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LITHUANIA'S ECONOMIC TRAJECTORY IN THE SHADOW OF THE UKRAINE CONFLICT

Kseniia KIZILOVA  

Vilnius Gediminas Technical University, Vilnius, Lithuania

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Abstract. The ongoing situation between Russia and Ukraine has sent shockwaves through Europe, impacting the economies of nearby nations like Lithuania. Lithuania, a member of the European Union, finds itself in a complicated position due to its historical and political connections to Russia and Ukraine. Using such methodology as literature review, correlation, and regression analysis, structural equation modelling this research dives into how war is affecting Lithuania's economy, including changes in trade, energy security, and relocation of investments. Because of the sanctions against Russia, an important trading partner for Lithuania, their usual trade routes have been thrown off. This has forced Lithuania to look for new markets and other places to get energy. At the same time, Lithuania has had to spend more on its military and faces greater uncertainty because of the conflict, which has changed fiscal policies and investor confidence. The conflict has also sped up Lithuania's move towards Western markets and strengthened its employment market. This paper takes a deep dive into Lithuania's economic journey within the changing landscape of security, economic indicators, and policy reactions. The results emphasize both the weaknesses and strengths of Lithuania's economy in the face of ongoing geopolitical conflict.

Keywords: geopolitical conflict, economic growth, war, economic stability.

✉ Corresponding author. E-mail: kseniia.kizilova@gmail.com

1. Introduction

Geopolitical conflicts can seriously impact a country's economic well-being and growth. These conflicts lead to changes in trade, affect investment flow, and even reshape national priorities. In today's global landscape, experts and policymakers highly focusing on how the war in Ukraine affects the global economic balance (Góes & Bekkers, 2023). The war in Ukraine started back in 2014 and escalated when Russia launched a full invasion in 2022. This conflict has had ripple effects not just within Ukraine but also across its borders, including Lithuania. As a member of both the European Union and NATO, Lithuania has felt economic uncertainties in several ways, from trade disruptions and increases in energy prices to growth in spending on defense and fluctuating investor confidence.

It's crucial to understand how these kinds of geopolitical pressures affect a nation's economic path so that strategies can be developed that help countries thrive even when faced with uncertainty. The conflict between Russia and Ukraine has sent ripple effects throughout the global economy, causing all sorts of disruptions such as changes in trade routes, investor uncertainty, a decline in

GDP, growth of inflation, and causing a lot more people to lose their jobs both in Ukraine and nearby countries.

Providing active support to Ukraine across different sectors, like military, financial, and humanitarian aid could boost Lithuania's standing within the EU and on the global stage. This enhanced status would attract more investors. To understand how geopolitical conflicts, particularly those close to Lithuania, affect its neighbours, the article focuses on factors, that have an impact on economic growth (Hall & Jones, 1999) knowing impact of war, helps to create policies to handle the crisis and adapt the economy to the new environment with geopolitical shifts. The study is structured around three key objectives: to systemize the theoretical background of the impact of geopolitical conflict, to create a methodology for evaluating the war's impact on the country's economic growth, and to evaluate the impact of war in Ukraine on the economic growth of Lithuania.

The objective of this study is to examine the impact of the war in Ukraine on Lithuania's economic growth, with a particular emphasis on identifying key economic factors that have been influenced by the conflict. By investigating these factors, the study aims to provide valuable insights that can help policymakers design strategies to adapt to the economic challenges posed by the war and geopolitical shifts.

2. Theoretical framework of the influence of the war on the country's economy

This chapter explores the impact of the war in Ukraine on the Lithuanian economy, based on a review of existing scientific literature. Key economic factors such as foreign direct investment (FDI), military spending and help, immigration, trade, inflation, and renewable energy consumption are analyzed, with a particular focus on how the conflict has disrupted these indicators and influenced Lithuania's economic trajectory.

The war usually impacts economic indicators, which influence economic growth, the dependence is shown in Figure 1.

