies for export to the Russian market. The results indicate the highest degree of compatibility between Russian import and all CEFTA countries' export of fruits, vegetable and its processed commodities.

According to Vlahović, Škatarić and Veličković [36], during the 2012-2016 period, CEFTA countries achieved a positive balance of foreign trade of wine. The positive balance was achieved by Moldova, Macedonia and Montenegro, while the Republic of Serbia, Bosnia and Herzegovina and Albania experienced a negative balance of foreign trade of wine. Based on another research, North Macedonia has a comparative advantage in their production of wine. Although it has a comparative advantage in the production of wine larger than Bulgaria and Croatia, North Macedonia does not reach the same level of export unit value as the countries compared [25]. Concerning differences in RCA across groups of countries, Serbia has recorded an almost continuous increase of comparative advantages in relation to CEFTA countries, although most CEFTA countries have a similar trade structure [31]. Vanka [35] deals with the economic prospects of the Serbian wine cluster, its current opportunities and the introduction of new approaches. Its main focus is therefore to introduce the advantages and opportunities that clusters could bring to this sector, considering the three pillars of sustainable development, namely economic growth, environmental and social development, and achieving competitiveness. According to the analyses of Prohnițchi et al., Moldova's exports of cereals, animal skins and hides, beverages (especially wine), fruit and vegetables (fruit juices and nuts), vegetable oils and oilseeds reveal a strong comparative advantage in the EU market [28].

Research focusing on agri-food export performances of Western Balkan countries indicated that all the countries in the region, except Albania, have comparative advantages in exporting these products, while export performances are lower than in the EU countries [4]. Concerning its economic specialization, it is noted that

Figure 2: Changes in shares of wine import from the CEFTA group in the total EU wine imports (2011–2020)



Source: Authors' calculations based on UN COMTRADE and ITC statistics.

Albania is relatively rich in natural resources and has a relatively low cost of labor force, but Albania does not reveal pure comparative advantages [23]. Other research referred to the level of competitiveness of the processed food sector of the Danube region countries [12]. This research indicated that development of agri-food trade could have an important role in faster economic development.

The literature review shows that there are only few studies that analyze the comparative advantages of wine export in CEFTA parties in relation to the EU Member States, which is precisely where the real contribution of this research should be observed.

Materials and methods

The measuring of competitiveness of wine export from CEFTA countries to the EU-28 market has been methodologically processed via two sets of indicators and two stages of calculation: selected competitiveness indices and constant market share analysis.

The data analysis refers to one export product: wine (HS classification, 4 digits, product: 2204). The data is retrieved from the International Trade Center's (ITC) website, where it is emphasized that the data is obtained from calculations based on UN COMTRADE and ITC statistics.

The analysis encompasses CEFTA signatory countries: Serbia, Montenegro, North Macedonia, Moldova, Bosnia and Herzegovina and Albania, excluding Kosovo for which data are unavailable, noting that the data for Albania in the database are inconsistent or incomplete.

The analysis covers a period of ten years, 2011–2020. Since the CMS model is sensitive to the selection of the base period, average values for the 2011-2015 and 2016-2020 periods were used for calculation and comparison.

Competitiveness indices

The first group of indicators are the three basic indices used: the trade intensity index, the revealed comparative advantage index and the export specialization index of CEFTA countries with regard to the EU-28 market.

The trade intensity index is used to determine competitiveness by measuring the intensity of trade between two countries. This index was first used by Kojima [15]. Value of the index higher than 1 indicates the presence of strong trade links between two countries and thus, export competitiveness. The trade intensity index is defined by the following formula and variables:

$$Ig,i = \frac{EXg,i}{EXg} \Big/ \frac{IMi}{IMw} \quad (1)$$

Ig, i – wine trade intensity index between the CEFTA country concerned and the EU

EXg, i – value of wine export from the CEFTA country to the EU

EXg – value of wine export from the CEFTA country to the world market

IMi – wine imports into the EU

IMw – world wine imports.

With the aim of identifying the existence of comparative advantage, Balassa [4] introduced the revealed comparative advantage index (RCA). The index measures the ability of a country to compete in the international market, which is confirmed when the value of the index is greater than 1. The formula and variables for calculating the revealed comparative advantage index are as follows:

$$RCA = (EXij / EXit) – (EXwj / EXw) \quad (2)$$

EXij – export value of product *j* (wine) in country *i*;

EXit – total export value in country *i*;

EXwj – world exports of product *j*;

EXw – total world exports.

The values of this index range from 0 to infinity. Country *i* has comparative advantages in the product or industry *j* if RCA > 1. Conversely, RCA <1 indicates lack of comparative advantages of country *i* in industry *j*.

The trade specialization index is defined as the share of exports of the analyzed product (wine) in the total exports of the country concerned, which is "normalized" by the average shares of all countries. This is an indicator derived from the revealed comparative advantage index, but due to its dynamic and fundamental characteristics, it is more suitable for comparison across countries over time [1]. The following formula is used to evaluate the relative export specialization of a particular country in the analyzed sector/product:

$$Bij = \frac{\frac{Xij}{Xi}}{\frac{1}{N}\sum_{i=1}^{N}\frac{Xij}{Xi}} \quad (3)$$

Where:
B – stands for specialization index
X – stands for exports
i – stands for country code, i=1,2…N
j – stands for product.

As with the Balassa index, the value of 1 separates the index values into the existence of specialization (when the share of product *j* in total exports of the analyzed country is higher than the average share of the same product in exports of N countries, we can say that the analyzed country has achieved relative export specialization for the product concerned. Otherwise, the value of the index is less than 1 and there is no relative export specialization).

Constant market share analysis

The second group of indicators relates to the constant market share analysis (CMSA) and was performed through two stages of calculation. The first stage of the analysis is the calculation of the market share or changes in the market share. A country with a higher market share or an increase in market share is considered to be competitive for the product concerned in the researched market and over a given period.

The second stage, with the aim of analyzing the causes of changes in wine exports, was carried out by applying the constant market share analysis method. This analysis was first introduced by Tyszynski [34]and then further developed by Leamer and Stern [17], Richardson [29], Krugman and Hatsopoulos [16], Fagerberg [11], Milana [22], Chen, Xu and Duan [10], Barbaros, Lenger, Akgüngör and Aydoğuş [5]and others.

Most studies and research available in the professional and scientific literature have been conducted by analyzing multiple products or multiple markets or cumulatively, at agricultural level. Only a few studies dealing with export competitiveness of a single product in multiple markets are available in literature: Ongsritrakul and Hubbard [26], Jin and Koo [13], Turkekul, Gunden, Abay and Miran [33], Amzul [2], Ndou and Obi [24], Zivzivadze and Taktakishvili [39] and Capobianco-Uriarte, Aparicio, De Pablo-Valenciano and Casado-Belmonte [9].

The constant market share model (CMS model) is based on the assumption that the industry (in this case, the wine industry) would maintain its share in exports – i.e., that the share would remain unchanged over time. It also assumes that the role of domestic factors of the exporting country is dominant in determining the causes, and includes both price and non-price competitiveness. This type of analysis originally singled out four components that decompose the change in exports occurred between two time periods according to the factor or effect causing it [29]: market size effect, market composition effect, commodity structure effect and competitiveness effect.

Since this paper analyzes the data for one single product (wine), three components have been included: market size effect or "structural effect", as it is coined in literature. The second part of the equation is the "competitiveness effect" and the third part is the "secondary effect", which is a combination of the previous two [10].

The calculation is expressed by the following formula and variables [26], noting that the formula has been modified in terms of application to values expressed in thousands of USD, and not as originally predicted, in product quantity (in tons).

$$q^1 - q^0 = S^0(Q^1 - q^0) + \sum_{i=1}^{n}(S_i^0 - S^0)Q_i^1 + (q^1 - \sum_{i=1}^{n}S_i^0 Q_i^1) \quad (4)$$

q – wine export value of the analyzed country in the regional/world market
S – export market share of the analyzed country in total exports in the regional/world market
Si – export market share of the analyzed country in total exports to the country *'s* market
Q – wine export value in the regional/world market
Qi – wine export value to the country *'s* market

The characters 0 and 1 in the subscript with the variables refer to the base and the subsequent period, by which data is compared, respectively. The equation shows that the occurred changes in the value of exports to the EU market from CEFTA countries between the two analyzed periods (q0 and q1) can be decomposed into three effects or components on the right side of the equation, namely: (1) structural effect – market size effect, (2) competitiveness effect, (3) secondary effect.

