


**TRANSMISSION MECHANISMS OF ECONOMIC SHOCKS IN THE EURASIAN
ECONOMIC UNION**

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ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 20 February 2023</p> <p>Accepted 22 May 2023</p>	<p>Purpose: The goal of the article is to identify the transmission mechanisms of economic shocks in the EAEU, and determine the impact of external shocks on the key macroeconomic indicators.</p>
<p>Keywords:</p> <p>Economic Shocks; Transmission Mechanisms; Vulnerabilities; Eurasian Economic Union; Panel Vector Autoregression Model; Debt Burden.</p>	<p>Theoretical framework: While there is a considerable body of literature on the transmission channels of economic shocks, there remains a need for empirical studies to identify the precise impact of these channels on crucial macroeconomic indicators, including but not limited to GDP, public debt, and exchange rates.</p>
	<p>Design/methodology/approach: In this article, we have identified three primary sources of transmission channels of shocks that affect the EAEU: global economic growth, instability of the international stock market, and volatility in raw material markets. To analyze the impact of these channels on macroeconomic indicators, we developed a panel vector autoregression model using 29 indicators for five countries. The model uses quarterly data from 2010 to 2022.</p> <p>Findings: The study revealed that shocks are transmitted to EAEU economies through several channels, including the exchange rate, foreign trade, foreign investments, budget indicators, and inflation. The impacts of changes in raw asset prices and global financial market conditions are observable across all these channels. Ultimately, all shocks have an impact on the rate of economic growth, as well as the government's debt burden.</p> <p>Research, Practical & Social implications: We are proposing a new research agenda and direction, emphasizing the need for empirical studies that align with the economic policy of integration. Such studies will be essential in advancing our understanding of the transmission mechanisms of economic shocks and their impact on the EAEU.</p> <p>Originality/value: Although there are analyses of how economic shocks are transmitted within specific countries, the significance of this research is emphasized by its examination of the EAEU as a cohesive entity.</p> <p>Doi: https://doi.org/10.26668/businessreview/2023.v8i6.2169</p>

**MECANISMOS DE TRANSMISSÃO DE CHOQUES ECONÔMICOS NA UNIÃO ECONÔMICA
EURO-ASIÁTICA**

RESUMO

Objetivo: O objetivo do artigo é identificar os mecanismos de transmissão de choques econômicos na EAEU e descobrir o impacto de choques externos nos principais indicadores macroeconômicos.

Referencial teórico: Embora exista uma rica literatura sobre os canais de transmissão de choques econômicos, ainda há necessidade de realizar estudos empíricos para identificar o impacto desses canais em indicadores macroeconômicos como PIB, dívida pública, taxa de câmbio, etc.

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Desenho/metodologia/abordagem: No artigo, identificamos 3 fontes primárias de canais de transmissão de choques que afetam a EAEU: crescimento econômico global, instabilidade do estoque internacional e mercados de matérias-primas. O modelo de autorregressão de vetores de painel foi desenvolvido usando 29 indicadores para 5 países, com dados cobrindo o período de 2010 a 2022 trimestralmente.

Resultados: O estudo mostrou que os choques são transmitidos às economias da EAEU através da taxa de câmbio, comércio exterior, investimentos estrangeiros, indicadores orçamentários e canais de inflação. Os impactos das mudanças nos preços dos ativos brutos e nas condições do mercado financeiro global são evidentes em todos os canais. Todos os choques acabam afetando a taxa de crescimento econômico, bem como o peso da dívida do governo.

Pesquisa, implicações práticas e sociais: Propomos uma nova agenda e direção de pesquisa, bem como enfatizamos a implementação de tais estudos empíricos com base na política econômica de integração.

Originalidade/valor: Embora existam análises de como os choques econômicos são transmitidos dentro de países específicos, a importância desta pesquisa é enfatizada por seu exame da EAEU como uma entidade coesa.

Palavras-chave: Choques Econômicos, Mecanismos de Transmissão, Vulnerabilidades, União Econômica da Eurásia, Modelo de Autorregressão de Vetores de Painéis, Peso da Dívida.

MECANISMOS DE TRANSMISIÓN DE CHOQUES ECONÓMICOS EN LA UNIÓN ECONÓMICA EUROASIÁTICA

RESUMEN

Propósito: El objetivo del artículo es identificar los mecanismos de transmisión de las perturbaciones económicas en la UEEA y averiguar el impacto de las perturbaciones externas en los principales indicadores macroeconómicos.

Metodología: Si bien existe abundante literatura sobre los canales de transmisión de los choques económicos, aún existe la necesidad de realizar estudios empíricos para identificar el impacto de estos canales en indicadores macroeconómicos como el PIB, la deuda pública, el tipo de cambio, etc.

Diseño/metodología/enfoque: Diseño/metodología/enfoque: En el artículo, hemos identificado 3 fuentes primarias de canales de transmisión de shocks que afectan a la UEEA: crecimiento económico global, inestabilidad de la bolsa internacional y mercados de materias primas. El modelo de vector de autorregresión de panel se desarrolló utilizando 29 indicadores para 5 países, con datos que cubren el período de 2010 a 2022 sobre una base trimestral.

Resultados: El estudio mostró que los shocks se transmiten a las economías de la UEEA a través del tipo de cambio, el comercio exterior, las inversiones extranjeras, los indicadores presupuestarios y los canales de inflación. Los impactos de los cambios en los precios de los activos brutos y las condiciones del mercado financiero mundial son evidentes en todos los canales. Todos los shocks afectan en última instancia la tasa de crecimiento económico, así como la carga de la deuda del gobierno.

Implicaciones de la Investigación: Proponemos una nueva agenda y dirección de investigación, así como enfatizamos la implementación de tales estudios empíricos sobre la base de la política económica de integración.

Originalidad/valor: Si bien hay análisis de cómo se transmiten los impactos económicos dentro de países específicos, la importancia de esta investigación se destaca por su examen de la EAEU como una entidad cohesiva.

Palabras clave: Choques Económicos, Mecanismos de Transmisión, Vulnerabilidades, Unión Económica Euroasiática, Modelo de Autorregresión de Vector de Panel, Carga de la Deuda.

INTRODUCTION

Economic shocks are defined by researchers as sudden changes in macroeconomic conditions that result in sharp fluctuations in economic indicators and affect economic activity (Vardanyan et al., 2020). Shocks can have positive or negative consequences, but economic policymakers must respond to them as promptly as possible to minimize negative impacts or maximize positive ones. Economic shocks are transmitted through various channels, and their

impact on different sectors of the economy varies depending on the combination of channels involved.

Although economic shocks typically originate from the same sources, their effects can differ significantly among different groups of countries. Developing economies, for instance, are particularly vulnerable to external shocks like changes in global commodity prices, the state of the global economy, and the financial system due to their integration into global production and financial chains. Developed countries, on the other hand, may experience shocks transmitted through the financial or commercial channels. Given the current trend of regionalization, integration associations are increasingly forming customs unions, coordinating policies, and creating common markets to face global or local challenges together.

The objective of the work is to identify the transmission channels of external shocks on EAEU member states, as well as to assess their impact on the economic growth and development of the Union. Considering the fact that the EAEU as a union is still in the process of integration, this article has both theoretical and practical significance and the obtained results can be applicable to the policymakers of the Eurasian Economic Commission and the Union countries.