To analyze the impact of the war in Ukraine on the economic growth of Lithuania, this chapter of work analyzes the situation in Lithuania before and after the war. First of all, the general situation in Lithuania is described. The conflict in Ukraine, which commenced in 2014 with Russia's annexation of Crimea and deepened in 2022 with a full-on invasion of the country by Russia, has shaken geopolitical and economic realities for neighboring states, including Lithuania. Following an analysis of key economic indicators in Lithuania before and after war in Ukraine, this chapter assesses the immediate and medium-term impacts of the Ukraine war on the Lithuanian economy and reflects on their broader implications for Lithuania's long-term economic trajectory. Before the Ukraine conflict outbreak, Lithuania had a vibrant and well-functioning economy, steady growth, and gradual strengthening. Strong GDP economic growth, low unemployment, a well-developed FDI environment, and substantial economic exports were key indicators.

The Russian invasion of Ukraine has significantly disrupted economic activities, leading to reduced demand for goods and services in neighboring countries. The destruction and economic dislocation caused by the war has directly decreased the demand for commodities from nations such as Lithuania. The region's depressed purchasing power has reduced product demand from countries like Lithuania and other countries bordering Ukraine (Irtysheva et al., 2022).

This can also affect trade and can have dire consequences on state partners with a conflict zone country, but this is what international economic sanctions imposed on such countries entail. In the case of the war in Ukraine, Russia's annexation of Crimea and military involvement in the conflict led to international sanctions that negatively impacted Lithuania's trade with Russia (Guénette et al., 2022). Investment, a pillar of economic growth and stability, faces significant obstacles when neighboring countries are embroiled in conflict or war. Geopolitical upheaval has consequences that extend well beyond national borders, typically impacting the investment climate of neighboring nations. War lowers investor trust in the investment climate of nations in conflict. Foreign investors contributing to the economy has been decreased in such uncertain conditions. Countries like Lithuania already experienced a significant reduction in Russian investment because of the Ukraine war.

The war in Ukraine has been a factor that has impacted the natural resources of the neighboring countries, especially Lithuania. A significant impact has been on natural gas both in Ukraine and Lithuania, which is the reason for the interruption of gas imports from Russia (Khudaykulova et al., 2022). To meet its energy needs, Lithuania is diversifying its energy sources and using more renewable energy and liquefied natural gas to secure the country within its territory (Izzeldin et al., 2023). Due to the impact on neighboring countries' natural resources and because Ukraine is a major agricultural producer and exporter, neighboring countries have been affected by the conflict, especially Lithuania. While it's difficult to predict the full extent of the conflict's impact on Lithuania's agricultural exports, it is suggested that the disruption of trade routes and the imposition of sanctions on Russia have already caused a 10% reduction in Lithuania's dairy exports to Russia, a key market before the war.

Due to Lithuania's proximity to nations like Russia and Ukraine, there have been several unintended consequences of the conflict, such as adjustments to energy costs, refugee migrations, and trade patterns. Numerous



Figure 1. Impact of war on economic growth of the country (source: created by the author)

industries have been impacted, including manufacturing, transportation, and agriculture. Despite its achievements in diversifying its economy and international commerce, Lithuania's economic growth and development remain seriously threatened by the possibility of violence in its bordering areas.

Over the past few years, the Ukraine-Russia conflict has dramatically affected the natural resources of neighboring nations, especially in Lithuania. One significant impact is on energy resources, specifically natural gas. Ukraine and Lithuania are significant consumers of Russian natural gas; the conflict has already disrupted the gas supply in both countries. Lithuania, historically reliant on Russian natural gas imports, has seen significant disruptions to its energy supply due to the war in Ukraine. Disruptions to natural gas supplies have led to a 15% increase in energy prices in Lithuania, prompting the country to accelerate its diversification of energy sources, including investing in LNG (liquefied natural gas) terminals and renewable energy alternatives (Ellis, 2021).

Conversely, the conflict's impact on natural resources in neighboring countries has also affected agriculture. Ukraine is a major producer and exporter of agricultural goods, with agricultural output disrupted by the conflict. This has affected neighboring countries that depend on Ukrainian agricultural imports. The sanction has had one of the most significant impacts on Lithuania regarding its agriculture. After the conflict between Ukraine and Russia, the agricultural exports from Ukraine decrease to Lithuania. Russia was also an important market for Lithuanian agricultural exports – especially dairy products. However, importation from Russia to the EU was banned because of the impact (Houle, 2019). While it's difficult to precisely predict the impact of the war on Lithuania's GDP, many analysts anticipate a slowdown in export growth due to the ongoing disruption in trade routes, particularly with Russia and Ukraine. It is forecasted that countries with close trade relations to Ukraine could see a 2–3% reduction in GDP growth if the conflict persists into 2024.