The market size effect or structural effect shows how much the export of the analyzed country would change between the two observed periods, if it changed at the same rate as the world average, or in this case, which share of change can be attributed to EU market growth. The competitiveness effect is a component which indicates the change in exports resulting from a change in the competitive position of the respective country in the market concerned. The secondary effect is a combination of the structural and competitiveness effects.

Results and discussion

Competitiveness indices

There are significant differences in trade intensity between CEFTA countries and the EU market, as presented in Table 2.

Observed by the average value of the trade intensity index of 0.7, Moldova is not predominantly oriented towards the European Union market. The growth trend of this index is noticeable. Compared to 2011, when the intensity index of the wine trade between Moldova and the EU was 0.34, a threefold increase in this index, reaching a value of 1.05, has been achieved by 2020.

The attained trade intensity with the European Union in 2020 is confirmed by the fact that European Union countries imported more than 35% of the value of wine exports from Moldova, with three EU countries having a predominant share: 16% of the wine export value from Moldova was imported to the Romanian market, and 8% to the markets of the Czech Republic and Poland, each. Strong trade links between the trading partners have been reflected by the indices relating to the trade between North Macedonia and the EU (ten-year average TSI is 1.42) and between Bosnia and Herzegovina and the EU (ten-year average TSI is 1.6). For example, in 2020, North Macedonia (TSI 1.38) reached almost half of the total wine export value through export to European Union countries: Germany (19%), Croatia (17%), Slovenia (6%) and Bulgaria (5%). In the same year, Bosnia and Herzegovina (TSI 1.66) exported wine to European Union countries worth more than 70% of the total exports, with Croatia being the dominant export market (62% of Bosnia and Herzegovina's wine export value), followed by Germany's 9% and France's 2%. When it comes to wine trade, Montenegro is a country with fewest links to the EU market. The situation regarding the trade relations between Albania and the EU is specific, the specialization level being high in the years when exports were recorded, but in 2014, 2015, 2017, 2018, 2019 and 2020, exports were non-existent or data were unavailable.

The wine export specialization index and the revealed comparative advantage index were calculated as the average value for two five-year periods over a ten-year period, 2011–2020. The two indices in Table 3 with values less than 1 indicate the absence of specialization or comparative advantage in exports, and the value greater than 1 indicates the presence of export specialization and the presence of revealed comparative advantage in wine exports of the country concerned in a given market. It can be observed that the values of the specialization index are consistent with the values of the revealed comparative advantage index.

Wine export specialization for the EU market is observed for wines from Moldova, North Macedonia and Montenegro. In Moldova and Montenegro, the value of this index, or the specialization level for wine export to the EU market, increased, whereas in North Macedonia

Table 2: Trade intensity index between CEFTA countries and the EU (2011–2020)

Trade intensity index	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Average
Moldova/EU	0.34	0.33	0.42	0.60	0.73	0.85	0.85	0.98	0.90	1.05	**0.70**
North Macedonia/EU	1.21	1.33	1.39	1.52	1.80	1.42	1.41	1.36	1.39	1.38	**1.42**
Serbia/EU	0.75	0.94	0.87	0.61	0.67	0.51	0.32	0.36	0.43	0.49	**0.60**
Montenegro/EU	0.07	0.07	0.11	0.09	0.13	0.12	0.13	0.15	0.15	0.15	**0.12**
Bosnia & Herzegovina/EU	1.67	1.68	1.58	1.49	1.58	1.46	1.45	1.72	1.68	1.66	**1.60**
Albania/EU	0.50	1.06	4.11	n/a	n/a	18.75	n/a	n/a	n/a	n/a	**2.44**

Source: Authors' calculations.

the specialization index decreased over time, followed by the same trends of the revealed comparative advantage index (Table 3).

Table 3: Wine export specialization index and revealed comparative advantage index of CEFTA in the EU market (2011–2020)

Country	Wine export specialization for the EU market		Revealed comparative advantage	
	2011–2015	2016–2020	2011–2015	2016–2020
Moldova	4.34	4.52	5.76	5.17
North Macedonia	3.31	3.25	4.40	3.72
Serbia	0.20	0.21	0.27	0.23
Montenegro	8.31	10.45	11.03	11.95
Bosnia & Herzegovina	0.28	0.26	0.38	0.30
Albania	0.01	0.00	0.01	0.00

Source: Authors' calculations based on UN COMTRADE and ITC statistics.

Market share analysis

Table 4 shows that in the observed ten-year period (2011–2020), and according to the average five-year data sets, there was an increase in the market share of Moldovan wine only, from 0.17% to 0.34%. Wines from North Macedonia and Serbia went into a decline in market share, whereas Montenegro, Bosnia and Herzegovina and Albania were stagnating, showing no significant changes in market share.

In nominal amounts, Moldova and Albania achieved an increase in average wine exports to the EU-28 market between the two analyzed periods, while the average wine export from North Macedonia, Serbia, Montenegro and Bosnia and Herzegovina to the EU-28 market decreased between the two analyzed periods.

Decomposition of changes in wine export values between the two five-year periods from 2011 to 2020 was performed by using the CMS analysis. The analysis shows that the increase in wine exports from Moldova to the EU market was predominantly a result of the competitiveness effect. The total change in Moldovan wine exports occurred due to a potential increase of approximately 110% of the share in total exports due to the export competitiveness of Moldovan wine in the EU market. The share of exports of approximately 5% was lost both due to the structural and the secondary effect.

The competitiveness effect, although in nominally smaller amounts, exists in the exports of wine from Albania. According to the analysis results, the declining competitiveness effect has been the main cause of the decrease in wine exports from North Macedonia (84%), Serbia (94%) and Bosnia and Herzegovina (71%) to the EU market, while the structural effect (decline in demand on the EU market) has been the dominant cause of the negative change in wine exports from Montenegro to the EU market.

Conclusion

The competitiveness of wine exports of CEFTA countries in the period from 2011 to 2020 has been examined in this paper. Moldova and North Macedonia are predominant

Table 4: Changes in wine exports and market share of CEFTA countries in the EU market

Exporting country	Period	Average wine exports to the EU market (000 USD)	Total wine imports to the EU-28 market – average for period (000 USD)	Average market share in the EU-28 market (%)	Change in market share (%)
Moldova	2011–2015	26,971.00	15,865,458.20	0.17	0.17
	2016–2020	51,284.20	15,170,131.00	0.34	
North Macedonia	2011–2015	40,858.00	15,865,458.20	0.26	−0.05
	2016–2020	31,733.40	15,170,131.00	0.21	
Serbia	2011–2015	6,217.00	15,865,458.20	0.04	−0.02
	2016–2020	3,290.20	15,170,131.00	0.02	
Montenegro	2011–2015	865.80	15,865,458.20	0.01	0.00
	2016–2020	828.40	15,170,131.00	0.01	
Bosnia & Herzegovina	2011–2015	2,681.60	15,865,458.20	0.02	0.00
	2016–2020	2,314.40	15,170,131.00	0.02	
Albania	2011–2015	157.80	15,865,458.20	0.00	0.00
	2016–2020	816.80	15,170,131.00	0.01	

Source: Authors' calculations based on UN COMTRADE and ITC statistics.

in the structure of total exports, generating over 80% of the total wine export value.

Wine has a different significance in the structure of agro-industrial exports of certain countries of the CEFTA group. Wine exports from Montenegro comprise 26% of the agricultural export value. Moldovan wine exports account for 12.5% of the agricultural export value, whereas wine exports from North Macedonia account for 9% of the country's food exports. Regarding the value of agricultural exports from the Republic of Serbia, Bosnia and Herzegovina and Albania, wine exports have no significant share and approximate to 1% (2020).

The trade intensity index indicates that Moldova is not predominantly oriented towards the European Union market. However, a growth trend of this index is observable. Compared to 2011, when the intensity index of wine trade between Moldova and the EU was 0.34, the index reached a value of 1.05 in 2020.