Against this backdrop, this study focuses on the Eurasian Economic Union as a single organic union, examining the transmission channels and mechanisms of economic shocks to the economy. Currently, there are no unified mechanisms for dealing with crises and instabilities in the EAEU, and they are very often only partial. Therefore, the study considers the member countries of the Union as subjects.

LITERATURE REVIEW

During the last decades, many valuable studies have been conducted on this topic, which analyzed the impact of economic shocks on macroeconomic variables (GDP, consumption, employment, etc.), assessed the degree of stability and resilience of a country or a group of countries. In these studies, special attention was paid to the transmission channels and mechanisms through which these shocks enter national economies. According to OECD experts, the country's resistance to economic shocks is manifested in its ability to absorb economic losses (Hashiguchi et al., 2017). Because a resilient economy is often defined as one in which the deviation between actual and potential output is relatively small under a series of shocks, Drew et al. (2004) linked economic stability to business cycle fluctuations. Duval et al. (2007) estimated the GDP gap (the deviation between actual and potential levels) using data

from 1982 to 2003 for 20 OECD countries and identified the relationship between the GDP gap and labor and product market regulations.

External economic shocks lead to changes not only in the main macroeconomic variables but also in the indicators of the stability of the national financial system. T. Kinda et al. (2016) assessed the impact of negative foreign trade shocks based on statistical data from 1997-2013 of 71 developing markets and economies with a significant share of goods exports in the economy's structure. The authors concluded that falling commodity prices increase the vulnerability of the financial sector. There is a decrease in the profitability of commercial banks, an increase in the share of overdue debts, and an increase in the probability of a banking crisis. The higher the variation in stock prices, the higher the risk investors face (Kasim, M et al., 2022).

In the professional literature, six main types of economic shocks are distinguished: demand, supply, institutional, financial, political, and technological (Vardanyan et al., 2020). Moreover, shocks can be considered real or nominal, depending on whether they arise from real changes in economic activity or from changes in the nominal values of financial variables (S. Anderson, 2021).

In the study carried out by D. Mayes (2004) on the monetary transfer mechanisms of the Baltic countries, four main ways are distinguished: *interest rates, exchange rates, expectations, and credit channels*. Although it is customary to distinguish between the "bank lending" and "balance of payments" channels, one would expect the exchange rate channel to be relatively more important than the interest rate channel in a small open economy, risking overgeneralization. In a less developed financial system, the credit channel will be less important, especially when bank lending is not the primary source of funding. However, the importance of expectations largely depends on confidence in the central bank. According to Mayes, small open economies need to be more flexible than their larger counterparts. Vetlov (2001) focused on the interest rate, credit, and exchange rate channels, and the two-stage transmission. They examined the transmission mechanisms in Latvia and Lithuania and found that there is a relationship between market interest rates and bank rates, particularly short-term interest rates.

With an increasing number of Central and Eastern European central banks turning to inflation control, either through direct inflation targeting or indirectly through informal targets, it is crucial to understand the transmission mechanisms of shocks in the economy to implement targeted policies effectively. In a study by Ganev et al. (2002), the transmission mechanisms

for ten CEE countries were examined, including Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. The study was limited to two primary transmission routes, namely the exchange rate and interest rate mechanisms and their transmission to inflation and output. The authors found that, for most countries, the exchange rate transmission channel was stronger and much more stable than the interest rate channel. Moreover, for all countries except Estonia and Slovenia, evidence of a cointegrating relationship was found, indicating that there is a systematic interaction between the variables in the long run. This research highlights the importance of understanding the transmission mechanisms of economic shocks for the effective implementation of targeted policies, particularly as more central banks in the region adopt inflation control measures.

In 2017, the OECD conducted an empirical study examining the relationship between economic shocks and structural changes in an effort to determine whether structural changes can help mitigate the negative effects of such shocks. The study was based on "expenditure-output" tables for OECD countries and 27 non-member economies, including all G20 countries, covering the period from 1995 to 2011. The authors found that countries able to maintain their economies by relying on their local service sector rather than domestic goods and external sectors during a decline in aggregate domestic demand were more resilient to negative shocks. Structural changes occur when an economic shock takes place, leading to an increase in the dependence of the service sector's added value and a decrease in the added value of the goods sector.

A study by the IMF in 2011 identified the financial channel as the fastest-spreading transmission mechanism for economic shocks. The study also highlighted the importance of the regional component, as analysis of five major economies - the USA, the Eurozone, China, Japan, and Great Britain - showed that neighboring countries are more interconnected and therefore more vulnerable to spillover effects from each other.

Sun, Zhang et al. (2020) conducted an empirical study of 24 economies, examining the transmission of shocks through expectations and policy coherence, including four international financial crises: the 2001 dot-com bubble crisis originating in the US, the 2008 global financial crisis originating from the US, the 2011 European debt crisis originating in France and other Eurozone countries, and the 2013 emerging market crisis originating in Russia and other emerging countries. The authors found that in several emerging economies, such as Turkey, financial systems are relatively fragile and have experienced larger-than-anticipated shocks during crises. The effectiveness of this channel in the first two crises in Turkey is above 60%.

Additionally, transmission along the expectations channel is more pronounced in highly integrated regions. For instance, during the 2011 European debt crisis, the transmission of stock market shocks from France to other Eurozone economies, such as Germany and Italy, was higher than in other regions. The influence of public debt on economic growth is ambiguous, and that the concept that public debt is detrimental to economic growth is based only on prima facie evidence (Yamin, I., et al).

M. Yu. Golovnin et al. (2012) studied the ways in which external factors influence the monetary sphere of Russia and concluded that the dynamics of monetary aggregates, exchange rates, dollarization, and inflation rate are the main channels through which shocks penetrate the national economy and affect monetary policy.

The IMF's October (2022) report on the regional economic development prospects of the Middle East and Central Asia referred to the transfer of funds of the Caucasus and Central Asia (CACA) countries as a result of the Russian-Ukrainian conflict. Based on micro-data of household budgets, inflation, and remittances were observed as ways of deepening poverty and inequality in the region.

A group of experts from the Academy of National Economy and State Administration under the President of the Russian Federation conducted an empirical study to assess the impact of monetary policy shocks from the Bank of Russia on the main macroeconomic indicators of partner economies in the EAEU. The study revealed the key role of the interest rate and international trade channels in transferring Russian monetary shocks to EAEU countries, with significant differences in the transmission process under different monetary policy regimes. Despite conflicting reactions of EAEU members to monetary shocks in Russia, the tightening of monetary policy is expected to lead to a decrease in economic activity throughout the entire territory of the economic union (Dobronravova et al., 2021).

Although the literature on the study and evaluation of shocks in EAEU countries is quite extensive, this article contributes to the existing literature by conducting an empirical analysis of the transmission mechanisms of shocks in the EAEU economies, using a panel vector autoregression model, which provides new insights and evidence on the transmission channels of shocks in the EAEU countries.