To conduct, surrounding countries have still been impacted by the conflict in Russia and Ukraine. For the reason that Lithuania is close to Russia and Ukraine, the conflict has brought a lot of adverse effects, such as an increase in energy prices, refugees from Ukraine, and trade distortion. Also, it has an impact on manufacturing, transport, and agriculture. Lithuania has made a significant effort to move forward after the conflict in Ukraine, diversifying the economy, but its economic development is under the influence of war in Ukraine. To cope with this influence, Lithuania could invest in economic resilience strategies – such as innovation, business competitiveness, and trade diversification – to decrease the risks. It also wants to improve its political relations and collaborate with international organizations to help ensure peace.

Lithuanian foreign trade has also been impacted by the Ukraine conflict, which may impact GDP development in the nation. These countries have trading links involving the export of minerals, machinery, and electrical equipment.

The war has led to significant trade barriers, particularly in agricultural goods such as dairy products, which were key exports to Russia. These disruptions, compounded by sanctions and declining demand, have contributed to a slowdown in Lithuania's GDP growth. Before, Lithuania had many goods imported from Russia, but after the EU implemented sanctions on Russia, the Lithuanian government closed the import and export activity in this conflicting country. The commodity prices and investor confidence fell, which caused capital flight and affected Lithuania's economy – the intensity of trade interruption and Lithuanian diversity of trading relationships. Lithuania could invest in technical advancements to improve its domestic capacities, open new export and import markets and attract new international assistance. Since the beginning of the war, investor confidence in Lithuania has decreased, as evidenced by a 7% decline in FDI in 2022, compared to 2021. Similar trends were observed in other Eastern European countries during the early stages of the conflict in Ukraine, as geopolitical instability led to increased risk premiums for investments in the region.

Furthermore, it was noted that international investors frequently reallocate their assets to safer locations in response to regional crises, limiting the affected country's access to vital foreign cash. This process may be especially noticeable in light of the Ukrainian conflict as investors re-evaluate the risks connected to Eastern European economies.

War, crisis, and other conflicts are important obstacles to a nation's growth and development that can only stop or slow down the economic activity in the country. This economic factor is important because FDI and other bilateral and multilateral trade links directly connect countries' economic growth and development through money flows and technology (Wang et al., 2023). Together, FDI and international commerce support the world economy. FDI can be obtained through public enterprises governed by national governments, private organizations, multinational businesses, and entrepreneurs. Trading links with other countries were disturbed and harmed after the invasion of Russia into Ukraine.

The economic situation in the world has impacted FDI, since the conflict in Ukraine, investments in Lithuania have declined, impacting the country's capacity for economic growth (Chishti et al., 2023). Investors' confidence dropped, and investment flow has decreased. Moreover, the war in Ukraine has exacerbated political and economic unrest in the area, which may have a detrimental effect on FDI into Lithuania and the Baltic region.

Like the rest of Europe, Lithuania saw a significant increase in gas and power costs due to the war in Ukraine and the sanctions placed on Russian energy suppliers. Despite this, there was no energy scarcity or concern about finding a substitute gas or oil source because the necessary infrastructure was in place.

For geopolitical reasons, Lithuania had long intended to become more independent of Russian energy supplies. The most important strategic energy initiatives and investments

over the past 10 years have been made with this goal in mind. Almost every infrastructure project related to energy diversification has been finished (Özdamar & Shahin, 2021). The conflict in Ukraine may impact inflation in Lithuania in several ways. If Lithuania is mainly dependent on importing products and services from Ukraine, trade interruptions may result in a reduction in supply, which would raise prices because of scarcity.

Military spending can have mixed effects on GDP growth. On one hand, it can stimulate demand in certain sectors, like defense and technology, boosting economic activity. On the other hand, if not funded by taxes or borrowing, it may lead to inflationary pressures, ultimately hurting economic growth. Inflationary pressures may result if extra military spending, is not supported by taxes or borrowing, which is negatively impacts economic growth. Positively, it affects the creation of jobs and demand, especially in manufacturing, technology, and defense industries, and these can affect the country's economic development. Investment in the military industry improves technology and brings innovation to civilian industries. Increased military spending can have mixed effects on GDP growth. On the one hand, it can stimulate demand in the defense sector and associated industries, as seen in the U.S. during the 2008 economic downturn. On the other hand, if not accompanied by increased taxation or borrowing, it may exacerbate inflationary pressures, which could dampen overall economic growth, as was observed in Russia during the 2014 annexation of Crimea (Zykiene et al., 2023).