Specialization of wine exports for the EU market is present for wines from Moldova, North Macedonia and Montenegro. In Moldova and Montenegro, the value of this index, or the specialization level for wine export to the EU market, increased, whereas in North Macedonia the specialization index decreased over time, followed by the same trends of the revealed comparative advantage index.

In the analyzed ten-year period, and according to the average five-year data sets, an increase in the market share in the EU market was observed only for Moldovan wine, from 0.17% to 0.34%. Wines from North Macedonia and Serbia went into a decline in market share in this market, whereas Montenegro, Bosnia and Herzegovina and Albania were stagnating, showing no significant changes in market share.

The analysis shows that the increase of wine exports from Moldova to the EU market was predominantly a result of the competitiveness effect. A share of exports of approximately 5% was lost both due to the structural and the secondary effect. The competitiveness effect is present in the exports of wine from Albania, but it is far lesser compared to Moldova. The competitiveness effect, however declining, has been observed in wine exports to the EU market from North Macedonia (84%), Serbia (94%) and Bosnia and Herzegovina (71%), while the structural effect (decline in demand in the EU market) has been the dominant cause of the negative change in wine exports from Montenegro to the EU market.

With the objective of increasing exports, it is necessary to intensify wine production, along with changing the structure towards wines of better quality. Intense competitiveness and market saturation are present in the EU market, which will make the export of wine from CEFTA countries very difficult in the forthcoming period. Non-tariff barriers are the largest obstacles to the actualization of full capacities in free trade between CEFTA countries and the countries of the European Union.

Table 5: Decomposition of changes in wine export value from CEFTA countries to the EU market (2011–2020)

CEFTA country		Change in average wine exports to the EU market	Structural effect	Competitiveness effect	Secondary effect
Moldova	Value in 000 USD	24,313.20	−1,182.04	26,663.83	−1,168.58
	%	100.00	−4.86	109.67	−4.81
North Macedonia	Value in 000 USD	−9,124.60	−1,790.66	−7,670.09	336.15
	%	100.00	19.62	84.06	−3.68
Serbia	Value in 000 USD	−2,926.80	−272.47	−2,775.99	121.66
	%	100.00	9.31	94.85	−4.16
Montenegro	Value in 000 USD	−37.40	−37.94	0.57	−0.02
	%	100.00	101.46	−1.52	0.07
Bosnia and Herzegovina	Value in 000 USD	−367.20	−117.53	−261.12	11.44
	%	100.00	32.01	71.11	-3.12
Albania	Value in 000 USD	659.00	−6.92	696.44	−30.52
	%	100.00	−1.05	105.68	−4.63

Source: Authors' calculations based on ITC and COMTRADE statistics.

References

1. Amador, J., & Cabral, S. (2014). *Global value chains: Surveying drivers and measures*. ECB Working paper 1739. Retrieved from https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1739.en.pdf.
2. Amzul, R. (2010). Export competitiveness of Indonesia's palm oil product. *Trends in Agricultural Economics*, *3*, 1-18.
3. Andersson, P., & Ödlund, M. (2011). *The wine production in FYROM –Does the wine sector have a comparative advantage?*. Independent project. Uppsala: Swedish University of Agricultural Sciences, Faculty of Natural Resources and Agricultural Sciences, Department of Economics.
4. Balassa, B. (1965). Trade liberalization and revealed comparative advantages. *The Manchester School, 33*(2), 99–123.
5. Barbaros, F., Lenger, A., Akgüngör, S., & Aydoğuş, O. (2009). *International marketing and trade of quality food products*. Wageningen, NL: Wageningen Academic Publishers.
6. Bojnec, S., & Ferto, I. (2009). Agro-food trade competitiveness of Central European and Balkan countries. *Food Policy*, *34*(5), 417- 425.
7. Bojnec, S., & Ferto, I. (2017). The duration of global agri-food export competitiveness. *British Food Journal*, *119*(6), 1378–1393.
8. Bojnec, S., & Ferto, I. (2018). Drivers of the duration of comparative advantage in the European Union's agri-food exports. *Agricultural Economics- Czech*, *64*, 51–60.
9. Capobianco-Uriarte, M., Aparicio, J., De Pablo-Valenciano, J., & Casado-Belmonte, M. (2021). The European tomato market. An approach by export competitiveness maps. *PloS one*, *16*(5). Retrieved from: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0250867.
10. Chen, K., Xu, L., & Duan, Y. (2000). Ex-post competitiveness of China's export in agri-food products: 1980-96. *Agribusiness*, *16*, 281-294.
11. Fagerberg, J. (1988). International competitiveness. *The Economic Journal*, *98*(391), 355-374.
12. Ignjatijević, S., Milojević, I., Cvijanović, G., & Jandrić, M. (2015). Balance of comparative advantages in the processed food sector of the Danube Countries. *Sustainability, 7,* 6976–6993.
13. Jin, H. J., & Koo, W. W. (2003). *Analysis of U.S. wheat market shares in East Asia*. Agribusiness & Applied Economics Report 23505. Fargo, ND: North Dakota State University, Department of Agribusiness and Applied Economics.
14. Kittova, Z., & Steinhauser, D. (2018). The international economic position of Western Balkan countries in light of their European integration ambitions. *Journal of Competitiveness, 10*, 51–68.
15. Kojima, K. (1964). The pattern of international trade among advanced countries. *Hitotsuboshi Journal of Economics*, *5,* 16-36.
16. Krugman, P., & Hatsopoulos, G. N. (1987). The problem of U.S. competitiveness in manufacturing. *New England Economic Review, issue Jan*, 18-29.
17. Leamer, E. E., & Stern, R. M. (1970). *Quantitative international economics*. Boston: Allyn & Bacon.
18. Marković, M., & Marjanović, I. (2019). Export competitiveness of Serbian agri-food sector in the Western Balkan countries. In B. Krstić (Ed), *Improving macroeconomic competitiveness* (79–97). Niš: Faculty of Economics, University of Niš .
19. Matkovski, B., Đokić, D. & Zekić, S. (2016). Export performances of agricultural sector of the Western Balkan countries. In D. Tomić, K. Lovre, J. Subić & Ševarlić, M. (Eds), *152nd EAAE Seminar — Emerging Technologies and the Development of Agriculture*, (294–303). Novi Sad, SRB: Serbian Association of Agricultural Economists, Faculty of Economics in Subotica & Institute of Agricultural Economics.,.
20. Matkovski, B., Lovre, K., & Zekić, S. (2017). The foreign trade liberalization and export of agri-food products of Serbia. *Agricultural Economics -Czech*, *63*, 331–345.
21. Matkovski, B., Kalas, B., Zekić, S., & Jeremić, M. (2019). Agri-food competitiveness in South East Europe. *Outlook on Agriculture*, *48*, 326-335.
22. Milana, C. (1988). Constant market share analysis and index number theory. *European Journal of Political Economy*, *4*(4), 453-478.
23. Mitaj, A., Muco, K., & Avdulaj, J. (2014). Albania's trade specialization and its economic growth perspective in the future. *European Journal of Sustainable Development*, *3*(3), 299-308.
24. Ndou, P., & Obi, A. (2013). Analysis of the competitiveness of the South African citrus industry using the Constant Market Share and Porter's diamond model approaches. *International Journal of Agricultural Management*, *2*(3), 160-169.
25. OECD. (2013). *Trade in intermediate goods and international supply chains in CEFTA*. CEFTA Issues Paper 6. Retrieved from: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.oecd.org/south-east-europe/programme/CEFTA%20IP6_Trade%20in%20Intermediate_Web%20and%20Print.pdf.
26. Ongsritrakul, S., & Hubbard, L. (1996). The export market for Thai frozen shrimps in the European Union. *British Food Journal*, *98*(8), 24-28.
27. Pjerotić, Lj. (2008). Trade liberalization in the South East Europe – Effects and controversial issues. *Panoeconomicus*, *4*, 497-522.
28. Prohniţchi, V., Popa, A., Oprunenco, A., Luecke, M., Tekce, M., Hristev, E., Mincu, G., & Vasilescu, V. (2009). *A free trade area between the Republic of Moldova and the European Union: Feasibility, perspectives and potential impact*. Expert-group. Retrieved from: http:// expert-grup.org/en/biblioteca/item/download/812_52db0254536832d1c28809572d8103cf.
29. Richardson, J. D. (1971). Constant-market-shares analysis of export growth. *Journal of international economics*, *1*, 227–239.
30. Stanojević, N. (2016). Russian food products market: New CEFTA export opportunity. *Industrija*, *44*(4), 175-196.
31. Stojanović, Z., Dragutinović-Mitrović, R., & Popović-Petrović, I. (2013). Serbia's food trade competitiveness and PTAS in the EU integration process. In D. Tomić, M. Ševarlić, K. Lovre, & S. Zekić, (Eds.), *Challenges for the global agricultural trade regime after Doha* (299-310). Belgrade, SRB: Serbian Association of Agricultural Economists & Faculty of Economics in Subotica.
32. Torok, A., & Jambor, A. (2013). Agri-food trade of the new member states since EU accession. *Agricultural Economics -Czech*, *59*, 101–112.
33. Turkekul, B., Gunden, C., Abay, C., & Miran, B. (2007). *A market share analysis of virgin oil producer countries with special respect to competitiveness*. Paper prepared for presentation at the I Mediterranean Conference of Agrofood Social Scientists. 103rd EAAE Seminar *Adding value to the Agro-food supply Chain in the Future EuroMediterranean Space*. Barcelona, ES.
34. Tyszynski, H. (1951). World trade in manufactured commodities, 1899-1950. *The Manchester School of Economic and Social Studies*, *19*, 222-304.