METHODOLOGY

Various theoretical and methodological approaches have been employed to study the transmission channels of shocks in different time periods. These include descriptive, graphical,

and comparative analyses, as well as the construction and estimation of econometric models using various input data and methods. Furthermore, there are studies that use dynamic stochastic general equilibrium (DSGE) models to determine the level of economic stability. Each method has its own advantages and disadvantages. For instance, vector-autoregression models (VAR, SVAR) can be highly useful in the transitional context of short data series and non-Nordic characteristics of economic interaction, but they may struggle to capture the dynamics of institutional change associated with the integration process. Conversely, the most granular macroeconomic models may encounter issues. The data required to operationalize them may be unavailable or unreliable, and the underlying assumptions about the structure and interaction of economic behavior in those countries may be unrealistic.

To identify the supranational transfer channels and mechanisms of EAEU member states, we reviewed the approaches available in international literature, highlighted the transfer channels present, and conducted comparative analyses.

There are studies on the transmission channels of economic shocks for both Armenia and EAEU member states. This topic is of research interest to the EEC and EBRD, and there are also studies on transfer channels and mechanisms affecting the EAEU as an integration unit. In 2018, Popkova developed a framework for economic activity transfer channels on EAEU countries' balances of payments, which included Trade, Investment, debt, current transfers, and income channels. The author emphasized the importance of examining mutual trade flows of intermediate goods. (A.S. Popkova, 2018).

According to a study conducted by the Eurasian Development Bank (EDB, 2019), the openness of EAEU economies and the integration of Russia and Kazakhstan into the global financial market have had a significant impact on their economic development. This is supported by the synchronization of business cycles in EDB member countries and the world's largest economies. Based on EDB's research, the following main conclusions can be made:

International Trade and Financial Flows Play an Important Role in the Economic Development of EDB Member States

During the period of 2006-2018, the total GDP of EAEU member states accounted for 2.7% of the world's volume, while foreign trade turnover made up 2.5% and the accumulated volume of foreign assets and liabilities was 1.0%. Foreign trade turnover represents one-third of the total GDP of the countries in the region. Moreover, the economy demonstrates an even higher degree of openness in terms of financial flows, with external assets and liabilities comprising

approximately 70% of GDP. Consequently, the external economic situation constitutes one of the key factors influencing the economic situation of EDB member states, primarily through trade and financial channels.

The impact of external financial shocks on the countries of the region varies depending on their degree of integration into the global financial system. Given the greater degree of integration of Russia and Kazakhstan into the global financial market, short-term capital flows directly affect the performance of stock and currency markets. The Chinn-Ito index (KAOPEN) measures the degree of openness of the country's capital account, according to which Armenia has the highest position among EAEU states.

Harmonization of Economic Cycles

The business cycles in the EAEU member states and the world's largest economies are increasingly becoming more synchronized. The similar patterns of GDP gaps between the EAEU countries and the USA and Eurozone countries highlight the significance of their trade and financial relationships. Notably, the economies of the region's states that possess a more developed financial sector and are more open to capital flows are more strongly interconnected with the business cycles of the world's largest developed countries. Furthermore, the significant reliance on remittances from Russia amplifies the impact of negative external demand shocks on the economies of Armenia and the Kyrgyz Republic.

The export-import operations of the states in the region are still heavily reliant on raw resources, making their economies vulnerable to fluctuations in global commodity markets, especially in energy resources. Among the EAEU member states, Kazakhstan's economy is expected to be the most negatively affected due to its strong dependence on the oil sector. The shock is also expected to impact Armenia, mainly through the price of copper, which serves as the main transmission channel. Therefore, the negative oil shock's primary transmission channel is the drop-in copper prices. Remittances from Russia play a significant role in strengthening the impact of the negative external demand shock on the economies of Armenia and the Kyrgyz Republic.

In 2020, the implementation of economic support measures led to a deterioration in fiscal balances and an increase in public debt in EAEU member states. The significant risk of maintaining low rates of long-term economic growth in these countries, due to low levels of investment activity, ineffective medium-term and long-term programs, deteriorating demographic situations, and weak economic diversification, makes them sensitive to sanctions

and external crises or shocks (EEC, 2021). Inflation risks remain high for all EAEU member countries due to rising global food and raw material prices, the extension of fiscal stimulus measures, and the devaluation of national currencies, which leads to inflationary expectations.

The EEC (2021) publishes macroeconomic risk transfer mechanisms annually for EAEU countries and revises them based on typical economic developments of the given period. Thus, for 2022, the EEC collegium has identified mutual trade, money transfers, and direct investments as the following transfer mechanisms.

Almost all negative risks from the supply and demand sides, both short-term and long-term, have emerged and should be noted. The table presents global risks and their transmission mechanisms, including reduced external demand, increased protectionism, low productivity, long-term slow economic growth, declining human capital, worsening debt sustainability, disruption of cross-border value chains, trade reorientation, and others.

The EAEU Council always pays close attention to external risks to EAEU macroeconomic stability. Specifically, the commission produces and publishes an annual analytical report that presents the main risks to EAEU macroeconomic stability for the given year, as well as the ways and extent of their influence, within the framework of multidisciplinary studies. The combination of these separate analyses and analysis of changes over the years provides an opportunity to understand the dynamics and duration of risks.

Table 1 : EAEU macroeconomic stability risks

The source of the risk	Ways of impact	Implementation probability			
		2016	2019	2020	2021
Intensification of financial and sectoral sanctions	Tightening sanctions may lead to devaluation of national currencies, inflation, reduced foreign trade and access to foreign financing.				
Investment activity level	Declining long-term economic growth rates, growing technological gap between the EAEU member states and the world's leading economies				
Capital flow volatility	With continued uncertainty, global capital prefers more conservative assets, which may delay FDI inflows into the economy.				
Decrease in the volume of remittances	The maintenance of social isolation measures and the restriction of international mobility are delaying the process of recovery of the volume of remittances.				
Debt sustainability and external debt structure	An increase in the budget deficit, deviation of the debt/GDP ratio from the threshold value (Armenia, Kyrgyz Republic), an increase in public debt servicing costs, a significant volume of repayable obligations and a reduction in access to external financing (Belarus).				
Credit risks materialization	Increase in insolvency, low rate of recovery of the population's incomes, risks of insolvency of individuals.				

Declining labor supply, aging population	Declining long-term economic growth due to declining employment and shrinking population (increased mortality, emigration, aging population).				
Commodity price volatility	General government revenue, fiscal reserves and territory.				
COVID-19	Low rates of economic growth, reduction of external and mutual trade and capital flows, limitation of population mobility				
Inflation risks	A continued rise in global commodity prices could raise inflationary expectations in member countries. The introduction of fiscal incentives and the devaluation of national currencies also put high pressure on prices.				
Increasing protectionism in the global economy	A decline in cross-border trade and investment could lead to a deterioration in the current account balance and a slowdown in economic growth. Also, the escalation of trade conflicts increases the instability of the financial market.				
The slowdown of the global economy	Weaker growth and lower commodity prices in major trading partners could affect exports and capital flows. This, in turn, will lead to a slowdown in the growth of domestic demand and pressure on the exchange rate.				
Risk accumulation in global financial markets	In the medium term, the continuation of the quantitative easing program may lead to the formation of new bubbles in global financial markets				
Maintaining the degree of economic diversification	The strong dependence of economic growth on the volume of mining production makes the economy vulnerable to the realization of the risks of production decline.				