A decline in investors' confidence and an unfavorable situation in the neighboring countries resulted in a decline in investments and expenditures, which led to an increase in inflation rates and financial pressure on the country's economy. The rise in food prices and inflation has interrupted trade and direct investment flow (Kola Benson, 2023).

The conflict in Ukraine has also affected unemployment rates in Lithuania. Loss of investments in the country may decrease financial and economic activity, which can lead to fewer jobs. Moreover, a decline in employment may decrease travelers and tourism activity due to the feeling of unsafety because Lithuania is close to conflict areas.

Additionally, firms, the reason for a decline in investments in the country and company, may recruit fewer employees, and this can cause consumers and investors to lack confidence, which can result in a rise in unemployment rates.

Another factor, such as investments, can impact Lithuania's economic growth. Low interest rates may affect investment confidence and make business loans affordable to people two people. It may result in a rise in the country's economic activity and GDP growth. From another perspective, high interest rates can be costly for investors and businesses. It may result in less investment and business activity and adversely affect GDP growth and total economic activity (Saktiawan et al., 2022).

In the situation where Russia invades Ukraine, Lithuania potentially has some changes in interest rates because of instability and uncertainty due to the conflict. In such a

situation, people can afford credits at high interest rates, which can lead to a decrease in financial and economic situation. In order to increase economic activity in the country, the government should take steps to stimulate the economy and lower interest rates. It can increase GDP growth and attract more investments to the country, making interest rates affordable to businesses (Martínez-García et al., 2023).

To conduct this, Lithuania needs to continue working with international organizations to support Ukraine during the conflict with Russia. Economic aid and investments in Ukraine improve the position of Lithuania globally, attracting more investments to the country. Diversifying the economy, supporting Ukraine, and working with international organizations should remain a priority for the neighboring countries. This helps to speed up the resolution of conflict and create economic growth and stability in the long term.

3. Research methodology

A comprehensive approach to data collection was used to investigate the impact of the Ukraine war on Lithuania's economic growth. The analysis is based on a time series dataset covering the period from 2002 to 2023. The choice of this period was motivated by the need to capture both pre- and post-conflict economic conditions, particularly following the escalation of the war in Ukraine after 2014 and its full-scale invasion in 2022. This timeframe allows for a comparison of Lithuania's economic performance before and after the conflict's escalation, ensuring a comprehensive understanding of its implications. Data from the World Bank provided extensive information on macroeconomic indicators, including GDP, unemployment, investment, and foreign trade balances. This made it possible to create a multidimensional picture for a deeper understanding of the economic changes taking place under the influence of the conflict. The variables and expected relationship with economic growth of Lithuania are presented in Table 1.

In order to evaluate the impact of the war in Ukraine on economic growth of Lithuania, a comprehensive methodology was set for research. In the first step, descriptive statistics and correlation analysis by Pearson coefficient has been used, for determining the strength and direction of a relationship between variables. There is a formula that represents the Pearson correlation coefficient, commonly known as the Pearson product-moment correlation coefficient:

$$r = \frac{n \sum XY - \sum x \sum Y}{\sqrt{(n \sum X^2 - (\sum X)^2)(n \sum Y^2 - (\sum Y)^2)}}, \quad (1)$$

where n – number of examines data; $\sum XY$ – the sum of the pair variables; x – independent variable; Y – dependent variable for each point in the data set; $\sum X$ – the sum of the x -independent variables in the data set; $\sum Y$ – the sum of the variable; Y – dependent variables in the data set; $\sum X^2$ – the sum of the sum of the squares of the x -independent

Table 1. Variables used in the research (source: created by author)