35. Vanka, G. (2015). *Achieving regional competitiveness via export opportunities and quality systems of Serbian agri-food clusters*. Paper presented at the XXII International Scientific Conference "*Enometrix*". Brno, CZ.
36. Vlahović, B., Puškarić, A., & Tomašević, D. (2013). Changes of international wine market. In D. Tomić, M. Ševarlić, K. Lovre & S. Zekić (Eds.), *Challenges for the global agricultural trade regime after Doha* . Belgrade, SRB: Serbian Association of Agricultural Economists & Faculty of Economics in Subotica.
37. Vlahović, B., Škatarić G., & Veličković, S. (2017). Tržište vina u zemljama CEFTA grupacije. *Agroekonomika*, *46*(74), 1-11.
38. Volk, T., Rednak, M., Erjavec, E., Rac, I., Zhllima, E., Gjeci, G., Bajramović, S., Vaško, Ž., Kerolli-Mustafa, M., Gjokaj, E. et al. (2019). Agricultural policy developments and EU approximation process in the Western Balkan countries. In B. Ilić, D. Pavloska-Gjorgjieska & P. Ciaian (Eds.), *EUR 29475 EN* ( ). Luxembourg: Publications Office of the European Union.
39. Zivzivadze, L., & Taktakishvili, T. (2019). Index-based analysis of Georgian wine export's competitiveness on a global market. *International Journal of Agricultural Economics*, *4*(5), 201-206.

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LONG-TERM EFFECTS OF THE SELECTED ECONOMIC VARIABLES ON SERBIA PUBLIC DEBT

Dugoročni efekti odabranih ekonomskih varijabli na javni dug Srbije

Abstract

Public debt control is one of the most important challenges which global economies face. The aim of this paper is to examine the long-term relationship between public debt and the selected economic variables in the Republic of Serbia by using the autoregressive distributed lag (ARDL) approach. The empirical analysis conducted on the basis of the annual data in the period from 2000 to 2019 includes, apart from the debt-to-GDP ratio as the dependent variable, 6 selected economic indicators, used in the model as independent variables. The obtained results indicate that economic growth and gross fixed capital formation have a statistically significant negative long-term effect on the public debt, while general government final consumption expenditure (% of GDP) and trade openness (% of GDP) show a statistically significant positive long-term effect on the public debt. The estimated long-run coefficients related to inflation and unemployment have the expected sign, but they are statistically insignificant. The results of the study can be important to policy makers when defining the activities aimed at establishing public debt stability and achieving long-term sustainable economic results.

Keywords: *public debt, economic growth, ARDL approach, error-correction model*

Sažetak

Kontrola javnog duga je jedan od najvažnijih izazova sa kojima se suočavaju sve svetske ekonomije. Cilj ovog rada je da se ispita dugoročna veza između javnog duga i odabranih ekonomskih varijabli u Republici Srbiji koristeći autoregressive distributed lag (ARDL) pristup. Empirijska analiza sprovedena na osnovu godišnjih podataka u periodu od 2000. do 2019. godine obuhvata pored učešća javnog duga u bruto domaćem proizvodu, kao zavisne promenljive, 6 izabranih ekonomskih indikatora, koji su u modelu uključeni kao nezavisne promenljive. Dobijeni rezultati ukazuju da ekonomski rast i učešće bruto investicija u stalna sredstva u bruto domaćem proizvodu imaju statistički značajan negativan dugoročni efekat na javni dug, dok učešće izdataka za krajnju potrošnju vlade u bruto domaćem proizvodu i učešće izvoza i uvoz roba i usluga u bruto domaćem proizvodu, imaju statistički značajan dugoročni pozitivan efekat na javni dug. Procenjeni dugoročni koeficijenti vezani za pokazatelje inflacije i nezaposlenosti imaju očekivani predznak, ali nisu statistički značajni. Rezultati ove studije mogu biti od značaja kreatorima politika prilikom definisanja aktivnosti usmerenih na uspostavljanje stabilnosti javnog duga i postizanja dugoročno održivih ekonomskih rezultata.

Ključne reči: *javni dug, ekonomski rast, ARDL pristup, model korekcije greške*

Introduction

Public debt is one of the most important indicators of financial and economic weakness of countries. In general, there is a growing tendency of countries to borrow money at a limited level. Simultaneously, a large number of factors can affect excessive public debt growth in relation to economic growth. The most significant example of this claim is the 2008 economic crisis, when several European countries had a significant increase in the public debt-to-GDP ratio [17, pp. 111-124].

A lot of countries are facing a public debt crisis, leading to a great deal of debate regarding its causes and consequences. At the same time, there is a need for greater fiscal constraints and greater efforts regarding fiscal consolidation based on the main model of the economic policy of the European Union [34, pp. 81-97].

Public debt in the Republic of Serbia reached a peak of 76 % of GDP in 2015, after which it declined due to fiscal adjustment and fiscal discipline. By the end of 2018, public debt amounted to 54.4 % of GDP, and in the report of the International Monetary Fund [21, p. 65] it is underlined that fiscal primary surplus as well as economic growth were the main reasons for this decrease.

According to the data from 2017, the largest part of the public debt was denominated in euros with a share of 41.5%, followed by the most traded currency the US dollar with 30.8%, the dinar with 22%. The rest of the debt comprised special drawing rights with 3.3% and other currencies with 2.4%. The interest rate on the 79.0% of Serbia public debt is fixed; whereas 20.7% is for the variable interest rate. As much as 74.4% of the total public debt with variable interest rates relates to EUROBOR and LIBOR per euro. [42, p. 45].

The paper aims to analyse the impact of GDP per capita growth (annual %), gross fixed capital formation (% of GDP), trade openness (% of GDP), general government final consumption expenditure (% of GDP), inflation, consumer prices (annual %), unemployment, total (% of total labour force) on Serbia total public debt (% of GDP).

After the introductory part we will give an overview of the literature which presents the researches on the relationship between the selected economic variables and public debt in developed and underdeveloped countries. Afterwards, we will focus on the description of the methodology used to examine the long-term relationship between public debt, economic growth and the selected economic variables in the Republic of Serbia, which is one of the main aims of this paper. The paper uses the data published by the World Bank. The following part of the paper presents the results of the application of the autoregressive distributed lag (ARDL) method. In the final part of the paper, the results are analyzed both from the theoretical and practical aspects and the proposal of possible future researches was given. Our research can be immensely important for policy makers and all employees in the competent authorities of the Republic of Serbia.

Literature review

One of the key goals of underdeveloped and transition economies is to achieve high and sustainable economic growth. Given the pandemic that all countries worldwide have been facing for the last two years, there is a tendency of increased domestic and external borrowing, which significantly affects public debt growth. So far, a large number of studies have pointed to a linear relationship between economic growth and public debt, proving that this relationship can be positive, negative, and insignificant.