	The risk is high
	The risk is medium
	The risk is low
	Risk assessments are not available

Source: The table was compiled by the authors based on the EEC reports of 2016, 2019 - 2021.

As shown in the table, assessments were not available for 14 periods out of 4 years for the 14 considered risks. For 22 periods, the risk was evaluated as high, while for 18 periods, it was assessed as average. Only in 2 cases were the risks deemed to be low.

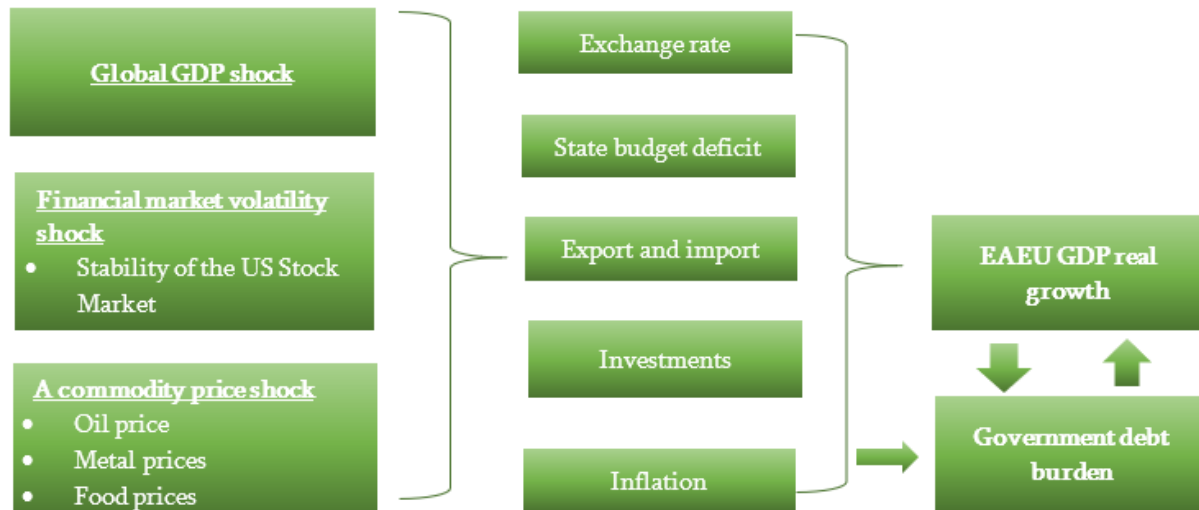
Empirical Analysis

As can be seen from the analysis of the main indicators of EAEU member states conducted in the previous section, and taking into account the economic characteristics of the EAEU, as well as international and EEC studies, we studied shock transmission mechanisms within the framework of the general scheme presented below.

Three primary sources of influence were identified as the sources of transmission of EAEU shocks: global economic growth, instability in the international stock market, and fluctuations in the international raw material market (including prices of oil, metals, and food). These shocks are transmitted to EAEU economies through exchange rates, foreign trade,

foreign investments, state budget indicators, and inflation. In the system developed by us, the impact of shocks is manifested in the economic growth of the EAEU, as well as on the state budgets of the countries, affecting the increase of the debt burden.

Figure 1. General diagram of the transmission mechanism of external shock absorbers



Source: The chart was constructed by the author based on the approaches available in professional literature, as well as the results of empirical evaluation.

To study the transmission channels of these shocks, a panel vector autoregression model was used. This model is a useful tool in applied macroeconomics that allows for all used variables to be simultaneously dependent and independent, as well as introducing exogenous variables when necessary. Additionally, panel models make it possible to include data from different countries in the analysis, revealing general patterns for that group of countries and differences between them when necessary.

The panel vector autoregression model combines the advantages of these two models, allowing for the identification of common correlations for EAEU countries (Canova, F., & Ciccarelli, M., 2013).

To develop the model, a total of 29 indicators spanning 5 countries were used. These indicators were measured at quarterly intervals between 2010 and 2022. For absolute indicators, annual growth rates were calculated, while correlation indicators were seasonally adjusted to account for seasonality in the data. Increases were calculated on an annual basis, comparing each quarter to the same quarter of the previous year.

Using these indicators, three distinct panel vector autoregression models were developed to identify the transmission mechanism of external shocks, as follows:

$$Y_t = [A(L)Y]_{t-1} + \varepsilon_t, t=(1, n)$$

where :

Y_t is endogenous of variables is $t = \overline{1, n}$ the vector,

A of coefficients is the matrix

L reflects selected __ the lager

ε_t of the balances is the vector which should be autocorrelated not be $.t = \overline{1, n}$

A matrix with certain restrictions is applied to exclude the influence of variables reflecting the EAEU economy on the analyzed sources of shocks. In developing the models, a lag of one quarter was selected, considering both the short-term nature of the interactions of the selected variables and the need to maintain the model's simplicity.

RESULTS AND DISCUSSION

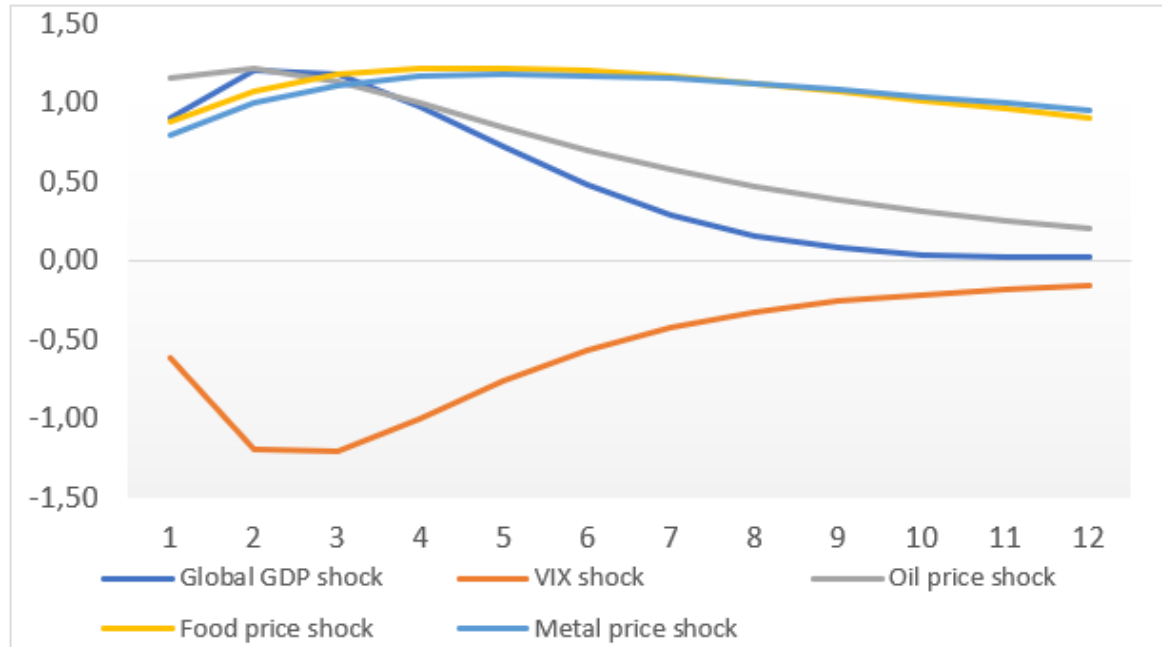
Given that the ultimate goal of studying transmission channels is to assess their impact on indicators that characterize economic stability, the effects of shocks were categorized based on the factors that caused them. They were then analyzed and interpreted within this context.