Variable	Measurement	Expected relationship with economic growth of Lithuania
FDI to Lithuania	% from GDP	Positive; higher FDI may lead to increased investment and growth
Military spending	% from GDP	Negative/Neutral; high military spending could divert resources from other sectors, potentially hindering growth
Immigrants from Ukraine	% from the total population	Positive; an increase in immigrants can boost the labor force and demand for goods/services
Lithuania-Ukraine export	% from export	Positive; higher exports to Ukraine may stimulate Lithuania's economic growth
Lithuania-Russia imports	% from import	Negative; reliance on imports from Russia could slow economic diversification and growth
Lithuania-Russia export	% export	Positive/Neutral; trade with Russia could help support export growth, though political tensions might limit this
Inflation	%	Negative; high inflation typically erodes purchasing power and economic stability
Business confidence index	index	Positive; higher business confidence usually correlates with investment and economic growth
Long-term interest rate	%	Negative; higher interest rates can increase borrowing costs and slow investment
Unemployment rate	%	Negative; higher unemployment generally indicates underutilization of labor, reducing economic growth
Consumption of renewable energy	% from total energy consumption	Neutral/Positive; renewable energy consumption could support sustainable growth, though it requires initial investment
Military support to Ukraine	% of GDP	Negative/Neutral; military support could divert resources from other economic priorities, potentially slowing growth
GDP growth	%	This is the dependent variable; measures the overall economic growth of Lithuania

variables in the data set; ΣY^2 – the sum of the y -dependent variables in the data set.

To check the significance of coefficients of correlation was used Student's T-test, using the formula:

$$T = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}, \quad (2)$$

where r – the correlation coefficient; n – the sample size; T – the Student's t -criterion.

Examining the level of linkage and correlation between variables is a common practice in research and data analysis. Correlation analysis is used in/several fields, such as the social sciences, business, and finance, to examine the connections between variables. Before calculating the correlation coefficient, the t -criterion, which can be used to determine whether/to accept or reject the null hypothesis, has been determined.

In the next stage the regression analysis has been made, the regression analysis highlights the impact of chosen factors on the dependent variable. This quantitative approach makes it possible to investigate the correlations between different factors to understand the influence and make conclusions about dependent and independent variables (Kersting et al., 2017). Regression analysis checked and checked the hypothesis about the impact of factors. The result of the analysis shows if the model fits the following data. The amount that the dependent variable (Y) changes if the independent variable (X) is raised by one unit of measurement is indicated by the multiple regression coefficient (b_p). As a result, it is a normative coefficient. The following is the multivariate regression formula:

$$Y = b_0 + b_1X_1 + b_2X_2 + \dots + b_pX_p, \quad (3)$$

where Y – predicted or expected value; X_p – independent variable; b_p – estimated regression coefficient.

The statistical analysis begins with the F-test, which is used to determine if the independent variables (X) explain a significant portion of the variation in the dependent variable (Y). In simpler terms, the F-test helps to figure out if the relationship between the X and Y variables is meaningful or if it's just due to random chance.

If the F-test is significant, it suggests that the relationship between the X variables and Y is worth exploring further. If the F-test is not significant, it indicates that changes in the X variables do not affect Y in any meaningful way. The way to perform an F-test is to find the appropriate p -value and interpret the resulting significance level. If the p -value is more significant than 0.05, the result is insignificant. If the p -value is less than 0.05, then the result is significant. If $p < 0.01$, then the result is highly significant.

Null Hypothesis for F-test: This hypothesis suggests that there is no significant relationship between the X variables and Y . In other words, changes in X have no impact on Y .

Alternative Hypothesis for F-test: This hypothesis suggests that there is a strong relationship between the X and Y variables. It implies that changes in X do influence Y , and at least one of the regression coefficients is different from zero.

To perform the F-test, we look at the p -value (a measure of statistical significance):

If the p -value is greater than 0.05, the result is not significant.

If the p-value is less than 0.05, the result is significant.

If the p-value is less than 0.01, the result is highly significant.

Alternatively, it can be compared the R-squared (R^2) value, which indicates how much of the variation in Y is explained by the X variables. If the R^2 value is high enough (compared to critical values from a table), the regression is considered significant.

Before running the regression model, it's important to check for multicollinearity—this means that the independent variables should not be highly correlated with each other. If two variables are highly correlated, it can cause issues in the model, and one of them should be removed. After conducting the F-test, it was used structural equation modeling (SEM) to analyze the relationships between variables in more depth. SEM is a powerful tool that allows us to model complex interactions, where multiple variables influence each other (Costa et al., 2017).

SEM is ideal for testing theoretical models that suggest how different factors, such as military spending and foreign investment, are interconnected and affect Lithuania's economic growth. This method also helps us understand causal relationships – how one variable may influence another, either directly or indirectly.

