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INTERDEPENDENCE OF FOREIGN TRADE AND THE ECONOMIC GROWTH OF SERBIA

МЕЂУЗАВИСНОСТ СПОЉНЕ ТРГОВИНЕ И ЕКОНОМСКОГ РАСТА СРБИЈЕ

Summary: *From the 1990s to this day, taking into account the increasing volume of international trade around the world, a large number of studies have emerged with the relationship between economic growth and foreign trade as their research subject. Most of these studies have shown that trade liberalization positively correlates with economic growth and productivity growth in developing countries. The aim of this research is to determine the interdependence between the changes of the gross domestic product and the foreign trade of Serbia in the period from 2000 to 2019. A vector autoregressive (VAR) econometric model and a vector model with error correction (VECM) were used in the research. Additionally, the paper tested the causality between the observed variables, performed an innovative analysis, together with an analysis of the variance decomposition. The results of the research showed the existence of a long-term connection between the changes in the share of imports and exports in the GDP and the development of the GDP in Serbia. In the long run, the share of imports correlates negatively with the GDP, while the share of exports positively correlates with GDP trends.*
Keywords: *international trade, foreign trade, economic growth, GDP, exports, imports, VAR, VECM VAR (Vector Autoregressive) and VECM (Vector Error Correction Modelling)*
JEL Classification: *B17, O4*

Резиме: *Од 1990-их до данас, узимајући у обзир све већи обим међународне трговине широм свијета, појавио се велики број студија са односом економског раста и спољне трговине као предметом истраживања. Већина ових истраживања је показала да либерализација трговине позитивно корелира са економским растом и растом продуктивности у земљама у развоју. Циљ овог истраживања је да се утврди међузависност промјена бруто домаћег производа и спољнотрговинске размјене Србије у периоду од 2000. до 2019. године. Приликом истраживања коришћени су векторски ауторегресивни (ВАР) економетријски модел и векторски модел са корекцијом грешке (ВЕЦМ). Поред тога, у раду је тестирана узрочност између посматраних варијабли, извршена је иновативна анализа, заједно са анализом декомпозиције варијансе. Резултати истраживања су показали постојање дугорочне везе између промјене учешћа увоза и извоза у БДП-у и развоја БДП-а Србије. Дугорочно гледано, учешће увоза је у негативној корелацији са БДП-ом, док је учешће извоза у позитивној корелацији са кретањима БДП-а.*
Кључне ријечи: *међународна трговина, спољна трговина, економски раст, БДП, извоз, увоз, ВАР, ВЕЦМ ВАР (Векторска ауторегресија) и ВЕЦМ (Векторски модел са корекцијом грешке)*
ЈЕЛ касификација: *B17, O4*

INTRODUCTION

The 1990s saw the appearance of various studies on the impact of international trade on economic growth. The reason for this can be found in the increased volume of international trade after 1980. During this period, international trade grew faster than production (Krugman and Obstfeld 2009). According to the World Trade Organization (WTO), the total trade from 1948 was equivalent to only 0.31% of the 2019 trade, while the 1978 trade was equal to 6.90% of the total 2019 trade. The rapid increase in international trade through the 1980s is reflected in the fact that the total trade in 1988 compared to the trade in 2019 was 15.15%. Also, the international exchange in 1998 amounted to 29.06% of the 2019 exchange, while the 2008 exchange amounted to as much as 85.40% of the 2019 exchange. This represents the largest increase concerning the total exchange 10 years prior. In other words, the total exchange in 1998 amounted to over 50%, while the exchange from 1998 and 2008 is similar to 2019.

Observing those trends, it is not necessary to look for other reasons why modern studies consider the effects of international trade on the global, but also on national economies, in which the presence and importance of foreign trade are more and more pronounced. These processes were undoubtedly made possible by the effects of globalization. They are reflected in the greater integration

of markets, people and information, with these effects being more visible in some countries than others, which is why they have become leaders in the overall world trade. According to the data on the level of imports and exports for 2019, the main participants in world trade are China, the USA, Germany, the Netherlands, Japan, France, Italy, Russia, India and Brazil. These participants are the primary bearers of world trade, primarily due to the size of their country, population and available resources, which all significantly affects the structure of foreign exchange. The foreign trade of these countries in 2019 amounted to 51% of the total world trade (Krajišnik and Gojković 2021). In addition to the specifics of these countries, each of them has a competitive advantage in specific trade areas, whether it is sophisticated technology, natural resources, cheap goods (primarily in China) or consumer goods. The importance of foreign trade for countries with no large share in total world trade is also the subject of various studies. Even though the significance of the world economy depends on the changes in its bearers, the shifts in foreign trade in individual countries are also of great importance for the movement of other macroeconomic variables in these economies.

This paper aims to determine the interdependence between the gross domestic product growth and the share of exports and imports in the GDP of Serbia. The research covers the time frame from 2000 to 2019. The paper analyses the interdependence of the observed variables based on the VAR econometric model. The paper subject is the research of the causal connection between these three observed variables, while the additional analysis on the movement of significant foreign trade indicators of the Serbian economy tries to present their significance in the given period.

1. LITERATURE REVIEW

From Adam Smith's discussion on specialization and market size, through debates about the advantages and disadvantages of import substitution and export-oriented growth, to works on technological progress, remarkable efforts have been made to discover the nature of trade and growth (Nikolić 2005). From mercantilism, through the classical economic school, historical school, neoclassical school and representatives of protectionist measures and free international exchange, there is an ongoing debate about the importance of international exchange for the economic growth of the state, as well as the role of the state in regulating international trade.

Because the process of globalization is intensifying, or rather, because of the integration of the world economy, there are more and more theoretical reasons that speak in favour of open economies growing faster than closed ones (Snowdow and Vane 2005). When researching the impact of trade on economic growth, as a measure of the openness of the country to trade, most studies in the field of international economics take into account the ratio of total foreign trade and the gross domestic product, the ratio of exports and GDP, imports and GDP and the coverage of imports through exports. However, based on these indicators, the extent of an economy's openness to international trade cannot be fully expressed. These indicators measure openness to trade but not the non-tariff barriers that countries apply (Yanikkaya 2003). Non-tariff barriers are vastly replacing traditional customs barriers. This type of protection of the domestic economy from foreign competition is called "new protectionism". Global Trade Alert publishes annual reports on trade barriers implemented by certain countries, as well as the types of barriers affecting trade partners in international trade. Such reports measure the number of non-tariff barriers that a country applies in international trade, without measuring the degree of their application (Baldwin 2003).

Lucas (1988) believes that removing all trade barriers can cause a series of increases in output, i.e. economic growth. Sachs and Werner (1997) state that, in the long run, free international trade is a source of economic growth. Trade liberalization has led to an expansion in global production and the surge of industrial firms' business activities in the industrialized world (Helleiner 1995). The more open the world economy is, the less important a country’s market is as a factor in its economic growth (Alesina and Spolaore 2003). The experiences of East Asian countries clearly suggest that industrialization can be achieved without relying on the domestic market (Krueger 1997). External orientation and good export performance can significantly contribute to economic growth (Ram, 1987). The way East Asian countries achieved a remarkable leap in economic growth through exports has been accepted in the literature as a strategy of export orientation or open economy. This strategy is based on the concept that international trade is an incredibly powerful generator of economic growth, production and income (Dragutinović, Filipovi, and Cvetanović 2015). Ekenayake (1999) investigated the causal link between the exports increase and economic growth in eight East Asian countries from

1960 to 1997. The survey showed a causal link between economic growth and short-term export growth, except in the case of Sri Lanka.

Countries that base their economic growth on export orientation or an open economy strategy rely heavily on their comparative advantages. World wealth will increase when each country exports products for which comparative costs are lower "at home" than abroad and imports products that comparatively cost more "at home" than abroad *(*Nafziger 2006*)*. However, as proven in a large number of papers, the more open an economy is the greater its benefits from international exchange are, and also the greater the exposure to disturbances that occur in the world economy (*Babić 2003*). Research conducted by *Keppel and Wörz* (2010) has revealed a strong link between export-oriented economies and their economic growth, especially from the production structure aspect. At the same time, this research has shown that more open economies are more susceptible to disturbances occurring during a crisis.

What characterizes the modern world is the unstoppable process of globalization, which connects people through the exchange of information and freedom of movement in the capital market, goods and services market, labour market, and financial market. This process combines domestic and international markets into one complex whole, which allows all entities to access the market, regardless of their country of origin or economic region. At the same time, this creates the possibility of feedback between the world market and the entities that exist in it (Bozyk 2006). Such relations allow open-to-trade countries to have greater opportunities to catch up with those that are more technologically advanced.

Romer (1990, 1993, and 1994) argued that openness to the world has several beneficial effects from investing in the research and development of other countries, which is considered an essential role for trade. Winters (2004) points out that imports stimulate productivity growth through the technological improvements they contain, which induces lasting improvements in growth. International trade and investing in research and development stimulate productivity growth, have a positive effect on economic growth and provide access to technological knowledge of other countries (Roe and Mohtadi, 2001). Developing and underdeveloped countries do not only get direct effects through technology transfer, but also indirect ones, through improved exchange conditions (Krugman 1979).

Researchers in more advanced countries make efforts to invent intermediate products and use them for the production of final goods to act as monopolists. Agents from countries that do not invest in research and development imitate and adapt products from advanced countries. Usually, the costs of adaptation and imitation are lower than RandD costs but have a similar effect (Barro and Sala-i-Martin 2004).