The research by Gargouri & Xanthini [17, pp. 111-124] was conducted on a sample of twelve European countries and indicated a statistically significant and negative impact of GDP on public debt, and a statistically significant and positive impact of imports on public debt. Emphasizing the importance of the export-led growth hypothesis [16, pp. 46-65], it is pointed to the existence of a one-way causality from exports to economic growth, as well as from exports and economic growth to public debt, with exports being a significant factor for economic development. The export-led growth hypothesis, suggesting that real export growth affects economic growth, cannot be rejected by the research conducted by Cetintas, and Barisik [14, pp. 636–649] and Santos, Ribeiro, and Carvalho [37, pp. 1-31]. The results of this research indicate a positive and significant impact of exports on economic growth, with exports directly and indirectly affecting public debt through economic

growth. The research by Bernardin, Fiagbe, and Quartey [7, pp. 61-69] indicates a positive and significant impact of exports on economic growth and an indirect effect on public debt reduction.

Analysing the impact of certain macroeconomic determinants on the indebtedness of Ethiopia, Beyene & Kotosz [8, pp. 313-332] indicate that in the long run the savings-investment gap, trade deficit, fiscal deficit, and debt service will have a positive and significant impact on external indebtedness. Moreover, the obtained results prove that the growth rate of gross domestic product, trade openness, and inflation have a negative and statistically significant impact on Ethiopia's indebtedness. A similar study in Ethiopia was conducted by Mulugeta [28, pp. 1-28] proving that per capita GDP growth has a positive and significant impact on indebtedness. Per capita GDP growth also has a significant short-term and long-term impact on debt growth, while openness and infrastructure development have a significant and negative impact on indebtedness. The research conducted in Turkey by Özat [32, pp. 134-143] shows that the impact of interest rates, savings, exchange rates and budget deficits have a statistically significant impact on Turkey's indebtedness in the short and long run.

Jordan Al-Fawwaz [2, pp. 116-123] proves that the variables trade openness, term of trade, exchange rate have a positive and statistically significant impact on indebtedness, while gross domestic product per capita has a significant and negative impact on indebtedness of Jordan. The empirical results conducted by Abdullahi, Bakar, & Hassan [1, pp. 745-752] in Nigeria prove that exchange rate, interest rate, saving and budget deficit can affect indebtedness significantly. The research conducted by Azolibe [4, pp. 1-16] on a sample of 39 extremely poor countries, proves that high rate of corruption, high dependence on foreign aids, government expenditure, population growth and unemployment rate significantly and positively affect the increase in indebtedness. Further, external reserves and gross domestic product reduce the indebtedness of extremely poor countries. In a sample of 32 Asian economies in development and transition, Dawood, Baidoo, & Shah [15, pp. 253-263] show that in the short and long run economic growth and investment can affect the reduction of public debt; whereas, exchange rate, trade, and government expenditure affect the growth of public debt. A study conducted by Waheed [41, pp. 234-240] on two samples consisting of 12 countries, exporters of oil and gas and importers of oil and gas, proves that economic growth, foreign exchange reserves, general government revenue, oil prices, and domestic investment significantly reduce indebtedness in the countries exporting oil and gas; while current account deficit, general government expenditure and inflation lead to debt growth. In the countries which import oil and gas, economic growth, general government revenue, and gross domestic savings reduce indebtedness; while the increase in trade deficit, international oil prices, interest payments affect public debt; FDI and domestic investment result in higher external debt in the countries which import oil and gas. A similar study conducted by Waheed & Abbas [41, pp. 1-11] on a sample of ten Islamic countries exporting oil and gas and nine countries importing oil and gas indicate that for Islamic countries which export oil and gas economic growth, central government revenue, FDI, and population have a negative impact on indebtedness; whereas central government expenditure, trade openness, inflation, and current account balance have a positive impact on indebtedness. In Islamic countries that import oil and gas, economic growth, central government revenue, current account balance, domestic investment, and labour force have a negative impact on indebtedness; and FDI and foreign exchange have a positive impact on indebtedness. South African debt is a consequence of slow economic growth and a high level of government infrastructure spending. The analysis conducted by Murwirapachena & Kapingura [29, pp. 138-152] shows that the increase in economic activity and foreign exchange reserves has a significant impact on reducing indebtedness, while the budget deficit and the increase in government infrastructure spending significantly increase the indebtedness of South Africa. In the countries of the European Economic and Monetary Union (EMU), Pjanić, et al. [36, pp. 3562–3579] prove that inflow of foreign direct investment and domestic credits to the private sector have a statistically significant and negative impact on public debt, while domestic credits by the financial sector and unemployment have a positive impact

on public debt. In the countries that are not the members of the EMU, gross domestic savings and unemployment have a statistically significant and negative impact on public debt, while interest rates have a significant and positive impact on public debt.

An empirical study conducted by Knapkova, Kiaba & Hudec [24, pp. 734-753] indicates that GDP growth has a positive effect on public debt, where there is a negative relationship between GDP growth and public debt growth, the unemployment rate negatively affects public debt.

The results of the previous researches served us as a basis for the selection of the variables and the initial hypothesis from which we started our research, as well as for making conclusions regarding the effect of the selected variables on the public debt of Serbia.

Methodology and data

As previously emphasized, the aim of the paper is to examine the impact of GDP growth rate and the selected variables on Serbia public debt. While selecting the variables, we focused on previous theoretical and practical researches in this area, including the research by Dawood et al. [15, pp. 253-263]. In their research, these authors used total external debt to gross domestic product as the dependent variable and 6 independent variables: real gross domestic product per capita, exchange rate, gross fixed capital formation as a share of gross domestic product, sum of exports and imports of goods and services measured as a share of gross domestic product, inflation, and general government final consumption expenditure as a share of gross domestic product. In our paper, instead of total external debt to gross domestic product as the dependent variable we used total public debt to gross domestic product. As an independent variable we included unemployment rate which was used in the research by Pjanić et al. [36, pp. 3562-3579], and we did not include dinar as a national currency (RSD) to American dollar (USD) exchange rate, because the results of the VIF test conducted by using *Stata 13 software package* were 11.95, pointing to the problem of multicollinearity.

The presentation of the influence of the selected indicators on Serbia public debt is based on the annual statistics by the World Bank taking into account the period 2000-2019.

Graph 1 illustrates the movement of public debt in % of gross domestic product and annual GDP growth rate for the period from 2000 to 2019. Until the global financial crisis there was gradual downward trend of public debt; however, there was an increase followed by a more moderate decline starting from 2009 until 2015. The financial crisis had a negative impact on the annual GDP growth rate (the most significant decline was recorded in 2009) as well as on the other selected variables (Graph 2).

The research is based on the following hypotheses:

$H_0$1: There is a negative long-run relationship between economic growth and public debt.

$H_0$2: There is a negative long-run relationship between gross fixed capital formation and public debt.

$H_0$3: There is a positive long-run relationship between trade openness and public debt.

$H_0$4: There is a positive long-run relationship between general government final consumption expenditure and public debt.

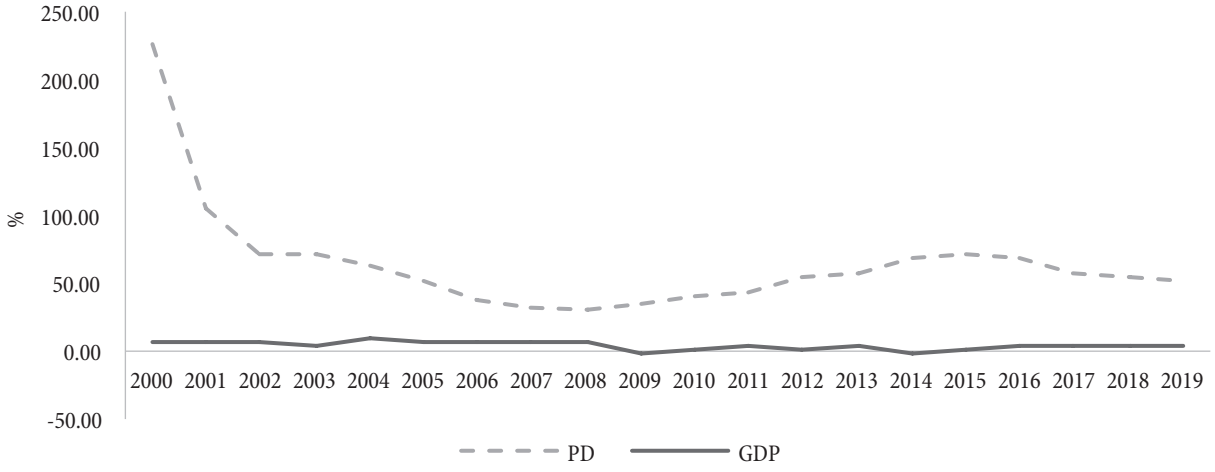
$H_0$5: There is a negative long-run relationship between inflation and public debt.