EAEU member states primarily position themselves in the global economy as exporters of raw and energy resources, highlighting the extent of their vulnerability. EAEU's oil production reaches 634 million tons annually, accounting for 14.5% of the global index. Gas production in the EAEU stands at 800 million cubic meters, representing 20.2% of the global share of electricity and gas production and ranking first in the world. The Union ranks fourth in the world in coal production, producing 560.2 million tons annually and contributing 6.5% of the global share. In terms of electricity production, EAEU is fourth in the world, generating 1 billion 255 million kW of electricity each year, or 4.9% of the global share. Despite the significant volumes of raw resource extraction, agricultural production in the EAEU amounts to \$123.9 billion, which is 5.5% of the global index. Additionally, EAEU countries account for 2.2% of the world's industrial output. However, despite all of this, the EAEU economies together contribute only 2.1% of the global GDP. This positioning in the global economy shapes the nature of interactions, which is why the conditioned model excluded the influence of EAEU countries' GDP on the world GDP.

Considering the raw material orientation of certain EAEU countries, fluctuations in the world economy have a reduced impact on these nations. Empirical assessments reveal that a shock of 2 standard deviations in World GDP growth (6.4% points) leads to a 1.2% increase in the economic growth of EAEU countries in the second quarter. The positive effect persists for five consecutive quarters, gradually fading over time. Unlike the global GDP growth, a similar positive oil price shock has a quicker impact on the EAEU region, resulting in a 1.16 percentage

point acceleration of economic growth in the first quarter, reaching its peak in the second quarter at 1.21 percentage points.

Figure 2. The impact of external shocks on EAEU GDP growth

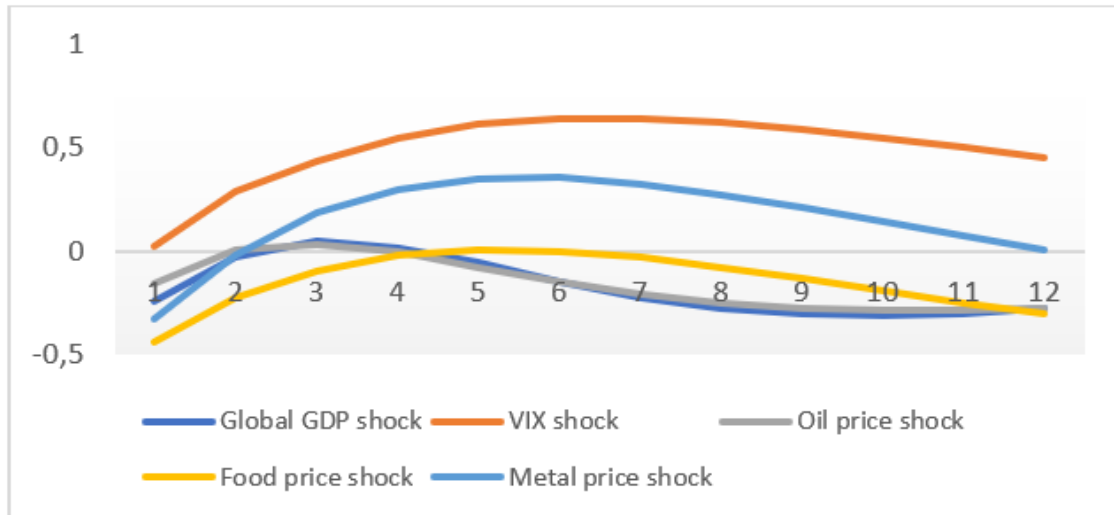


Source: Results implemented by the authors based on panel vector autoregression models.

Similar effects were observed for standard deviations of food and metal price shocks, which can be attributed to their correlation and proportions in the economic structure of EAEU member states. With a correlation coefficient of 0.9, these two indicators displayed similar behavior during the observed period, leading to comparable effects on the economy. Furthermore, EAEU member countries account for 5.5% of global agricultural production, with a significant portion being allocated to grain production and export. In terms of global metal production and export, EAEU contributes 4.3%, creating a foundation for sustained growth in EAEU GDP as a result of these external shocks. Unlike other shocks, which dissipate by the end of the considered period (Dragun N.P., Kurbieva I.Yu. 2016).

The VIX index, which reflects the volatility of the US S&P 500 stock index, has a negative impact on economic growth due to the slowdown in pace caused by increasing uncertainties around the world and volatility in the global financial market. Empirical evaluations have shown that a positive shock in the VIX index results in a 0.6 percentage point decrease in EAEU GDP growth during the first quarter. This effect reaches its peak of 1.2 percentage points in the following two quarters, after which it gradually fades within the given time frame.

Figure 3. The impact of external shocks on inflation



Source: Results implemented by the authors based on panel vector autoregression models.

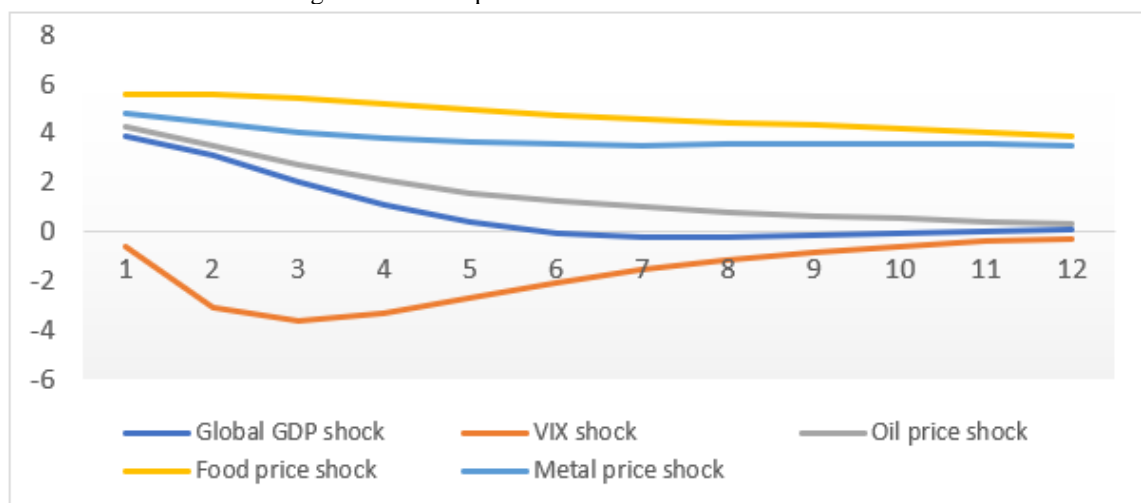
External shocks have a significant impact on the level of inflation in the EAEU region. As depicted in the chart, the shocks from the world GDP, VIX index, and food prices reach their maximum impact in the 5th-6th lagger of the observed horizon, causing an increase in the inflation rate by 0.35%, 0.6%, and 0.01%, respectively. However, it is noteworthy that in the case of these three shocks, the initial impact was negative, resulting in a decrease in the inflation level during the first 2-3 months, which later transforms into growth. Meanwhile, almost all shocks disappeared by the end of the observed period, except for the effect of the VIX index, which continued to impact the inflation level even in the long-term horizon.