Edwards (1998) investigated the impact of trade on productivity in 93 countries employing the panel analysis. He used a simple equation in his research, where the total production in the country depends on the capital *(K)* that the country owns, the labour *(L)* that is available to it and the accessible technology *(A)*, or $Y = Af(K, L)$. The growth of the total production depends on the growth of these three factors. The author states that the growth of technology can be provided from domestic sources, such as innovations related to human capital and international factors, that relate to the rate at which the imitator country absorbs (imitates) the leader country. The rate of change A is defined as:

$$\frac{\dot{A}}{A} = \delta + \theta(W - B)/B \qquad 1)$$

where W is the world stock of knowledge growing at the rate of g; δ is the growth rate of innovation in the observed country, $g \geq \delta$ except for the country that is the world leader in innovation; θ is the speed at which a country adopts the accessible technology. In his research, *Edwards* used data from 93 countries, where he examined the robustness of the relationship between openness and productivity growth in the observed countries. The robustness analysis, conducted in this study, showed the countries that overly open experiencing faster productivity growth.

Krugman (1985) states that technological progress depends on the progress of technology-intensive industries. These are also the export industries of the leader country, so the progress in the leading countries corresponds to a leading country's export, while the import of the less developed country, i.e. the one which imports the products that cannot produce from the leading country, which creates competition within the follower country. Choudhri and Hakura (2000) researched the impact of the international trade structure on overall production and productivity growth in developing countries,

based on Krugman's 1985 model. The research showed that increasing import competition in the industrial sectors of medium growth contributes to the overall productivity growth in the follower countries. Mazumdar (2001) conducted an analysis based on panel data from developing countries, and it showed that investing in domestically produced equipment reduces growth rates, while investing in imported equipment increases them.

Winters et al. (2004) believe that trade liberalization, along with productivity growth, is the best policy in fighting poverty. Frankel and Romer (1999) investigated the link between the openness to trade and living standards. Their findings showed that the 1% growth of the share of trade in GDP contributes to the improvement of living standards by 2%. On the other hand, a study based on the panel analysis model, conducted by Lundberg and Squire (1999), shows that free trade is negatively correlated with the income growth of 40% of the developing countries population. That is, it's also positively correlated with income growth among the middle-class groups and the most affluent groups.

Aside from the research that proves a positive link between openness to trade and economic growth, many studies challenge the positive connection between these variables. *Rodriguez and* Rodrick (2001) do not dispute the fact that trade liberalization while relying on comparative advantages, provides benefits. They argue that integration into the world economy can be a potent force that will contribute to economic growth and point out that it cannot in itself be a substitute for a country's development strategy. Baldwin (2003) states that developing countries should not base their economic policies on removing trade barriers to accelerate economic growth.

Dowrick and Golley (2004) point out that specialization in primary products is bad for economic growth. They also conclude that since 1980 the effects of foreign trade have contributed most to the expansion of prosperous economies. Due to specialization in primary products, developing countries and underdeveloped countries become dependent on the demand for these products in, by rule, rich countries, which import these products. According to *Todaro and Smith* (2006), the percentage increase in demand for primary products will be smaller than the percentage increase in the gross national income of developed countries. As a result of the low elasticity of demand for primary goods, there is a downward trend in their relative price.

Rodrick (1995) states that it is difficult to see the role of export orientation in economic growth, using the example of Korea and Taiwan from the 1960s. He reckons that the profit of these countries, which was constantly increasing at that time, cannot be linked to their exports because exports in the observed period were negligible. In the same study, the authors state that the roles of physical capital, a well-educated workforce, and the state in resource management led to the economic growth of these countries. Numerous proponents of trade liberalization as a generator of economic growth advocated replacing the import substitution strategy with the export-oriented growth strategy. However, as stated by Chernery et al. (1986), there is almost always a period of considerable import substitution before the expansion in exports period.

The connection between economic growth, exports and imports was analysed by Kwame and Dikgang (2020), using the example of the Republic of South Africa in the period from 1960 to 2018. Through their analysis, they showed a sustainable connection between the GDP, exports and imports, in the long run. According to them, long-term exports show a positive impact on economic growth. Research has also shown that long-term exports determine imports to South Africa as well, while exports do not determine short-term economic growth.

Bjelić, Erić and Vujnic (2020) examined the relationship between foreign trade, economic and industrial growth on the example of the Republic of Srpska in the period from 2001 to 2018, applying simple linear regression. In this research, the value of GDP in billions of convertible marks was investigated as an independent variable and the level of exports in billions of convertible marks was stated as an explanatory variable. The results showed that each change in the unit of the explanatory variable leads to an increase in the independent variable of BAM 1.27 billion, with the analysed model having a high level of significance.

Bakari and Mabrouki (2017) analysed the relationship between imports, exports and economic growth, using the example of Panama in the period from 1980 to 2015, employing a VAR model based on annual data for the variables that are the research subjects. By interpreting the data of the applied model, the results presented show no connection between the three observed variables. However, the authors gave several explanations claiming that openness to foreign trade, i.e. exports and imports, is Panama's economic growth predictor. The authors analysed the economic and social situation in Panama, the existence of channels through Panama, the structure of exports and imports, only to link these analyses to economic growth.

Makhmutova and Mustafin (2017) assessed the role of foreign trade in the economies of China, the United States, Russia and Germany, in the period from 2015 to 2016. The authors analysed the significance of the impact of foreign trade on the economy of the observed countries. The results showed that the German economy is most dependent on foreign trade. The United States is described as an open economy, but the author concludes that, in the observed period, the American economy was recovering from the crisis and recession. Similar to the case of the United States, China's economy is not heavily influenced by foreign trade. In the economy of Russia, which suffered the devaluation of the national currency and certain sanctions, a trend of growth and recovery of the economy can be noticed, with the indicators showing reduced dependence on foreign trade.

Uddin and Khanam (2017) investigated the connection between exports, imports and economic growth in Bangladesh from 1981 to 2012. The results showed a constant foreign trade deficit in this economy. Additionally, it has been shown that there is a negative link between imports and GDP, i.e. that there is a positive relationship between exports and GDP. The results also indicate that the relationship between GDP and exports is negative, i.e. that following the analysis performed and the data presented, increasing GDP reduces exports. This study established no significant relationship between imports and exports in Bangladesh's economy in the observed period. In addition to the mentioned variables, government expenditures, inflation and consumption were used as explanatory variables and showcased a positive relationship, except for government consumption, which showed a negative effect on exports.

Tang (2019) explored the combined effects of export structure and economic growth in member states of the European Union from Central and Eastern Europe. The research showed that the export of agricultural products does not contribute to economic growth, while transport equipment, textiles, steel and chemical products accelerate the growth of the observed countries.

2. REVIEW OF SERBIA'S BASIC MACROECONOMIC INDICATORS

The analysis of the relationship between Serbia's foreign trade and the gross domestic product begins with a review of the major macroeconomic indicators of the Serbian economy in the period from 2007 to 2019, which includes the financial crisis from 2008 and the weather disasters in 2014, but also a period marked by Serbia's increased openness to the rest of the world. The fundamental macroeconomic aggregates are analysed here, with particular reference to the gross domestic product, i.e. the actual growth rates, while foreign trade and its importance in the observed period will be analysed below.

2.1. Main macroeconomic indicators of Serbia

The following table (Table 1) provides data on GDP trends, real GDP growth, GDP per capita, investments and savings, unemployment rates and public debt.

Table 1.Movements of main macroeconomic indicators in the Serbian economy for the period from 2007 to 2019

Year	GDP (in billions of dollars)	Real GDP growth (in %)	GDP per capita (in dollars)	GDP per capita (PPP)	Average inflation (in %)	Exchange rate - Serbian dinar in relation to the euro[1]	Exchange rate - Serbian dinar in relation to the US dollar[2]	Public debt to GDP ratio (in %)	Unemployment rate
2007.	43,4	6,4	5878,9	12022,2	6,0	79,2	53,7	31,2	18,8
2008.	52,1	5,7	7087,5	13004,4	12,4	88,6	62,9	30,6	14,4
2009.	45,2	-2,7	6168,2	12796,8	8,1	95,9	66,7	33,9	16,9
2010.	41,4	0,7	5673,6	13093,1	6,1	105,5	79,3	41,2	20,0
2011.	49,3	2,0	6809,9	13742,3	11,1	104,6	80,9	44,0	23,6
2012.	43,3	-0,7	6012,6	13929,2	7,3	113,7	86,2	54,4	24,6
2013.	48,4	2,9	6752,8	14624,1	7,7	114,6	83,1	57,5	23,0
2014.	47,1	-1,6	6598,9	14657,1	2,1	121,0	99,5	67,6	19,9
2015.	39,6	1,8	5585,1	14922,1	1,4	121,6	111,2	71,3	18,2
2016.	40,6	3,3	5756,4	15832,2	1,1	123,5	117,1	68,9	15,9
2017.	44,1	2,0	6284,2	16599,4	3,1	118,5	99,1	58,7	14,1
2018.	50,6	4,4	7246,2	17841,8	2,0	118,2	103,4	54,5	13,3
2019.	51,4	4,2	7382,4	18971,9	1,9	117,6	104,9	52,8	10,9