Table 1: Description of the researched variables

Variable name	Notation	Role of variable
Public debt, total (% of GDP)	PD	dependent
GDP per capita growth (annual %)	GDP	independent
Gross fixed capital formation (% of GDP)	GFCF	independent
Trade openness (% of GDP)	TO	independent
General government final consumption expenditure (% of GDP)	GEX	independent
Inflation, consumer prices (annual %)	INF	independent
Unemployment, total (% of total labour force)	UNE	independent

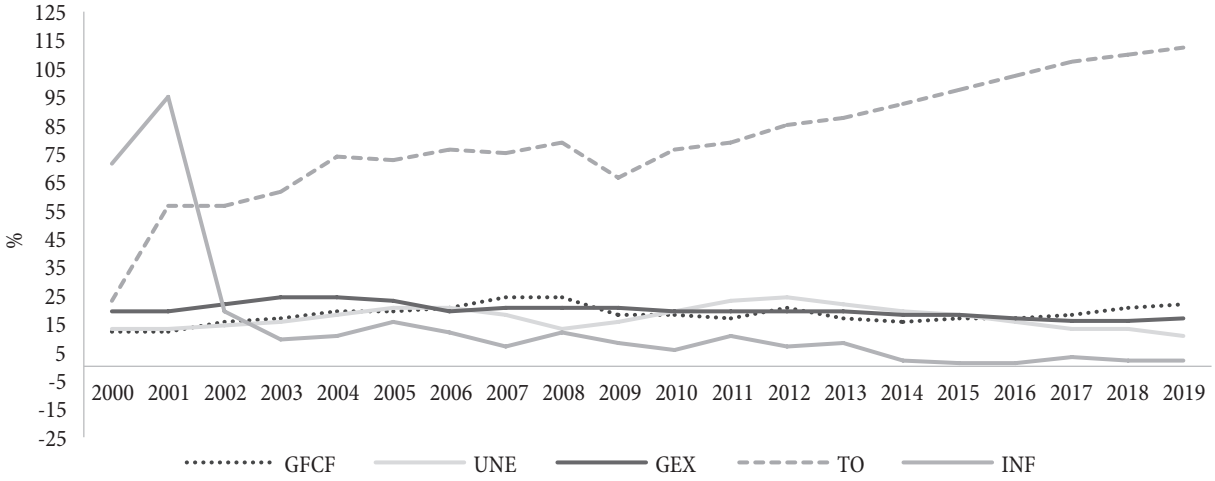
Source: [39].

Graph 1. Movement of PD and GDP in the period 2000-2019



Source: [39].

Graph 2. Movement of the GFCF, UNE, GEX, TO and INF in the period 2000-2019



Source: [39].

$H_0$6: There is a positive long-run relationship between unemployment and public debt.

In order to analyse the presence of a long-term relationship between public debt and economic growth, we are going to use the autoregressive distributed lag (ARDL) method which was used in our research as well as in the following researches: [1, pp. 745 – 752], [2, pp. 116-123], [3, pp. 270–287], [8, pp. 313-332], [28, pp. 1-28], [32, pp. 134–143].

The logarithmic transformation of the used variables was conducted as in the previous paper, since all the negative values were corrected ba adding the constant M as explained in Mickey et al.[26, p. 448].

The autoregressive distributed lag (ARDL) method is applicable in the cases where the variables are integrated of order 0 -I (0) or order 1- I (1); however, it is not applicable in the cases where the variables are integrated of order 2 or higher [30, pp. 1-3]. Prior to analysing the presence of a long-term relationship between public debt and economic growth, it is necessary to examine stationarity. [20, pp. 814-820].

The testing of the presence of a long-term relationship between the variables on the basis of the bounds test is suggested by Pesaran, Shin, and Smith [35, pp. 289-326]. After determining the existence of a long-term relationship between the observed variables, the long-run and short-run coefficients are evaluated. The abovementioned methodology was also used in the paper Mitrašević et al. [27, pp. 395–420] which dealt with the relationship between insurance market and economic growth in the European Union.

The existence of serial correlation is going to be examined when applying the Breusch-Godfrey LM test [11, pp. 334-355; 18, pp. 1303-1310].

Likewise, the Jarque-Bera normality test [22, pp. 255–259] and the Breusch-Pagan-Godfrey heteroscedasticity test [19, pp. 227–236], [12, pp. 1287–1294] were performed.

To use this methodology, the software package EViews v. 10.0 and Stata 13 were applied.

Empirical results

Testing for Multicollinearity

In the first stage of our analysis, we check the presence of multicollinearity among independent variables. The results of the VIF test (Table 2) show that there is no problem of multicollinearity following the proposed rule of thumb in literature [40, p. 132].

Table 2. VIF test results

Variable	VIF
logGDP	1.75
logINF	3.92
logTO	3.87
logGEX	2.17
logGFCF	1.93
logUNE	1.73

Source: Authors' calculation using Stata 13 software package.

Unit roots tests

After establishing that there is no problem of multicollinearity, we are going to test the time series of the selected variables for the existence of a unit root by using Augmented Dickey Fuller (1979) tests, starting from the null hypothesis that the observed variable contains a unit root. If the p-values of the used tests are less than the selected significance level (10%, 5% and 1%), the null hypothesis can be rejected and it can be concluded that the observed series is stationary. During the implementation, we used Automatic lag length selection based on Akaike Information Criterion (AIC). The aim of conducting this test is to determine the level of integration of the variables, because the Autoregressive distributed lag (ARDL) method is not applicable in the cases when the order of the integration of variables is greater than one.

Table 3: The results of Augmented Dickey Fuller (ADF) tests

Variable	Models	t-Statistic	
		At Level	At 1st difference
logPD	Intercept	-2.704416*	
	Intercept and trend	-1.708110	-1.320390*
	No intercept and trend	0.432448	-1.330132*
logGDP	Intercept	-2.312635	-4.124888***
	Intercept and trend	-2.328636	-4.140240**
	No intercept and trend	-0.968354	-4.249177***
logINF	Intercept	-1.796899	-4.825545***
	Intercept and trend	-2.937907	-4.918745***
	No intercept and trend	-2.086398**	
logTO	Intercept	-1.373035	-13.05296***
	Intercept and trend	-2.059957	-12.01020***
	No intercept and trend	2.243169	-3.598643***
logGEX	Intercept	-0.692968	-4.377095***
	Intercept and trend	-5.688659***	
	No intercept and trend	-2.276337**	
logGFCF	Intercept	-2.482400	-3.267536**
	Intercept and trend	-1.939313	-3.244814*
	No intercept and trend	1.092867	-3.121550***
logUNE	Intercept	-1.978637	-3.661504**
	Intercept and trend	-1.668388	-3.463302**
	No intercept and trend	-0.513021	-3.957834***

Note *, **, and *** indicate significance at 10%, 5%, and 1%
Source: Authors' calculation using software package EViews v. 10.0

The results show that the time series are integrated of order 0 and 1, where the results of the conducted test also depend on whether we include a constant or a linear trend in the model or we choose not to include any of them. Since the results show that we have a combination of variables I(0) and I(1), this allows us to apply the ARDL approach to analyse the long-run relationship between public debt and economic growth.

ARDL Bounds tests for cointegration

The initial stage of the ARDL approach indicates the presence of the long-term relationship between the observed variables [35, pp. 289-326]. The null hypothesis states that there is no cointegration relationship between the examined variables, regardless of whether they are

explanatory variables pure I(0) or I(1). If the calculated F statistic exceeds the lower and upper limit of the critical values, the null hypothesis is rejected. Based on the above criteria, using the selected variables, we create a model with a restricted constant and no trend which will be analysed in the following part of the paper.