It is worth noting that the empirical evaluations' estimates align with historical developments, indicating that sharp fluctuations in inflation levels are particularly noticeable in crisis regions. In general, the highest prices in the EAEU region were recorded in 2008 and 2016, at 14.6% and 14.1%, respectively, while the lowest level was in 2018, at 3.2%. The theory was also confirmed during the low inflationary pressures in EAEU countries in 2019-2020 and the post-COVID high inflationary developments, which led to a high inflation environment in EAEU countries in parallel with the increase in raw resource prices and the activation of the global economy. As a result, most countries experienced a peak in industrial product prices in March 2022, while consumer prices peaked in April. The previous section's analysis also revealed overlaps in economic periods among EAEU member countries, aligning with our empirical evaluations' results. This allows us to conclude that the inflation index is one of the primary transmission channels for external indicators, which can be considered a quality indicator and used in future model evaluations.

The next important transmission mechanism studied in the empirical evaluations pertains to investment flows, which is one of the crucial drivers for the economic development of all EAEU countries. This observation is pertinent for nearly all countries worldwide, and therefore, the effectiveness of the investment direction has been repeatedly proven in the theoretical literature. As per the data of accumulated balances, the share of EAEU in the global volume of FDI was 1.5% in 2021. An increase in investment activity has been observed in most EAEU member states in recent years, except Belarus and Russia. Investments in fixed capital grew by 5.3% in January-September 2022, compared to the 6.6% growth observed during the same period in 2021.

Regarding the impact of investment channels, it is essential to pay special attention to the impulse response of world food and metal prices. Empirical estimates indicate that the standard deviation of these two indicators over the considered horizon offers opportunities for sustained growth between 4 and 6 percentage points, explained by the significant shares of these resources in the EAEU's economic structure, as well as their significant export volumes.

Figure 4. The impact of external shocks on investment



Source: Results implemented by the authors based on panel vector autoregression models.

The influence of global GDP growth and oil price shocks on EAEU investment volumes is also noteworthy, but unlike the impacts mentioned earlier, they do not have a lasting effect and gradually diminish over the observed period.

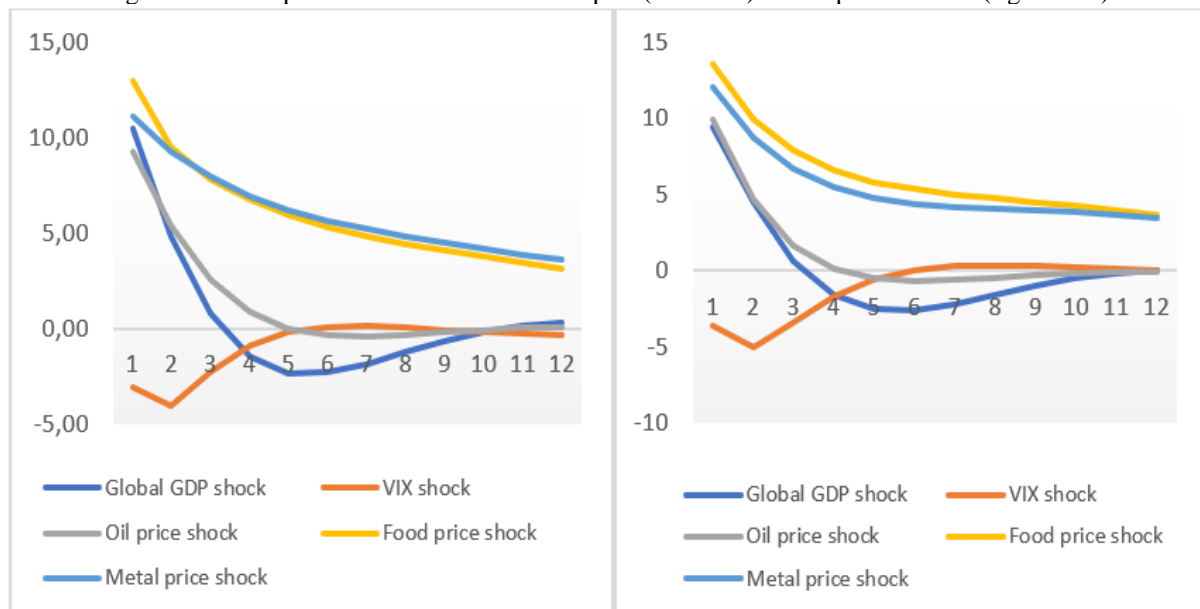
The VIX index's standard deviation reaches its maximum impact of 3.63 percent in the third lag, which gradually fades away as the period progresses. Consequently, along with the increase in uncertainty, the trend of decreasing investment flows persisted, as seen in crisis situations in both 2008 and 2016.

During this period, economic growth slowed down due to a decrease in capital accumulation in both the public and private sectors. Investment growth sharply declined since 2008, caused by policy growth uncertainty and credit constraints following the global financial crisis. The post-crisis investment dynamics worsened in almost all groups of countries and regions. About half of the slowdown in economic growth during the global financial and economic crisis was due to the decrease in investments.

External shocks have similar effects on both export and import volumes. In the case of a VIX shock, the effect is negative in lags 1-3, then it fluctuates around the 0 level. The global GDP shock and oil price shock almost proportionally affect the observed indicators, initially having a sharp positive effect, then they sharply slow down in 2-3 lags, after which the shocks gradually dissipate. In the case of food price and metal price shocks, they not only have the biggest impact on exports and imports, but also have a long-term positive effect.

These results are also supported by recent developments. The increase in the value of exports of EAEU member states to third countries compared to 2020 (by 44.7%) is due to the rise in the average prices of exported goods (by 46.4%). However, the physical volume of goods supplies decreased by 1.2% compared to 2020.

Figure 5. The impact of external shocks on export (left chart) and import volumes (right chart).



Source: Results implemented by the authors based on panel vector autoregression models.