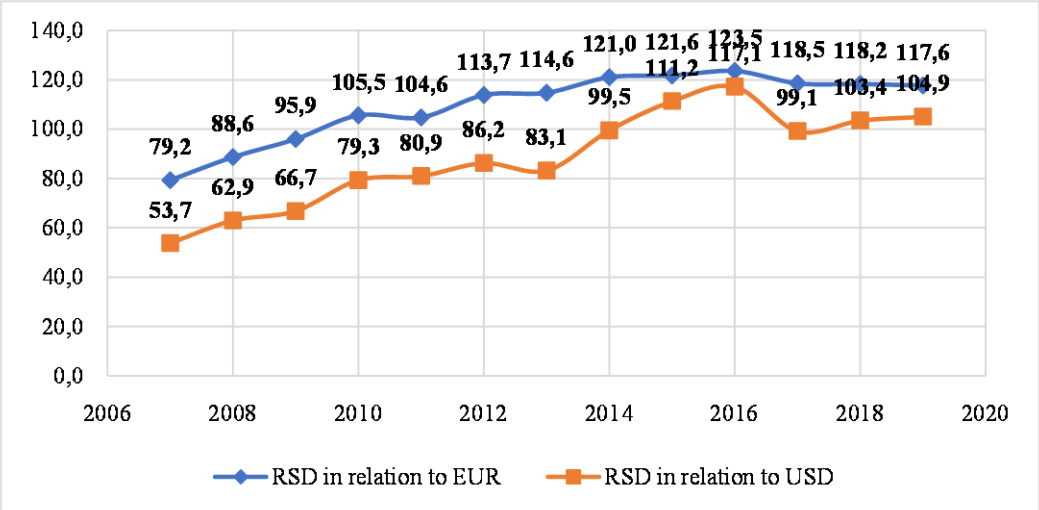
Source: International Monetary Fund 2020

Based on the previously presented data, a positive movement trend of the gross domestic product and GDP *per capita* can be seen. The highest GDP growth rate was achieved in 2007 when the real GDP growth of Serbia was 6.4%, and in 2008, when the real growth was 5.7%. After that, in 2009, there was a negative GDP growth rate, amounting to 2.7%. In the observed period, a significant decline in GDP happened when the negative growth rates of the gross domestic product were 1.6% and 0.7% in 2014 and 2012, respectively. In other years, stable growth is noticeable, ranging from 0.7% in 2010 to 4.4%, the real GDP growth in 2018. This trend meant that the gross domestic product of Serbia surged to another level, from 43.4 billion dollars in 2007 to 51.4 billion dollars in 2019. GDP *per capita* in 2019 was about 7.3 thousand dollars, while the level of GDP *per capita* in 2007 was 5.8 thousand dollars. Furthermore, in the observed period, GDP growth *per capita* was expressed according to the purchasing power parity, which in 2019 amounted to 18.9 thousand, while in 2007 it amounted to about 12 thousand.

Besides GDP, the two most important macroeconomic indicators, inflation and unemployment, moved in different directions in the observed period. The highest inflation rate in the observed period was recorded in 2008 when it amounted to 12.4%. A high inflation rate of 11.1% was also recorded in 2011. A relatively stable level of inflation was recorded from 2014 to 2019 when the inflation rate ranged between 1.1% and 3.1%. In 2019, inflation was 1.9%. When it comes to unemployment, a decline in unemployment can be noticed in the period from 2013 to 2019. In 2013, unemployment rose to about 23% of the total available labour force, while in 2019, it was at approximately 10%. The highest unemployment was recorded in 2014 when it amounted to 24.6%. Significant unemployment rates of 20% and 23.6% can be observed in 2010 and 2011, respectively.

Based on the data from Table 1, the following chart (Chart 1) shows the movement of the Serbian dinar in relation to the euro and the dollar.

Chart 1. Movement of the exchange rate of the Serbian dinar in relation to the euro and the US dollar in the period from 2007 to 2019 (in units of the dinar for one euro, and one dollar)



Source: The National Bank of Serbia 2020

From 2007 to 2016, one can note a significant trend of RSD value weakening in relation to the other two observed currencies. In 2007, the value of one euro was 79.2 dinars, while in the same year, the value of one dollar was 53.7 dinars. In the period up to 2016, the dinar value compared to the observed foreign currencies weakened significantly, and in 2016 it reached its lowest value. In that year, one euro amounted to 123.5 dinars, and in the same year, the dollar amounted to 117.1 dinars. It represents the highest value of both foreign currencies expressed in dinars in the observed period. From 2017 to 2019, the strengthening of the dinar against the euro and the dollar can be observed. In 2017, one euro amounted to 118.5 dinars; in 2018, one euro was worth 118.2 dinars, while the value of the euro in 2019 was 117.6 dinars for one euro. The value of the dinar in relation to the dollar was 99.1 dinars for one dollar in 2017. In 2018, one dollar was equal to 103.4 dinars, while in 2019, this ratio was 104.9 dinars for one dollar.

2.2. Review of the developments in the foreign trade of Serbia

Serbia's inclination towards full membership in the European Union means greater openness towards the member states of the Union. Diminished to the level of goods and services exchange, EU membership also implies a broader market for domestic products, i.e. less protection for the domestic production due to increased foreign competition. By signing the Stabilization and Association Agreement (SAA) in 2013, Serbia committed itself to the gradual abolition of customs rates towards EU countries. It completely deprives the Serbian economy of traditional measures to protect domestic production, further indicating a greater dependence of the gross domestic product on foreign trade. The following table shows the total exports of Serbia in the period from 2007 to 2019, by product groups.

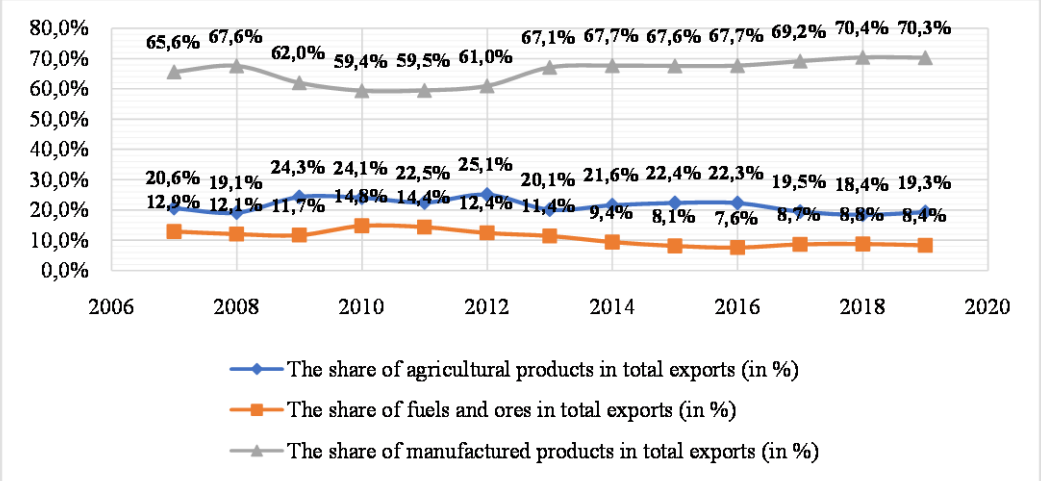
Table 2. Movement trends of Serbian exports, by product groups, from 2007 to 2019 (in millions of dollars)

Year	Agricultural products	Fuels and ores	Manufactured products	Steel and iron	Chemicals	Machinery and transport equipment	Textile	Clothing	Total exports
2007.	**1822**	**1140**	**5792**	1094	915	1263	93	445	**8825**
2008.	**2100**	**1323**	**7420**	1448	1111	1900	102	552	**10972**
2009.	**2031**	**976**	**5175**	648	658	1486	86	533	**8345**
2010.	**2359**	**1449**	**5817**	953	875	1593	95	407	**9795**
2011.	**2648**	**1693**	**7009**	992	999	1963	125	481	**11779**
2012.	**2819**	**1395**	**6849**	370	907	2548	132	505	**11229**
2013.	**2941**	**1670**	**9810**	408	1247	4539	163	603	**14614**
2014.	**3207**	**1400**	**10049**	490	1191	4466	194	629	**14845**
2015.	**2991**	**1089**	**9042**	489	1129	3898	172	527	**13376**
2016.	**3323**	**1131**	**10070**	494	1304	4400	196	594	**14874**
2017.	**3306**	**1475**	**11753**	741	1566	4763	232	674	**16992**
2018.	**3545**	**1694**	**13541**	1060	1859	5345	265	711	**19227**
2019.	**3792**	**1640**	**13805**	925	1805	5580	276	678	**19630**

Source: World Trade Organization, Database 2020

Based on the previously presented data, a significant increase in total exports of Serbia can be observed for the period that was studied. In 2007, Serbia's exports amounted to 8.8 billion dollars, while in 2019, it reached the level of 19.6 billion dollars, which means that the value of exports in 2019 was higher by about 55% compared to 2007. Along with that, a drastic decline in exports can be noted in 2009 compared to 2008. The drop amounted to about 2.6 billion dollars. The decline in exports occurred in 2012 as well, dropping by 500 million dollars compared to the previous year, and in 2015, being lesser for the amount of about 1.5 billion dollars compared to 2014. In the remainder of the observed period, the constant growth of exports is visible, with non-constant rates. The following chart shows the structure of exports in the observed period, by product groups in relation to total exports.