The results prove the presence of cointegration between the variables (F-statistic exceeds the upper limit at all significance levels: 10%, 5%, 2.5%, and 1%); therefore, the evaluation of long-run and short-run coefficients could be performed.

Table 5 depicts the ARDL regression results. To evaluate the optimal number of lags for each variable, the Akaike Information Criterion is applied (maximum lag length=1) When determining the maximum lag length of an estimated model, the leg length at which no autocorrelation can be found is taken into account. The optimal number of lags for the variables in the selected ARDL model is (1, 0, 0, 0, 1, 0, 0).

The value of Jarque-Bera Test shows that we cannot reject the hypothesis that the residuals are normally distributed. The residual diagnostic test displays that there is no serial correlation (Breusch-Godfrey Serial Correlation LM Test - lag 1) and heteroskedasticity (Heteroskedasticity Test: Breusch-Pagan-Godfrey) in the residuals. The values of the long-run coefficients are displayed in Table 6.

Our results show that GDP per capita growth (annual %) and gross fixed capital formation (% of GDP) have a statistically significant negative long-term effect on public debt, i.e. there is interdependence between these variables, which is negative and long-term, while inflation also has a negative impact and it is not statistically significant. Trade openness (% of GDP) and general government final consumption expenditure (% of GDP) show a statistically

Table 4. Bounds testing for cointegration

F-statistic	Significance level	Bounds test critical values	
		I(0)	I(1)
31.77191	10%	1.99	2.94
	5%	2.27	3.28
	2.5%	2.55	3.61
	1%	2.88	3.99

Source: Authors' calculation using software package EViews v. 10.0

Table 5. The results regarding ARDL regression

Variable	Coefficient (Std. Error)
logPD(-1)	0.697259*** (0.084219)
logGDP	-0.127207*** (0.038588)
logINF	-0.039907 (0.031102)
logTO	0.759169*** (0.234908)
logGEX	1.745686*** (0.360089)
logGEX(-1)	-0.654204** (0.319921)
logGFCF	-0.482393** (0.237247)
logUNE	0.039926 (0.104095)
C	-3.887792** (1.661979)
Adjusted R-squared	0.962737
Jarque-Bera Test	0.275875 [0.871153]
Breusch-Godfrey Serial Correlation LM Test	1.899150 [0.2015]
Heteroskedasticity Test: Breusch-Pagan-Godfrey	0.502332 [0.8294]

Note *, **, and *** indicate significance at 10%, 5%, and 1%. The p-values are given in square braces
Source: Authors' calculation using software package EViews v. 10.0

Table 6. Estimated Long-run Coefficients Using the ARDL Approach

Variable	Coefficient
logGDP	-0.420185* (0.222520)
logINF	-0.131818 (0.114317)
logTO	2.507655** (0.918604)
logGEX	3.605340** (1.358659)
logGFCF	-1.593420*** (0.458671)
logUNE	0.131883 (0.355791)
C	-12.84200* (7.651875)

Note *, **, and *** indicate significance at 10%, 5%, and 1%
Source: Authors 'calculation using software package EViews v. 10.0

significant positive long-term effect on public debt. The results indicate that unemployment rate has an impact on the increase in public debt, but estimated long-run coefficients are not statistically significant.

After estimating the long-run coefficients, the next steps in the ARDL approach are error correction analysis and the estimation of short-run coefficients.

The following table (Table 7) shows the ARDL Error Correction Model (ARDL ECM). The model estimates the rate at which the dependent variable returns to long-term equilibrium after a change in other variables, and is based on the fact that the deviation from the last period of long-term equilibrium affects its short-term dynamics.

Table 7. Error-correction representation of the selected ARDL

Variable	Coefficient
C	-3.887792*** (0.201434)
D(GEX)	1.745686*** (0.225795)
CointEq(-1)*	-0.302741*** (0.015989)

Note *, **, and *** indicate significance at 10%, 5%, and 1%
Source: Authors' calculation using software package EViews v. 10.0

It should be emphasized that the coefficients with first difference variable indicate short-run coefficients.

Following part of the paper presents the aforementioned obtained results.

Discussion and concluding remarks

The main goal of this study was to examine the determinants of Serbia public debt in the period from 2000 to 2019 by employing the ARDL cointegration approach.

Our results of the long-run coefficients assessment using the ARDL approach indicate that we cannot reject H01 and that economic growth expressed as the indicator of GDP per capita growth (annual %) can affect the decrease in public debt. The results which outline the importance of the impact of economic growth on the decrease of the total public debt are in line with the economic theory. Murwirapachena & Kapingura [29, pp.138–152], Bittencourt [10, pp. 463-472], Al-Fawwaz [2, pp. 116-123], Gargouri & Xanthini [17, pp. 111-124], and Azolibe [4, pp. 249-264] prove that an increase in GDP reduces external debt, while the research of Mulugeta [27, pp. 1-28] proves that economic growth increases public debt.

Further, our results show that gross fixed capital formation can affect the decrease in public debt meaning that we cannot reject H02. Waheed [6, pp. 234-240] states the same when it comes to the exporters of oil and gas, while with the countries which import oil and gas the investment affects public debt positively.

Our results indicate that inflation has a negative long-run coefficient, and it is not statistically significant. Bittencourt [10, pp. 463-472] also proves that inflation can affect the decrease in public debt, while Waheed & Abbas [41] state that inflation affects the increase in public debt.

The values of the long-term coefficient show that the growth of the unemployment rate has an impact on the growth of public debt; however, this impact is not statistically significant. Azolibe [4, pp. 249-264] states that this relationship is confirmed in economic theory, since in the conditions of high unemployment, governments are additionally indebted in order to invest in the projects that can provide additional jobs. Similarly, Pjanić et al. [36, pp. 3562-3579] prove that the unemployment rate has positive impact on public debt in the case of members and non-members of the EMU, and out of the selected 12 economic indicators only unemployment is statistically significant predictor of public debt in both groups of countries. Bearing in mind that EU countries are experiencing unemployment issue as their urgent problem, noticed by Marelli & Signorelli, [25, pp. 5–56], it is considered that the debt crisis will finish when unemployment rate gets to the level before the emergence of the crisis. [36, pp. 3562-3579].

Trade openness and general government final consumption expenditure show statistically significant impact on the growth of public debt, meaning that we cannot reject H03 and H04.

The impact of trade openness on the growth of public debt is also proved by Al-Fawwaz [2, pp. 116-123] and Waheed & Abbas [41]. On the other hand, Bittencourt [10, pp. 463-472], and Mulugeta [28, pp. 1-28] show that trade openness can affect the decrease in public debt.

The fact that central government expenditure can affect the increase in public debt due to budget deficits is proved by Waheed & Abbas [41] and Dawood [15, pp. 253-263], who propose an increase in tax revenues generated by additional increases in employment resulting from government investment in productive sectors as a measure to reduce excessive public debt.

When we look at the short-term coefficients obtained by using the ARDL error correction model shown in Table 7, we can conclude that general government final consumption expenditure also has the positive influence on public debt. This can result from additional borrowing of the government when it wants to cover excessive expenditure.

The value of Error correction coefficient (CointEq (-1)) shows that 30% of the short-term deviation of public debt variable from their long-term is left out on annual basis, and that it takes more than three years to achieve the balance. Therefore, policy makers ought to consider the stabilization of the selected factors whose influence we examined in this paper. Future researches should focus on examining the effects of economic crisis on Serbia public debt.