The European Union remains the main buyer of goods exported by EAEU member states, accounting for 41.9% (compared to 37.6% in 2020). The Netherlands, Germany, Italy, and Poland are the most important suppliers of goods from the EU countries, accounting for 8-

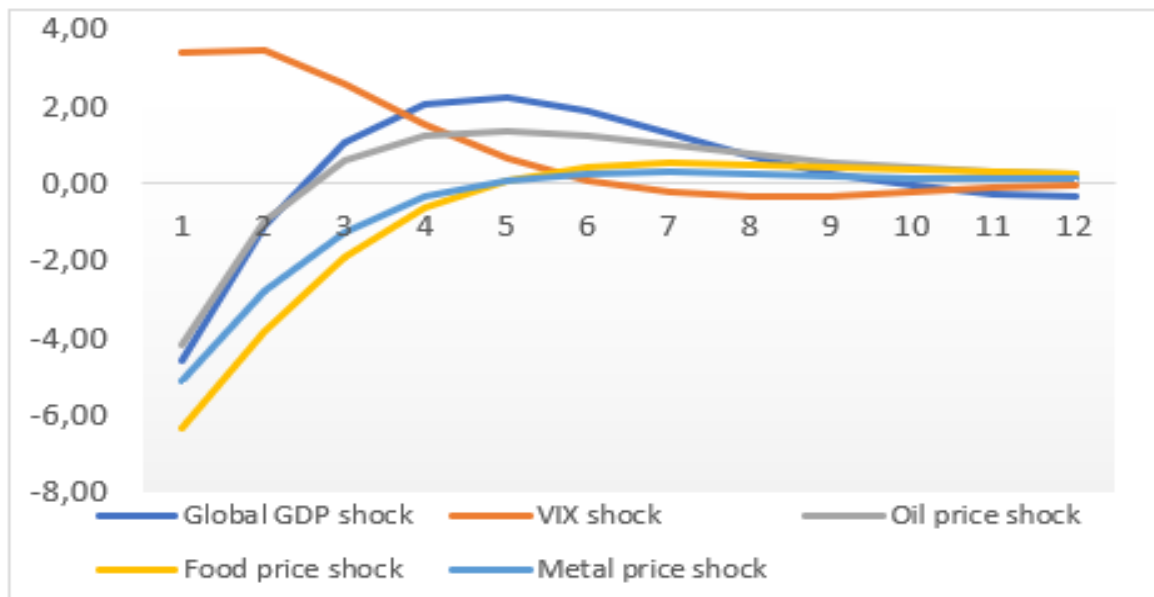
9.5%, 5-6.0%, 4-5.4%, and 3-3.6% of EAEU exports, respectively. APEC countries received 28.4% of all exported goods, of which 15.2% went to China, 3.6% to the USA, and 3.6% to South Korea. CIS countries accounted for 5-6% of EAEU exports, of which Ukraine accounted for 2.7% and Uzbekistan for 1.6%. In 2021, compared to 2020, there was a significant increase in supplies from EAEU to Moldova (71%), Ukraine (42.7%), and Azerbaijan (31.5%).

Import volumes are concentrated in APEC countries (45-47%) and the European Union (33-35%). Among APEC countries, the largest import volumes are from China (27.4%), the USA (6.0%), South Korea (4.4%), and Japan (3.1%). Among EU countries, Germany is the leader in EAEU imports with 9.8%, followed by Italy with 4.3% and France with 4.2%. CIS countries account for 3.8% of EAEU imports. In 2021, compared to 2020, there was a significant increase in imports to the Union market from Tajikistan, Uzbekistan, and Azerbaijan (35.6%) (EEC, 2022).

It is important to note that changes in world market prices for raw materials, as well as changes in export and import volumes, can't have an impact on the exchange rate level.

After analyzing the impact of external shocks on the exchange rate, it is evident that, except for the VIX shock, which accelerates the exchange rate depreciation in the first and second lags and gradually decreases from the third lag until its effect fades, all other shocks initially result in the exchange rate appreciating, which gradually slows down and loses its effect in the third and fourth lags. The exchange rate channel is considered one of the fastest and most effective transmission channels for the economies of EAEU member states, primarily because its impact is immediately felt by these countries. In 2021, EAEU member countries' exchange rates strengthened significantly due to a favorable external environment. The real effective exchange rate appreciated in Armenia by 9.5% and in Kyrgyzstan by 7.9%, with the main strengthening of member countries' currencies occurring in the second half of the year.

Figure 6. The impact of external shocks on the rate of growth (devaluation) of the nominal exchange rate against the dollar

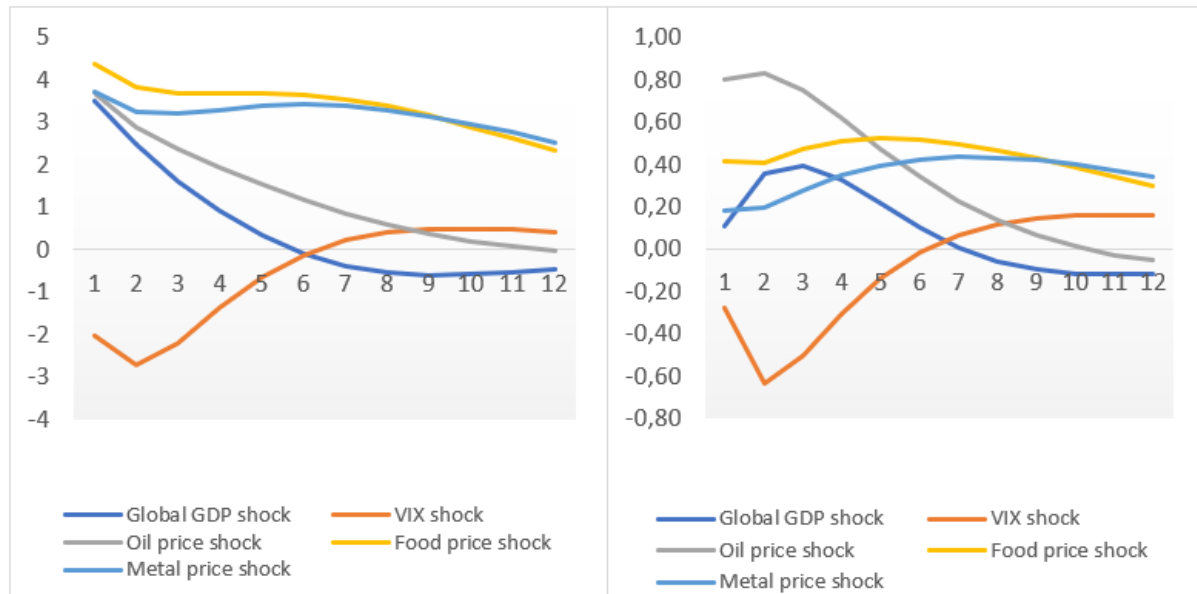


Source: Results implemented by the authors based on panel vector autoregression models.

Like most countries, the fiscal sector is an important channel through which external shocks affect the EAEU region. As previously stated, external factors can cause a decrease in the GDP of the countries, resulting in a reduction of the nominal value, which serves as the basis for tax revenues of the state budget. Consequently, a decrease in nominal GDP leads to a decrease in state budget revenues and an increase in the deficit. These theoretical justifications, which are well-known in the literature, are also supported by empirical evidence. External shocks have a significant impact on budget revenues and deficits. In the case of a VIX shock, the impact on both the state budget deficit and revenues is negative in the first and second lags. However, the effect gradually changes from the fifth lag, with a positive trend. The oil shock affects the budget deficit in the second lag and budget revenues immediately. However, in both cases, the shock gradually dissipates.

The shock to the global GDP reduces state budget revenues and deepens the budget deficit. This effect is particularly pronounced in the first and second lags. However, after the fourth and fifth lags, the impact gradually weakens and eventually fades. In the case of food and metal price shocks, both budget revenues and the deficit gradually increase after the first and second lags, and remain at a high level.