Chart 2 Review of changes in the share of product groups in total exports of Serbia, from 2007 to 2019 (in %)



Source: Author's calculations according to the WTO Database 2020

The chart above shows a noticeable decrease in the share of agricultural products in Serbian exports. In 2007, the percentage of agricultural products in total exports was 12.9%, while in 2019 it was only 8.4%, which is a result of the declining trend of the farming products share in total exports since 2010 when those products accounted for 14.8% of total exports. The lowest share of the percentage was recorded in 2016 when the export of agricultural products accounted for 7.6% of total exports. The share of ores and fuels in total exports varied in the observed period, from 18.4% in 2018 to 25.1% in 2012. Thus, there was a cyclical movement between these two extremes in the observed period. The share of manufactured products in total exports from 2011 to the end of the period recorded a constant growth. In 2011, the share of manufactured products in total exports was 59.9%, while at the end of 2019 it reached the level of 70.3%. At the beginning of the period, in 2007, the share of manufactured products in total exports was 65%, and in 2008 65.6%.

Data on total imports of Serbia from 2007 to 2019 also testify to the openness of foreign trade of the Serbian economy in the given period. All this is reflected in the positive import growth trends. The following table shows the total imports of Serbia, by product groups, in the observed period.

Table 3. Movement trends of Serbian imports, by product groups, from 2007 to 2019 (in millions of dollars)

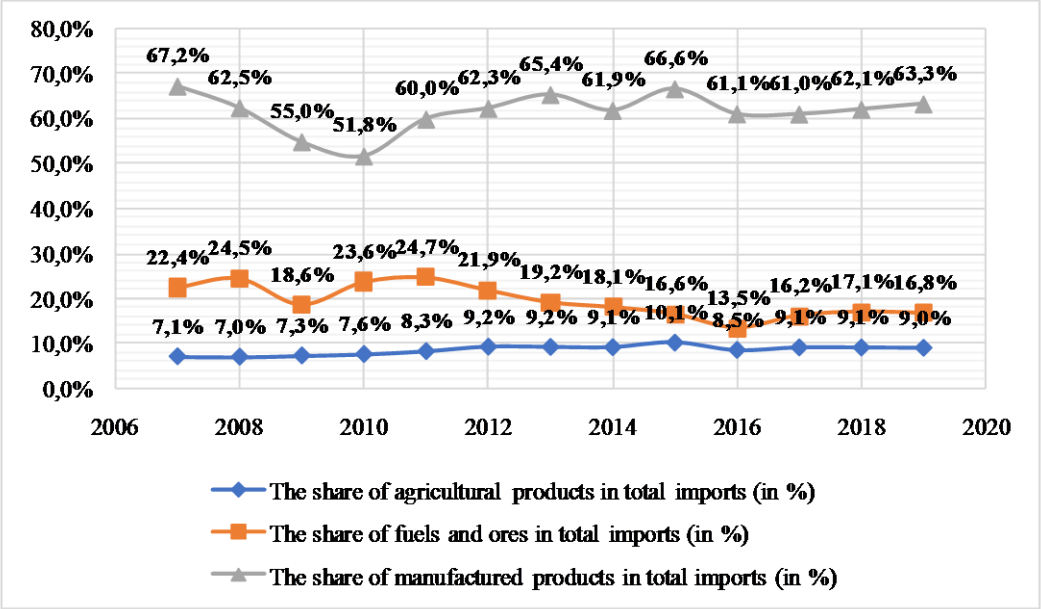
Year	Agricultural products	Fuels and ores	Manufactured products	Steel and iron	Chemicals	Machinery and transport equipment	Textile	Clothing	Total imports
2007.	**1364**	**4293**	**12886**	930	2605	5340	496	362	**19164**
2008.	**1709**	**5954**	**15195**	1119	3166	6227	522	491	**24331**
2009.	**1173**	**2989**	**8818**	494	2035	3252	358	331	**16047**
2010.	**1274**	**3953**	**8666**	583	2087	2996	370	289	**16735**
2011.	**1640**	**4905**	**11910**	681	2969	4535	477	324	**19862**
2012.	**1750**	**4138**	**11796**	639	3127	4473	456	311	**18925**
2013.	**1889**	**3938**	**13426**	639	3161	5750	504	334	**20543**
2014.	**1882**	**3726**	**12749**	635	2967	5152	538	365	**20601**
2015.	**1814**	**2970**	**11912**	553	2728	5084	505	300	**17876**
2016.	**1641**	**2603**	**11758**	475	2666	4863	546	333	**19245**
2017.	**1996**	**3563**	**13397**	660	3055	5356	622	356	**21947**
2018.	**2349**	**4423**	**16077**	872	3505	6711	683	422	**25882**
2019.	**2408**	**4488**	**16922**	1076	3677	7004	696	447	**26730**

Source: World Trade Organization 2020

The movement trends of imports in the observed period also show positive growth. The value of Serbian imports in 2019 totalled up to 26.7 billion dollars, while at the beginning of the period observed, in 2007, it reached up to 19.1 billion dollars. It indicates that the value of imports in 2019 was about 40% higher compared to the beginning of the observed period, which is less when considered in relative terms with exports, according to the same indicator. The most drastic drop in total imports occurred in 2009 when its value was about $ 16 billion, which, compared to 2008, is a drop of about $ 8.3 billion. The drop of about 900 million dollars in total imports was also recorded in 2012 compared to 2011. 2015 saw a decline in total imports as well when it amounted to about 17.8 billion dollars, which was a decrease of about 2.8 billion dollars, compared to 2014. From 2016 to 2019, there was a noticeable increase in imports compared to the previous year, with the total reaching its maximum in 2019 when imports amounted to 26.7 billion dollars.

Based on the data shown in Table 3, the dynamics of the structure of imports in the observed period can be shown. On this wise, the following chart shows the structure of imports, by product groups, in the period from 2007 to 2019.

Chart 3. Review of changes in the share of product groups in total exports of Serbia, from 2007 to 2019 (in%)



Source: WTO Database 2020 and the author's calculations

The movement trends for the imports of agricultural products in the observed period indicate a growth tendency. In 2007, imports of agricultural products amounted to 7.1% of total imports, while in 2019, the share of agricultural products in total imports amounted to 9%. The largest share of agricultural products in total imports was recorded in 2015, when it equalled 10.1%. Imports of ores and fuels recorded a significant decline in the observed period, especially from 2011 to 2019. In the initial year (2007), the share of ore and fuel imports in total imports was 22.4%, and in 2019 the share of this product group was 16.8%. The highest percentage of ores and fuels in total imports was recorded in 2011, while in the following period until 2019, a substantial linear decline in their share can be observed. In the period from 2007 to 2010, there was a significant decline in the percentage of manufactured products in total imports. In 2007, the share of manufactured products amounted to 67.2% of total imports, while the share of this group of products amounted to 51.8% of the total in 2010, which is the lowest share of manufactured products in total imports in the observed period. In the period from 2011 to 2019, a gradual increase in the share of imports can be observed for this group of products, and the share of manufactured products measured up to 63.3% of total imports in 2019.

2.3. The importance of Serbia's foreign trade in the period from 2007 to 2019

Based on the data presented above, on the movement trends of imports and exports of Serbia by product groups, it is possible to show particular significant indicators, such as openness of foreign trade, the openness of imports, openness to exports. It is also possible to see the movement of foreign trade balance in the observed period. The share of foreign trade in goods and services in the domestic product measures the openness of the economy. The most commonly used measure of openness to trade is the share of the sum of imports and exports in the gross domestic product. However, in addition to this, indicators of the share of exports in total trade are also used, as well as the share of imports in the domestic product. In the continuation of the paper, the essential indicators that measure the openness of foreign trade flows will be presented as a share in the domestic product. First, the trade balance movement of Serbia (Table 4) in the observed period will be shown.

Table 4. Changes in the trade balance of Serbia's foreign trade from 2007 to 2019 (in millions of dollars)

Year	Agricultural products	Fuels and ores	Manufactured products	Steel and iron	Chemicals	Machinery and transport equipment	Textile	Clothing	Trade balance
2007.	**458**	**-3153**	**-7094**	164	-1690	-4077	-403	83	**-10339**
2008.	**391**	**-4631**	**-7775**	329	-2055	-4327	-420	61	**-13359**
2009.	**858**	**-2013**	**-3643**	154	-1377	-1766	-272	202	**-7702**
2010.	**1085**	**-2504**	**-2849**	370	-1212	-1403	-275	118	**-6940**
2011.	**1008**	**-3212**	**-4901**	311	-1970	-2572	-352	157	**-8083**
2012.	**1069**	**-2743**	**-4947**	-269	-2220	-1925	-324	194	**-7696**
2013.	**1052**	**-2268**	**-3616**	-231	-1914	-1211	-341	269	**-5929**
2014.	**1325**	**-2326**	**-2700**	-145	-1776	-686	-344	264	**-5756**
2015.	**1177**	**-1881**	**-2870**	-64	-1599	-1186	-333	227	**-4500**
2016.	**1682**	**-1472**	**-1688**	19	-1362	-463	-350	261	**-4371**
2017.	**1310**	**-2088**	**-1644**	81	-1489	-593	-390	318	**-4955**
2018.	**1196**	**-2729**	**-2536**	188	-1646	-1366	-418	289	**-6655**
2019.	**1384**	**-2848**	**-3117**	-151	-1872	-1424	-420	231	**-7100**

Source: WTO Database 2020 and the author's calculations

Based on the data from Table 4, specific positive trends in the foreign trade balance of the Serbian economy can be observed. The extremely high trade deficit of 10 and 13 billion dollars for 2007 and 2008 respectively was gradually reduced, and in 2016 that resulted in the recording of the smallest trade balance deficit in the observed period, when it amounted to 4.3 billion dollars. However, in the last three years of the observed period, the level of the foreign trade deficit has achieved significant growth, and in 2019 it amounted to 7.1 billion dollars. In the observed period, Serbia has a constantly growing surplus in the exchange of agricultural products. The value of that surplus reached 458 million dollars in 2007, while the surplus amounted to 1.3 billion dollars in 2019. The largest surplus in the exchange of agricultural products was realized in 2016 when it amounted to 1.6 billion dollars. In the exchange of fuels and ores, Serbia has a constant deficit, but with a trend of reducing that deficit. The deficit level in the exchange of fuel and ores in 2007, of 3.1 billion dollars, was reduced to 2.8 billion dollars in 2019.