References

1. Abdullahi, M. M., Bakar, N. A. B. A., & Hassan, S. B. (2015). Determining the Macroeconomic Factors of External Debt Accumulation in Nigeria: An ARDL Bound Test Approach. Procedia - Social and Behavioral Sciences, 211, pp. 745–752. https://doi.org/10.1016/j.sbspro.2015.11.098.
2. Al-Fawwaz, T. M. (2016). Determinants of External Debt in Jordan: An Empirical Study (1990-2014), International Business Research, Canadian Center of Science and Education, vol. 9(7), pp. 116-123.
3. Asteriou, D., Pilbeam, K., & Pratiwi, C.E. (2021). Public Debt and Economic Growth: Panel Data Evidence for Asian countries. J Econ Finan 45, https://doi.org/10.1007/s12197-020-09515-7, 270–287.
4. Azolibe, C.B. (2021). Determinants of External Indebtedness in Heavily Indebted Poor Countries: What Macroeconomic and Socio-Economic Factors Matter? The American Economist, Sage Publications, vol. 66(2), pp. 249-264, https://doi.org/10.1177/0569434520938326
5. Barro, R. J. (1979). On the Determination of the Public Debt. The Journal of Political Economy, 87(5), http://dx.doi.org/10.1086/260807, 940-971.
6. Waheed, A. (2017). Determinants of External Debt: A Panel Data Analysis for Oil and Gas Exporting and Importing Countries, International Journal of Economics and Financial Issues, Econjournals, vol. 7(1), pp. 234-240.
7. Bernardin, S., Fiagbe, A. K., & Quartey, P. (2018). The effect of external debt on economic growth in Sub-Saharan Africa. International Journal of Business and Economic Sciences Applied Research (IJBESAR). Eastern Macedonia and Thrace Institute of Technology. Kavala, Vol. 11, Iss. 1, http://dx.doi.org/10.25103/ijbesar.111.07, 61-69.
8. Beyene, S. D. & Kotosz, B. (2020). Macroeconomic determinants of external indebtedness of Ethiopia: ARDL approach to co-integration, Society and Economy, Akadémiai Kiadó, Hungary, vol. 42(3), pp. 313-332.
9. Bhatta, G., & Mishra, A. (2020). Estimating Optimum Growth-Maximizing Public Debt Threshold for Nepal. NRB Economic Review, 32(2), https://doi.org/10.3126/nrber.v32i2.35298, 1-28.
10. Bittencourt, M. (2015). Determinants of Government and External Debt: Evidence from the Young Democracies of South America, Emerging Markets Finance and Trade, 51:3, pp. 463-472, DOI: 10.1080/1540496X.2015.1025667.
11. Breusch T. S. (1978). Testing for Autocorrelation in Dynamic Linear Models. Australian Economic Papers, 17, pp. 334-355.
12. Breusch, T.S., & Pagan, A.R., (1979). A Simple Test for Heteroscedasticity and Random Coefficient variation. Econometrica 47, pp. 1287–1294.
13. Butkus, M., & Seputiene, J. (2018). Growth Effect of Public Debt: The Role of Government Effectiveness and Trade Balance, Economies, 6 (62), https://doi.org/10.3390/economies6040062, 1-27.
14. Cetintaş, H., & Barisik, S. (2009). Export, Import and Economic Growth: The Case of Transition Economies. Transition Studies Review, 15(4), https://doi.org/10.1007/s11300-008-0043-0, 636–649.
15. Dawood, M., Baidoo, S. T. & Shah, S. M. R. (2021). An empirical investigation into the determinants of external debt in Asian developing and transitioning economies, Development Studies Research, 8:1, pp. 253-263, DOI: 10.1080/21665095.2021.1976658
16. Dritsakis, N., & Stamatiou, P. (2017). Causal Nexus between Government Debt, Exports and Economic Growth for Three Eurozone Countries: A Panel Data Analysis. Journal of Economics and Public Finance, 3(1), https://doi.org/10.22158/jepf.v3n1p47, 46-65.
17. Gargouri, I., & Ksantini, M. (2016). The Determinants of Public Debt. The Romanian Economic Journal, 18(59), pp. 111-124.
18. Godfrey L. G. (1978). Testing for Higher Order Serial Correlation in Regression Equations when the Regressors Include Lagged Dependent Variables. Econometrica, 46, pp. 1303-1310.
19. Godfrey, L.G. (1978). Testing for Multiplicative Heteroscedasticity. Journal of Econometrics 8, pp. 227–236.
20. Gujarati, D.N. (2004) Basic Econometrics. 4th Edition, McGraw-Hill Companies.
21. International Monetary Fund. (2019). Staff report for the 2019 article fourth consultation and second review under the policy coordination instrument—press release; staff report; informational annex; staff statement; and statement by the executive director for Republic of Serbia, IMF Country Report No. 19/238, p. 65.

22. Jarque, C., & Bera, A. (1980). Efficient Tests for Normality Homoscedasticity and Serial Independence of Regression Residuals. Econometric Letters 6, pp. 255–259.
23. Jarque, C., & Bera, A. (1987). A Test for Normality of Observations and Regression Residuals. International Statistical Review 55, http://dx.doi.org/10.2307/1403192, pp.163–172.
24. Knapkova, M., Kiaba, M., & Hudec, S. (2019). Impact of Macroeconomic Indicators on Public Debt of Slovak Republic, 20(4), https://doi.org/10.3846/jbem.2019.10184, pp. 734-753.
25. Marelli, E., & Signorelli, S. (2015). Convergence, crisis and unemployment in Europe: The need for innovative policies. Croatian Economic Survey, 17(2), pp. 5–56. https://doi.org/10.15179/ces.17.2.1
26. Mickey, R., Dunn, O., & Clark, V. (2004). Applied Statistics: Analysis of Variance and Regression. John Willey & Sons.
27. Mitrašević, M., &Pjanić, M.,&Novovic Burić, M. (2022). Relationship bet ween insurance market and economic growth in the European Union, Politická ekonomie, 70 (4), pp. 395–420. https://doi.org/ 10.18267/j.polek.1358.
28. Mulugeta, E. T. (2021), Macroeconomic Determinants of External Debt Accumulation in Ethiopia: An ARDL Bound Testing Approach. African Journal of Economics and Sustainable Development 4(2), pp. 1-28. DOI: 10.52589/AJESD-5CHIK2TR
29. Murwirapachena, G., & Kapingura, F.M. (2015). Determinants of external debt in South Africa: a VAR-based approach', Int. J. Economic Policy in Emerging Economies, Vol. 8, No. 2, pp.138–152.
30. Nkoro, E., & Uko, A. K. (2016). Autoregressive Distributed Lag (ARDL) Cointegration Technique: Application and Interpretation. Journal of Statistical and Econometric Methods. SCIENPRESS Ltd, vol. 5(4), 1-3.
31. Özata, E. (2017). Determinants of external debt accumulation in Turkey: Evidence from an ARDL bound test approach. Journal of Business & Economic Policy, 4(4), pp. 134–143.
32. Panizza, U. & Presbitero, A. F. (2014). Public debt and economic growth: Is there a causal effect? Journal of Macroeconomics, Elsevier, vol. 41(C), 21-41.
33. Pečarić, M., Slišković, V., & Kusanović, T. (2018). Public Debt in New EU Member States – Panel Data Analysis and Managerial Implications. Management, 23(1), pp. 81-97. DOI: 10.30924/mjcmi/2018.23.2.81,
34. Pesaran, M.H., Shin, Y., & Smith, R. (2001). Bounds Testing Approaches to the Analysis of Level Relationships. Journal of Applied Econometrics, 16, https://doi.org/10.1002/jae.616, 289-326.
35. Pjanić, M., Milenković, N., Andrašić, J., Kalaš B. & Mirović V. (2020). Public Debt's Predictors in EU: Evidence from Members and Non-members of European Monetary Union. Economic Research-Ekonomska Istraživanja, 33:1, pp. 3562-3579, DOI: 10.1080/1331677X.2020.1776137.
36. Santos, P. G., Ribeiro, A. P., & Carvalho, V. M. (2013). Export-led growth in Europe: Where and What to Export?. FEP Working Papers 479. Universidade do Porto. Faculdade de Economia do Porto, pp. 1-31.
37. Spilioti, S. (2015). The Relationship between the Government Debt and GDP growth: Evidence of the Euro Area Countries, 12(1), pp. 174-178.
38. The World Bank Database. (2020). https://data.worldbank.org/indicator.
39. Verma, J., & Abdel-Salam, A. (2019). Testing statistical assumptions in research. JohnWiley & Sons.
40. Waheed, A. & Abbas, S. (2021). Determinants and Sustainability of External Debt: A Panel Data Analysis for Selected Islamic Countries, MPRA Paper107486, University Library of Munich, Germany.
41. European Commission. (2018). Government of the Republic of Serbia, Economic Reform Programme for the Period 2018-2020.

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