Figure 7. The impact of external shocks on state budget revenues (left chart) and deficit (right chart)



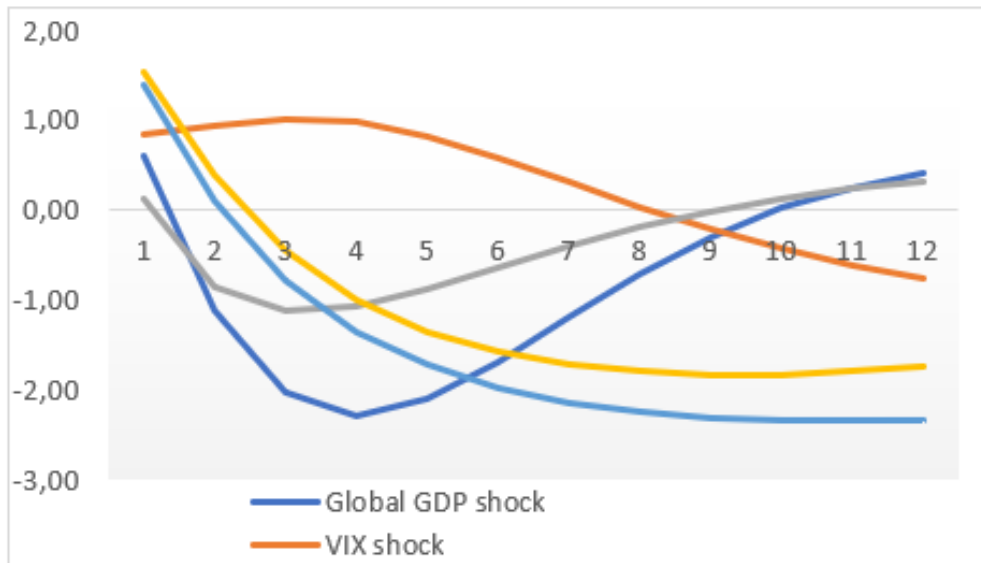
Source: Results implemented by the authors based on panel vector autoregression models.

The member states of the EAEU display differing dynamics in their consolidated state budget deficits. In some cases, the budget is in surplus (such as in Belarus and Russia), although there are also years when it is in deficit. The EAEU agreement defines an annual budget deficit/surplus of 3% of GDP, but this is often exceeded due to external shocks and crises. For example, in certain years, the budget deficit has surpassed that of Armenia, Kazakhstan (in 2020-2021), Kyrgyzstan (in 2016), and Russia (in 2020).

Starting in 2021, fiscal policy regulations have gradually been implemented, as evidenced by the reduction of the budget deficit or the transition from surplus in countries where economic activity has been restored. By the end of 2021, Belarus, the Kyrgyz Republic, and Russia had all achieved a positive consolidated budget balance of 0.3%, 0.7%, and 1.5% of GDP, respectively. However, in Armenia and Kazakhstan, the consolidated budget still showed a deficit, although its size had decreased to 4.6% and 3.5% of GDP, respectively. Despite this decrease, the value of the deficit remains above the threshold set by the agreement.

External developments that have a negative impact, such as lower budget revenues and increased deficits, falling GDP, and devaluation of the exchange rate, lead to an increase in the debt burden. This phenomenon was particularly evident in 2016 and 2020, when external factors such as sanctions against Russia and economic recession or growth slowdown in EAEU countries resulted in a sharp increase in deficits. To cover these deficits, countries had to attract additional debt funds to finance their current expenses.

Figure 8. The impact of external shocks on public debt.



Source: Results implemented by the authors based on panel vector autoregression models.

This logic is also reflected in the empirical study of the transmission mechanism. Specifically, a positive shock of 2 standard deviations of global economic growth affects the level of public debt at the beginning of the second quarter, reducing its share in GDP by 1.13 percentage points. The shock reaches its maximum impulse in the fourth lag, which is within one year, resulting in a 2.28 percent change in the level of public debt. A similar shock in oil prices has an almost identical but relatively mild effect on public debt. In this case, the effect of the standard deviation reaches its maximum earlier, in the third lag, by 1.13 percentage points, reducing the debt-to-GDP ratio.

As in the previous cases, food price shocks and metal price shocks have a similar effect, but the impact of metal prices is stronger. Additionally, in the case of global GDP growth, VIX index, and oil prices, the shock weakens over time during the observed period. In contrast, in the case of metals and food prices, the shock weakens later due to the lower volatility of the prices of the latter in the long run. However, the debt-to-GDP ratio either naturally decreases or increases during this period, and economies overcome the shock with a higher or lower debt burden.

FINDINGS AND CONCLUSIONS

The EAEU countries are vulnerable to a variety of external economic shocks that can have significant impacts on key macroeconomic variables, including GDP growth, government debt levels, and budget deficits. The sources of these shocks include world GDP growth, commodity prices such as oil, metals, and food, and international financial market conditions.

Among these sources, the EAEU economies are particularly sensitive to changes in oil prices, both as oil exporters and small economies reliant on oil imports.

A literature review has demonstrated that these shocks usually affect economies through trade and financial channels, including investment, inflation, and exchange rates. Econometric analysis has revealed that economic shocks from all studied sources are significant for the EAEU economy, with differences in transmission channels highlighted. Meanwhile, shocks to both raw asset prices and international financial market conditions operate through clear transmission mechanisms across all studied channels. Ultimately, all shocks impact the rate of economic growth, as well as the government's debt burden, reflecting vulnerabilities in the public sector.

Different EAEU member states have different levels of resilience to external shocks, with some countries experiencing budget surpluses even during difficult economic periods, while others struggle with high deficits and debt burdens. The study underscores the importance of effective policy responses to external shocks, such as improving fiscal management, promoting economic diversification, and implementing structural reforms to boost productivity and competitiveness.

Overall, the findings suggest that the EAEU economies are highly interconnected with the global economy and vulnerable to external economic shocks. As a result of an empirical study, it was revealed that the GDP growth of EAEU countries is affected by global GDP shock, food price shock, VIX shock, metal price shock, oil price shock channels. Effective policy responses are essential to mitigate the negative impacts of such shocks and promote sustainable economic growth and development in the region.

The article is limited by the fact that the economic characteristics of the EAEU countries vary considerably and the amalgamation of statistical data presents challenges for empirical studies. Despite these challenges, we have successfully identified the transmission channels of external shocks and their impact on the economic stability of the Union.

In order to deepen our understanding of the Union's economic performance, future research could explore the impact of internal shocks on the economic developments of the Union through binary model analyses. Additionally, future research could focus on incorporating qualitative data and conducting case studies to provide a more nuanced analysis of the economic performance of individual member states within the EAEU. Furthermore, the present study focused solely on quarterly data from 2010 to 2022, and thus, further research could investigate longer time frames and consider additional variables. In particular, future

research could investigate the impact of technological advancements and innovation on the economic performance of the Union, as these factors are likely to become increasingly important in the future.

Despite these limitations, the present study has contributed to our understanding of the economic developments within the EAEU and highlights the importance of considering external shocks and their transmission channels in the economic analyses of the Union.

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