In 2008, the largest deficit in the exchange of fuels and ores was recorded, and it totalled up to 4.6 billion dollars, while the smallest deficit of 1.4 billion dollars was in 2016. In the exchange of manufacturing products, the deficit from the beginning of the observed period, of just over seven billion dollars, was reduced to 3.1 billion dollars in 2019. However, in the last three years of the observed period, an increase in the trade deficit can be observed, namely in the exchange of ores and fuels and manufactured products and the total trade.

Based on the conferred data on the movement of exports, or rather, imports and the gross domestic product, some of the basic indicators used in research can be presented. Table 5 shows the indicators of the share of foreign trade in the domestic product, then the individual share of exports and imports in the domestic product, the indicator of the coverage of imports by exports and the share of the trade balance in the gross domestic product in the observed period.

Table 5. Review of the key indicators of foreign trade and the domestic product of Serbia from 2007 to 2019

Year	The share of foreign trade in the GDP	The share of exports in the GDP	The share of imports in the GDP	Coverage of imports by exports	The share of trade balance in the GDP
2007.	88,3%	20,3%	44,2%	46,0%	-23,8%
2008.	93,4%	21,1%	46,7%	45,1%	-25,6%
2009.	71,1%	18,5%	35,5%	52,0%	-17,1%
2010.	80,9%	23,7%	40,5%	58,5%	-16,8%
2011.	80,6%	23,9%	40,3%	59,3%	-16,4%
2012.	87,4%	25,9%	43,7%	59,3%	-17,8%
2013.	84,9%	30,2%	42,4%	71,1%	-12,3%
2014.	87,5%	31,5%	43,8%	72,1%	-12,2%
2015.	90,2%	33,8%	45,1%	74,8%	-11,4%
2016.	94,7%	36,6%	47,4%	77,3%	-10,8%
2017.	99,5%	38,5%	49,7%	77,4%	-11,2%
2018.	102,3%	38,0%	51,2%	74,3%	-13,2%
2019.	104,0%	38,2%	52,0%	73,4%	-13,8%

Source: WTO 2020; IMF 2020 and the author's calculations

The share of foreign trade in the gross domestic product of Serbia is constantly increasing, as observed in the period from 2007 to 2019. Thus, in 2007, the total foreign trade of Serbia amounted to about 88% of the gross domestic product, while the value of foreign trade, in relation to the GDP in 2019, amounted to 104%. A constant increase in the share of foreign trade in the GDP is evident in the given period, except in 2009 when this share was about 20% lower than in 2008. The shares of imports and exports in the domestic product, when viewed individually, are in constant growth. The share of exports in GDP in 2007 was about 20%, while exports in relation to the GDP were about 38% in 2019. The share of imports in GDP in 2007 was about 44% and in 2019 52%. Significant growth is also achieved by the indicator of coverage of imports by exports. Thus, the coverage of imports by exports in 2007 was 46%, while the same indicator in 2019 had a value of 73.4%. Also, it is possible to observe a decreasing trend in the coverage of imports by exports in the last three years of the observed period. The share of the trade deficit in GDP declined significantly, from 23.8% of the deficit in relation to GDP in 2007 to 13.8% in 2019.

3. RESEARCH METHODOLOGY

The study of the interdependence of GDP, exports and imports is conducted based on the data of three variables that are the subjects of analysis: the value of the gross domestic product, the share of exports in GDP and the share of imports in GDP. The data used in the research relate to the period from 2000 to 2019. All data used in the model can be found in the annexes. Annexe 1 shows the movement of GDP in millions of dollars and contains annual data on exports and imports of Serbia in millions of dollars.

The specification of the model used in the research (Table 6) shows the labels, type, and method of calculating variables and data sources. A logarithmic transformation was performed for the all-time series presented for the variables GDP, EXP and IMP, and they are included in the model as such.

Table 6. Specification of variables in the model

Variable	Label	Variable type	Method od calculating	Source
GDP growth	*GDP*	Dependent	Official growth rate	Statistical Office of the Republic of Serbia
Export	*EXP*	Independent	EXP=X/Y	World Trade Organization and the Statistical Office of the Republic of Serbia
Import	*IMP*	Independent	IMP=M/Y	World Trade Organization and the Statistical Office of the Republic of Serbia

Source: Author's review

Starting from the subject of this research, i.e. the interdependence of movement trends of the gross domestic product and foreign trade, specifically, the movement trends of imports and exports, a vector autoregression model (*VAR*) and a vector model with correction (Vector Error Correction Model - *VECM*) will be formed. The application of this model in economics, especially in macroeconomics, was popularized by Sims (1980), who dealt with improving previous models. He gave the basic assumption, which led to the further development of this group of models, and that is that all variables in the model should be considered endogenous. The application of the VAR model in the economy has become more intensive in recent years. The reason for doing so is that many economic variables, especially variables in macroeconomics, affect each other. If there is uncertainty about which variables are exogenous or endogenous, then all variables are treated symmetrically, that is, as endogenous (*Asteriou and Hall*, 2011). Applying VAR models often estimates quantities such as inflation, GDP, interest rate, imports, exports, etc. Also, many variables in macroeconomics have the characteristics of linear processes, which include a linear combination of past variable values to predict its current movement.

The VAR model allows the creation of vectors of endogenous variables, which will enable regression of each variable, namely regression of each of the endogenous variables to previous eigenvalues, i.e. regression to the prior and present values of explanatory variables in the model. The VAR model of order *p* is mathematically expressed as follows:

$$y_{kt} = \phi_0 + \phi_1 y_{1t-1} + \phi_2 y_{2t-2} \cdots + \phi_k y_{kt-p} + \varepsilon_t \quad 2)$$

where y_{kt} is a vector of endogenous variables k, that is $y_{kt} = [y_{1t}, y_{2t}, \cdots, y_{kt}]$, ϕ_0' is a matrix of vector of constants of dimensions $k * 1$, ϕ_1 to ϕ_k are matrices of coefficients of dimensions $k * k$, and ε_t is a vector of white noise processing, for which the expected value of the variance $E(\varepsilon_t) = 0$ and for which the variance $Var(\varepsilon_t) = \sigma^2$ and the covariance $Cov(\varepsilon_t, \varepsilon_{t-1}) = 0$.

The application of the VAR model in economics has gained importance since the appearance of Granger and Newbold's work (1976). They showed that the evaluation of the parameters for the regression model is conditioned by the correlating structure of the time series. As a consequence of such parameter estimates, a problem called spurious regression arises. The conclusion is that the similar nature of the trend of the observed time series cannot predict a long-term relationship between the phenomena. Time series prediction involves using past values to indicate the values of future series. Thus, this prediction process implies there is a similarity between future and past values, more precisely, a similarity in the probability of a series distribution in the future with the distribution in the past. This is where the concept of stationarity comes in, to imply that past series values can be generalized in the future. In other words, a time series is stationary if the probability of its distribution does not depend on time1 (Stock and Watson 2020). Most time series in an economy are not stationary; they usually have a pronounced upward or downward trend (e.g. domestic product, consumption, inflation, unemployment, industrial production, etc.), which indicates the problem of using simple regression in levels. Most often this problem is solved by using the first differences of the time series being predicted.

If the time-series y_t is stationary in levels, such a time series is denoted by $I(0)$, which means that the time series needs to be differentiated zero times in order to become stationary. If the time series is not stationary in levels, then there is a possibility to differentiate it and to check the stationarity of the time series. If after the first differentiation, $\Delta y_t = y_t - y_{t-1}$, the time series becomes stationary, then such a time series is denoted by $I(1)$, which means that the series had to be differentiated once to become stationary. If after the first differentiation the time series remains non-stationary, then it is necessary to differentiate the differentiated time series once again, so $\Delta_2 y_t = y_t - y_{t-1}$. If after the second differentiation the time series does not become stationary, then we differentiate it as many times as necessary for y_t to become a stationary time series. In the general case, a non-stationary time series needs to be differentiated *n* times in order to become stationary, which is denoted by $I(n)$. Dickey and Fuller (1979 1981) proposed formalized procedures for determining the stationarity of observed time series. The key benefit of the testing they proposed is testing non-stationarity by equating it with the testing of the existence of a unit root, and the test itself is based on the form of a simple AR (1) model (Asteriou and Hall 2011). In addition to the correction proposed by Dickey and Fuller the values of the dependent variable with delay are added: $\Delta y_t, i = 1,2, \ldots, p$. In doing so, it is assumed that a series of residuals of the extended model will follow the white noise process. This makes it possible to define an augmented *Dickey-Fuller* test *(ADF)*, with appropriate test statistics (Kovačić 1995). Statistical inference using ADF statistics is performed based on the t-schedule and the *Dickey-Fuller* table. If the obtained value of the test statistics is less than the critical value from the *Dickey-Fuller* table, then the null hypothesis about the existence of a unit root of the series is rejected and an alternative about its non-existence is accepted. If it turns out that the time series has a unit root, it is said that this series is non-stationary, that it follows the process of a random walk, so its expected variance increases with time.

The problem with predicting time series of economic variables is their non-stationarity, so predicting time series at levels with a stochastic trend can lead to the problem of false regression. This problem could be faced if linear regression of three non-stationary time variables with high correlation coefficients were applied in this study (Table 6). The same trend that the presented series follows does not necessarily indicate a relationship between these variables; it may simply have a similar trend nature. To observe a strong relationship between two or more variables in the long run, Engle and Granger (1987) proposed a study of cointegration between variables1. Two or more time series with a stochastic trend can move together in the long run so that they have the same trend component; these series are said to have a common trend (Stock and Watson 2020). Cointegration is a link that, during

modelling, connects non-stationary or integrated processes with the concept of a long-term equilibrium of the econometric model *(*Kovačić *1995*). Such a cointegrative connection can be interpreted as a stable long-term relationship between vector time series. *(*Baltagi *2008)*

Johansen's cointegration technique will be used to test the cointegration relationship between the observed time series. This procedure relies on the relationship between the rank of the matrix and its characteristic roots (Enders 2014). It represents the best method when testing the cointegration relationship in multivariate regression analysis. If there is a cointegration relationship between the variables, then a vector model with error correction (*VECM*) is formed, which is represented in the following form:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i^* \Delta Y_{t-i} + \varepsilon_t \tag{4}$$

where $\Pi = \sum_{j=1}^{p} \Gamma_j - I$, $\Gamma_i^* = -\sum_{j=i+1}^{p} \Gamma_j$, i ΠY_{t-1} is the encrypted error correction condition. The previous relation can be displayed in the developed form:

$$\begin{bmatrix} \Delta y_{1t} \\ \Delta y_{2t} \\ \Delta y_{3t} \end{bmatrix} = \begin{bmatrix} \Pi_{11} & \Pi_{12} & \Pi_{13} \\ \Pi_{21} & \Pi_{22} & \Pi_{23} \\ \Pi_{31} & \Pi_{32} & \Pi_{33} \end{bmatrix} \begin{bmatrix} y_{1t-1} \\ y_{2t-1} \\ y_{3t-1} \end{bmatrix} + \sum_{i=1}^{p-1} \begin{bmatrix} \Gamma_{11,i} & \Gamma_{12,i} & \Gamma_{13,i} \\ \Gamma_{21,i} & \Gamma_{22,i} & \Gamma_{23,i} \\ \Gamma_{31,i} & \Gamma_{32,i} & \Gamma_{33,i} \end{bmatrix} \begin{bmatrix} \Delta y_{1t-i} \\ \Delta y_{2t-i} \\ \Delta y_{3t-i} \end{bmatrix} + \begin{bmatrix} \Delta \varepsilon_{1t} \\ \Delta \varepsilon_{2t} \\ \Delta \varepsilon_{3t} \end{bmatrix} \tag{5}$$

From the previous relation, the matrix Π consists of the adjustment parameter matrix α and the matrix of cointegration vectors β. From relation (5) it can be seen that the formation of a linear process based on these vectors implies that the first difference of the vector Y_t is stationary, or $I(1)$. These cointegration vectors form the basis for forming a long-term relationship between the observed variables. It is the testing of these coefficients that is the subject of *Johansen's* cointegration test. This cointegration test assumes testing of variables in levels, not in differences. Therefore, the equation for testing the cointegration connection is given by the form:

$$Y_t = \sum_{i=1}^{p} \Gamma_i Y_{t-i} + \varepsilon_t \tag{6}$$

where Γ_i is the vector of coefficients, and ε_t a vector of random errors in which the expected value of variance is zero, and the variance and covariance are constant. *Johansen's* cointegration test uses the trace test and the largest characteristic root test to determine the cointegration relationship between variables.

The existence of a causal relationship between the observed variables will be performed based on the causality test proposed by *Granger* (1969). This test reveals a short-term relationship between the observed variables of the *VECM* model; in this study - the movement trends in the real growth rate and the share of exports and imports in gross domestic product. In addition, *the Akaike information criterion (AIC), the Hannan-Quin criterion (HQ), the final prediction error (FPE), the likelihood ratio (LR) and the Schwartz criterion (SC)* were used as information criteria for selecting the optimal shift length.

4. RESEARCH RESULTS AND DISCUSSION

The condition for applying the VAR model for the variables observed in the research is the existence of the time series stationarity. As mentioned earlier, an augmented *Dickey-Fuller* test is used to test the stationarity of the observed time series. The following table shows the results of *Dickey-Fuller's* augmented stationarity test for the observed time series in levels and the first differences.

Table 7. The results of the augmented Dickey-Fuller's test

Series		Critical values for the ADF test	*p*-value
GDP	Levels	-1,969	0,579
	First difference	-4,918	0,005
EXP	Levels	-3,133	0,127
	First difference	-5,954	0,000
IMP	Levels	-4,238	0,357
	First difference	-7,128	0,000

Source: Author's calculations

The null hypothesis in the ADF test says that a given time series has a unit root and it is non-stationary, as opposed to the alternative hypothesis, which assumes the absence of a unit root and implies the stationarity of the observed time series. If the value of the obtained test statistics is less than the critical value, then the alternative hypothesis of the non-existence of a unit root is accepted. Otherwise, the alternative is discarded, and the null hypothesis is accepted. The table above shows that the value of ADF test statistics, for time series given in levels, is higher in relation to critical values, for variables GDP and EXP, while for time series IMP the value of statistics is lower in relation to critical values. It is confirmed by the p-value, which says that the null hypothesis cannot be rejected for significance levels of 5% and 1%, which leads to the conclusion that the time series GDP, EXP, and IMP are non-stationary in levels. After differentiating the initial series of observed variables, new values of test statistics and their significance levels are obtained. They have a common conclusion for all three observed time series, which is to reject null and accept the alternative hypothesis of no unit root for three-time series, at a significance level of 1%. A constant and trend test was used when testing stationarity based on ADF test statistics. This implies that the GDP, EXP, and IMP time series are, which indicates that it is impossible to apply the VAR model. The solution can be obtained by applying the error correction model. In addition to the ADF test statistics, the *Phillips-Perron* test was used to analyse the stationarity of the observed time series as well. In it, the constant and trend were used, and the results did not differ from those obtained through the ADF test (results are available on request).

As mentioned earlier, the condition for applying the error correction model is the existence of cointegration between the observed time series, which will be tested using the *Johansen* technique. Before that, the length of the time series past values used in the regression must be determined, which is done by applying the previously defined criteria. Commonly used criteria give different conclusions about the optimal regression length to past values, which is why they are often taken as guidelines rather than rules when determining the optimal lengths of time series. As *McQuarrie and Tsai* (1998) say, it is crucial that the model be freed from the autocorrelation of the resulting regression residues.
The following table shows the optimal length of the time series for the tested three past values of the observed time series.

Table 8. Selection of the optimal number of past values based on six criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	21,26942	NA	2,34E-05	-2,14934	-2,00231	-2,13473
1	58,87796	57,51895*	8,30E-07	-5,51506	-4,92690	-5,45659
2	71,52756	14,88187	6,15E-07	-5,94442	-4,91516	-5,84211
3	89,04626	14,42717	3,25e-07*	-6,94661*	-5,47624*	-6,80046*

Source: Author's calculations

It can be observed that the five information criteria (LR, FPE, AIC, SC and HQ) suggest the optimal length of three past values of the time series in the model, while the LR indicates the length of only one past value. For these lengths of past values of the time series, there is cointegration, or in other words, there are common trends. The *Johansen* cointegration technique used shows the existence of cointegration between the observed time series: GDP, the share of exports in GDP and the share of imports in GDP. The results of *Johansen's* cointegration are shown in the following table.

Table 9. Results of the Johansen cointegration test

Null hypothesis	**Alternative hypothesis**	**Test statistics**	**Critical values**	**p-value**
Trace test				
r = 0	r ≤ 1	87,641	29,797	0,000
r = 1	r ≤ 2	43,377	15,494	0,000
r = 2	r ≤ 3	9,483	3,841	0,021
Largest characteristic root test				
r = 0	r = 1	44,363	21,131	0,000
r = 1	r = 2	33,794	14,265	0,000
r = 2	r = 3	9,483	3,841	0,021

Source: Author's calculations

By observing the critical values and probabilities of the trace test and the test of the most extensive characteristic root, it can be concluded that, at the significance level of 1%, the null

hypothesis about the absence of a cointegration relationship between the observed variables is rejected. Also, as shown in the previous table, it can be deduced that there are at most three cointegration equations for the observed model. It further confirms the existence of a long-term relationship between GDP trends, trends in the share of imports and the share of exports in the gross domestic product. As shown by relation (6), the existence of cointegration coefficients provides evidence of the presence of a cointegration relationship between the observed time series.

Based on the calculated coefficients, the results of the error correction model can be presented, or rather, the cointegration equation of the model with three variables, which testifies to the existence of a long-term relationship between the GDP and the share of exports or imports in it. The presentation of this model requires the insertion of a cointegration equation and a change parameter into the system of three variables. The normalized cointegration equation, which speaks of the existence of a long-term relationship between the GDP, the share of imports and exports in GDP, all based on the procedure of calculating the observed coefficients, reads:

$$GDP_{t-1} = 7{,}939 + 4{,}18EXP_{t-1} - 9{,}99IMP_{t-1} \quad (7)$$

Appropriate to the previously presented cointegration equation, it is concluded that there is a positive cointegration link between the share of exports in GDP and the movement of the domestic product. Additionally, the existence of a negative relationship between the share of imports in GDP and the movement of the domestic product is evident as well. Namely, an increase of 1% in the share of exports in the gross domestic product of Serbia will mean an increase in GDP by about 4.18% in absolute terms, while an increase in the share of imports in the domestic product by 1% will mean a decrease in GDP by 9.99%. Based on these results, obtained by analysing data from 2000 to 2019, it can be implied that such a long-term relationship between international trade and growth implies a deepening of Serbia's balance of payments deficit in the coming period, as well as pressure on GDP growth due to the growth in balance of payments deficit, and especially the balance of goods and services. The previously presented cointegration equation can be represented as follows:

$$\begin{aligned}\Delta GDP = {} & -0{,}02 * [GDP_{t-1} - 4{,}188EXP_{t-1} + 9{,}99IMP_{t-1} - 7{,}94] + 0{,}19\Delta GDP_{t-1} - 0{,}02\Delta GDP_{t-2} \\ & + 0{,}69\Delta EXP_{t-1} - 0{,}03\Delta EXP_{t-2} + 0{,}19\Delta IMP_{t-1} + 0{,}024\Delta IMP_{t-2} + 0{,}02\end{aligned} \quad (8)$$

Equation (8) shows the short-term effects of the impact the shares of imports and exports in GDP have on its movement. The cointegration equation represents a long-term relationship between the motions of the dependent and independent variables in the system. If the GDP is in an imbalance in the current period, if there is an imbalance with GDP above the long-term equilibrium, then in the next period the share of imports should increase, and the share of exports decrease so that the system can reach equilibrium again. The previous regression shows that GDP trends respond to shocks in the share of exports and imports in the GDP, with an equilibrium adjustment parameter of 2%.

The *Granger* causality test is used to test the relationship between previous values of particular variables and current values of different variables. In this paper, causality testing is performed on the basis of the already formed model of three equations for the movement of the share of imports in GDP, the share of exports in GDP and the movement of real growth rates of gross domestic product. The results of the *Granger* causality test are given in the following table.

Table 10. Results of the Granger causality test

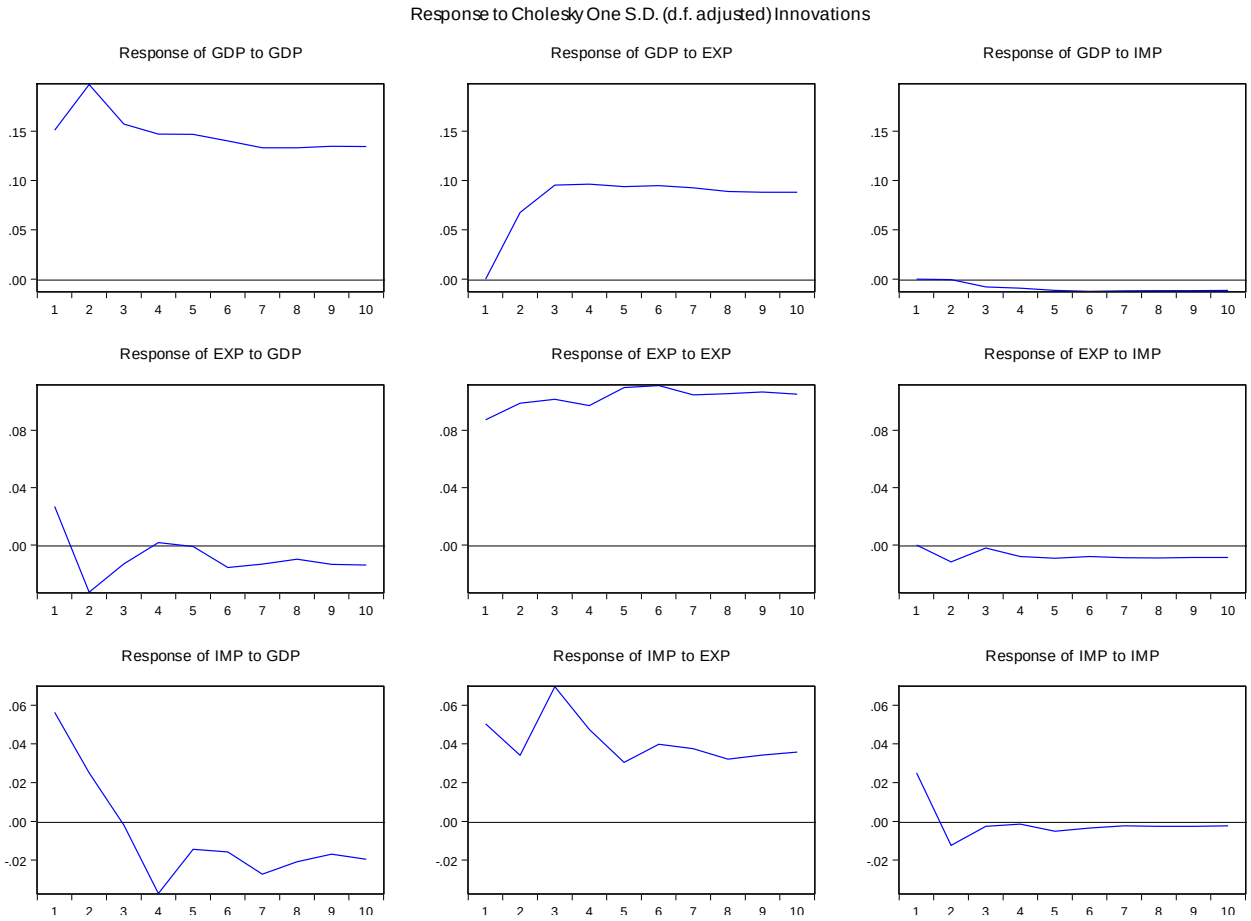
Null hypothesis	χ^2	p-value	Result of the causality test
EXP does not cause GDP	1,655	0,437	Exports do not cause GDP movements
IMP does not cause GDP	0,352	0,839	Imports do not cause GDP movements
EXP and IMP do not cause GDP	2,182	0,702	Exports and imports together do not cause GDP movements
GDP does not cause EXP	3,223	0,199	GDP does not cause export movements
IMP does not cause EXP	1,463	0,481	Imports do not cause export movements
GDP and IMP do not cause EXP	4,977	0,289	Growth and imports together do not cause export movements
GDP does not cause IMP	6,197	0,045	GDP causes import movements
EXP does not cause IMP	0,199	0,905	Export causes import movement
GDP and EXP do not cause IMP	6,430	0,169	Growth and exports together do not cause import movements

Source: Author's calculations

The analysis of the results obtained by Granger's causality test shows a causal relationship between the movement of past values of the share of imports and exports in GDP and the movement of the domestic product, and consequently that there is a unilateral link between the movement of past GDP values and the share of imports in it. The conclusion is that the GDP growth in the previous period means a higher share of imports in the GDP in the present. For other variables, that is, for their interrelationships, causality was not confirmed in their time series.

Innovation analysis based on the impulse response function (IRF), used to determine the relationship between the share of imports and exports in GDP and the movement trends of absolute GDP values, shows the results caused by the shock of one standard deviation in an individual series to the shock of an endogenous variable in the system. The following chart shows the results obtained based on the IRF.

Chart 3. Impulse response function



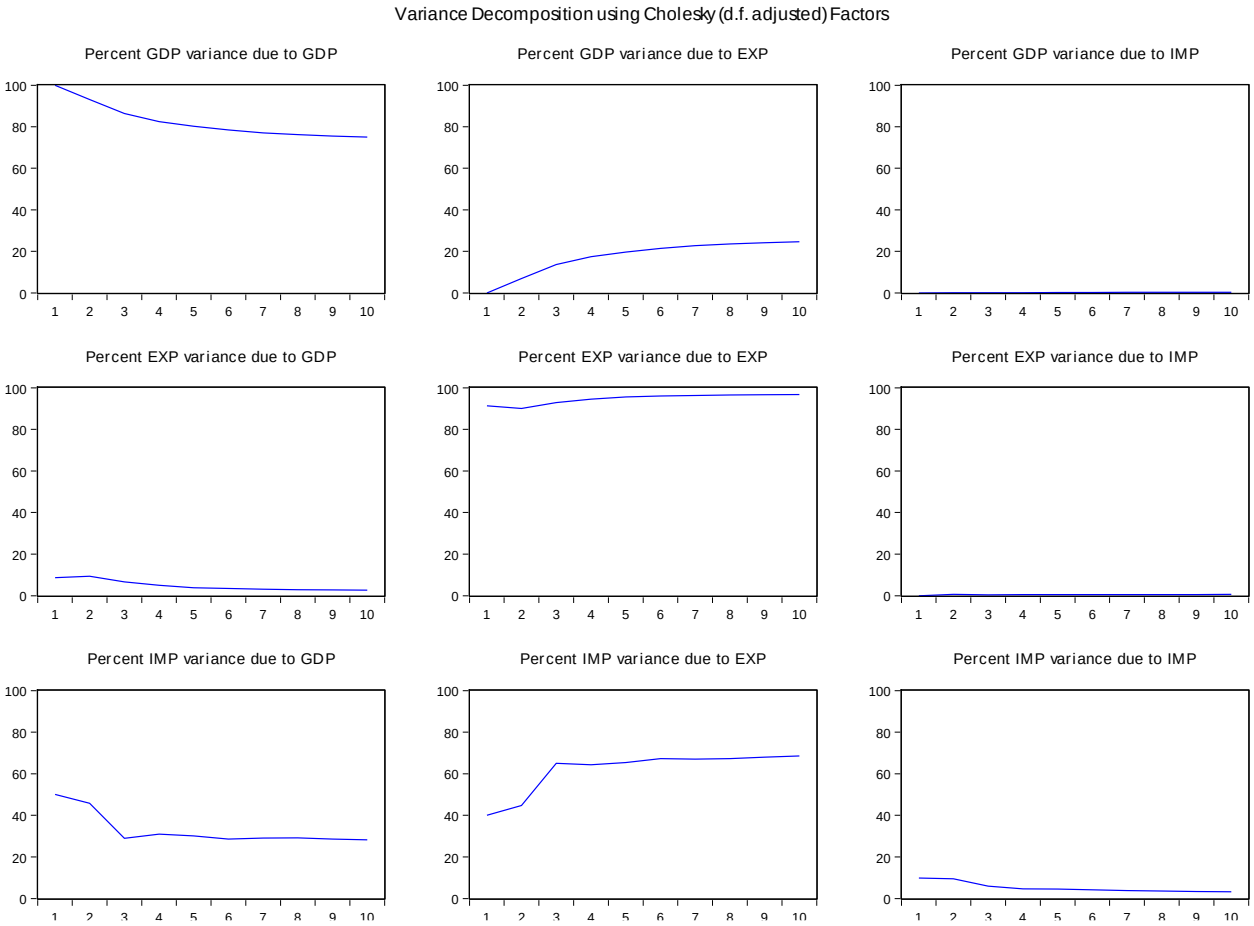
Source: Author's calculations in the EViews programme

The IRF for the period from 2020 to 2030 shows projected variable shocks caused by shocks of the other two variables in the system. A shock of one standard deviation in the share of exports in GDP would cause positive oscillations in GDP movements in the first three years of the projected period. However, a shock in GDP movements would be balanced after the third year. A shock of one standard deviation in the movement of the share of imports in GDP would mean a reduction in GDP from the third year of the projected period. A shock of one standard deviation in the movement of GDP would mean a decrease in the share of exports in the first two years. In the fourth year, there would be an increase in the share of exports, while after the fifth year shocks of export participation would stagnate. The impact of the share of exports on the movement of imports would mean that a shock of one standard deviation in the first two years indicates a decrease in the share of exports, growth in the third year and balanced shocks after the fourth year. A shock of one standard deviation in the movement of GDP will signify negative shocks in the movement of the share of exports from the first four years of the observed period, while the shocks will have a balanced form after the fifth year. The impact of the share of exports on imports in the observed period will mean negative shifts in

the first two years, growth in the third year, a decline in the fourth and fifth, and balanced shocks in the movement of import participation compared to shocks in export participation after the sixth year.

Additionally, variance decomposition analysis was applied to examine the proportion in which variables participate in variations of other variables from the system, over a 10-year period. The results of the variance analysis are shown in the following graph.

Chart 4. Variance decomposition analysis



Source: Author's calculations in the EViews programme

The variance decomposition analysis shows that about 20% of the variations in GDP are explained by the movement of the share of exports in the gross domestic product. Nevertheless, the analysis also shows that the impact of variations in the movement of the share of imports in GDP is negligible. The movement of variations in the share of imports in GDP can be explained by some 30% variations in its movement, i.e. by about 60% of variations in the share of exports in GDP.

CONCLUSION

GDP is undoubtedly the essential indicator of a country's strength. High GDP growth rates have allowed many countries a considerably higher standard of living. The goal of achieving high economic growth rates has already been accepted as a fundamental goal of modern governments. Transitional countries are lagging in growth and development compared to those who accepted the market principles of economic organization and free foreign trade earlier in their development. The principal significance of international trade on the movement of GDP for transitional countries comes from the acceptance of international trade conditions, a prerequisite to join the global flow of goods. One of the countries that went through, and is still going through the transition process, is Serbia. It is evident in the growing rates of the share of foreign trade in the GDP of Serbia since 2000.

Using the VAR model, the goal of this study was to discover the interdependence of GDP trends and the share of imports and exports in the GDP. In addition to the VAR model, the existence of a causal link between the observed variables was tested, and innovative analysis and an analysis of decomposition of variance were used. The results of this study point to a permanent sustainable link between the GDP and the share of imports and exports in GDP, which is represented with a cointegration equation. In the long run, the share of exports has a positive impact on GDP trends, while the increase of imports is negatively correlated with GDP trends. The results of Granger's causality test indicate only a unilateral causal link between GDP trends and their influence on the imports volume. The conclusion of a said causal link is that the growth of GDP in the previous period meant the increase in the share of imports in the current period.

Impulse-responsive analysis shows that the shock of a standard deviation in the share of imports in GDP positively affects its value over three years. However, the shock of one standard deviation in the share of imports has a negative effect after the second year. Additional significance is found in the analysis of the influence of GDP on the movement of import shares, where the shock of one standard deviation in the movement of the GDP value produces a negative effect on the share of imports over three years in the projected timespan. A shock of one standard deviation in the movement of GDP will mean negative shocks in the movement of the share of exports in a period of one to four years of the observed time frame, while after the fifth year, the shocks assume a balanced form. The impact of the shock of one standard deviation of the share of exports on shocks in the movement of imports during the observed period indicates a negative change in the first two years, growth in the third, a decline in the fourth and fifth, and balanced shocks in the share of imports relative to the shocks share of exports, after the sixth year. The results of the variance decomposition analysis point to the conclusion that GDP trends can be explained by the movement of the share of exports in GDP to a level of 20%. Additionally, the variance decomposition indicates that around 30% of the variation in the share of imports is explained by the movement of the GDP and that around 60% of the variation in the share of imports is explained by the movement of the share of export in GDP.

The final conclusion of this study is that economic openness, through the lens of export-oriented policies, contributes to the growth of the GDP in the long run, while the impact of the share of imports in the economy is negatively correlated with GDP trends. On the other hand, it can be concluded that there is a significant influence of GDP growth on the growth of imports. With such results, a recommendation that points to strengthening the economic capacity and adopting policies that will improve export orientation may be given to the creators of economic policies.

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ANNEXES

Annex 1. Trends in the movements of GDP, imports and exports

Year	GDP	EXP	IMP
2000	26359	1558	3330
2001	13061	1721	4261
2002	17148	2075	5614
2003	22491	2755	7473
2004	26113	3523	10750
2005	27616	4482	10455
2006	32540	6428	13170
2007	43215	8825	18968
2008	52156	10974	24042
2009	45234	8344	15807
2010	41724	9795	16471
2011	49254	11779	19862
2012	43238	11226	18923
2013	48386	14610	20550
2014	46990	14845	20196
2015	39640	13376	17875
2016	40688	14883	18899
2017	44286	16997	21920
2018	50588	19239	25882
2019	51501	19633	26730

Annex 2. Autocorrelation test

As it can be seen in the following presentation, by testing the serial correlation on six shifted values of the time series model, based on F-statistics and p-values, it can be concluded that the model used in this study is free of serial correlation.

VEC Residual Serial Correlation LM Tests
Date: 11/01/21 Time: 11:04
Sample: 2000 2019
Included observations: 17

Null hypothesis: No serial correlation at lag h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	4.378546	9	0.8848	0.425028	(9, 9.9)	0.8930
2	3.556448	9	0.9381	0.334279	(9, 9.9)	0.9427
3	6.727559	9	0.6655	0.717264	(9, 9.9)	0.6858

Null hypothesis: No serial correlation at lags 1 to h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	4.378546	9	0.8848	0.425028	(9, 9.9)	0.8930
2	25.49682	18	0.1118	1.568886	(18, 3.3)	0.3848
3	445.3686	27	0.0000	NA	(27, NA)	NA

*Edgeworth expansion corrected likelihood ratio statistic.

Annex 3. Normality of residuals

Skewness, *Kurtosis*, and *Jarque-Bera* tests were used to test the normality of the model residuals. Based on the p-value, it is concluded that the model residues are normally distributed.

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: Residuals are multivariate normal
Date: 11/01/21 Time: 11:06
Sample: 2000 2019
Included observations: 17

Component	Skewness	Chi-sq	df	Prob.*
1	-0.678392	1.303945	1	0.2535
2	0.188598	0.100779	1	0.7509
3	0.196851	0.109792	1	0.7404
Joint		1.514517	3	0.6789
Component	Kurtosis	Chi-sq	df	Prob.
1	2.129069	0.537286	1	0.4636
2	4.148310	0.934020	1	0.3338
3	1.937499	0.799643	1	0.3712
Joint		2.270949	3	0.5181
Component	Jarque-Bera	df	Prob.	
1	1.841231	2	0.3983	
2	1.034800	2	0.5961	
3	0.909435	2	0.6346	
Joint	3.785465	6	0.7057	

*Approximate p-values do not account for coefficient estimation