A key feature of SEM is that it assumes certain statistical conditions. For example, the variables should have a multivariate normal distribution (i.e., the data should follow a specific pattern). This assumption is necessary for applying maximum likelihood estimation, which helps determine the best-fitting model.

The chi-square test is one of the main tests in SEM. It helps us evaluate how well our proposed model matches the actual data. If the chi-square value is significant, it means that the model does not fit the data well, and we may need to adjust the model.

4. Results of the research

The main drivers of Lithuania's economic growth are thoroughly summarised by descriptive statistics, which also shed light on distributions, variability, and core tendencies, presented in Tables 2 and 3.

The continuation of results of descriptive statistics Table 2 presented in Table 3.

Based on the descriptive results, Lithuania had constant GDP growth rates in the years preceding the war. Such growth resulted from robust domestic consumption, investment, exports, manufacturing, technology, and services. Unemployment in Lithuania had been on a downward trend, even as the global financial crisis had created ripples in the country. FDI inflows were a major driving force in Lithuania's economic growth. Due to its strategic location, skilled workforce, and favorable business environment, the country drew a great deal of foreign capital. Major investors were Western European and Nordic companies. Disruption of trade routes was one of the most immediate impacts. With war coming to the region, uncertainty and risks associated with Ukraine-Russia trade only increased. Trade volumes fell significantly in sectors that

Table 2. Descriptive statistics of variables (1) (source: created by author)

Statistics	FDI	Military spending	Immigrants of Ukrainians	Lithuania-Ukraine export	Lithuania-Russia import	Lithuania-Russia export
Measurement	US\$	US\$	Number of people	US\$	US\$	US\$
Mean	1536001542	1833906938	7988,181818	7639,59091	150278756,6	239396221
Median	1235042280	434459094	395	894,5	5181170,397	4092100,2
Standard deviation	1186252234	5764326570	19667,51309	21549,8816	604893562,1	768472205
Sample variance	1,40719E+18	3,3227E+19	386811071,2	464397397	3,65896E+17	5,9055E+17
Minimum	-360197700	181481441	50	363	1635916,347	663828,13
Maximum	4505744062	2,7576E+10	74034	80225	2837718991	2880285439

Table 3. Descriptive statistics of variables (2) (source: created by author)

Statistics	Ukraine-Lithuania import	Inflation	Business confidence index	Long-term interest rate	Military support to Ukraine	Renewable energy consumption
Measurement	US\$	index	US\$	index	US\$	% from total energy consumption
Mean	48243884,11	3,68173985	101,1951097	3,36681818	25890725	9,51181818
Median	698878,4512	2,67820632	101,3312133	2,835	262965450	8,4
Standard deviation	154141663,2	4,62966716	2,527010952	3,3621668	84070786	3,68154036
Sample variance	2,37597E+16	21,433818	6,385784353	11,3041656	7,0679E+15	13,5537394
Minimum	121296,12	-1,1343085	92,825445	0,16	262965450	4,3
Maximum	534096018	19,7050462	105,4217333	14	306630500	17,8

depend on these routes for Lithuania, which has important trade links with both countries.

The war raised energy security concerns in Lithuania, which relies heavily on energy imports, including Russian natural gas. The war put a huge question mark on the stability and reliability of energy supplies. This stimulated Lithuania to hasten its diversification of energy sources and reduce its dependence on Russian energy.

The influx of Ukrainian immigrants, which has been a major driver of Lithuania's economic growth, especially since the war began in 2022, obviously has a different face. Productivity has also risen as industrious and enterprising Ukrainian immigrants have taken up labor shortages in manufacturing, services, and construction. Their employment has facilitated stable economic growth by overcoming demographic challenges such as Lithuania's aging population and decreasing labor pool. Also, Ukrainian workers and companies have raised domestic consumption by participating in the economy as consumers of goods and services.

Lithuania's support of Ukraine throughout that country's ongoing conflict symbolizes the nation's dedication to regional security and unity. This Baltic nation's significant military assistance, including weapons, ammunition, and logistical support provisions, has improved Ukraine's ability to defend itself against hostile aggression. In addition to its military assistance, Lithuania has ensured that critical aid reaches the individuals who need it most through the distribution of humanitarian (medical supplies, shelter, or other aid for displaced Ukrainians). Lithuania has also emerged as a supporter of Ukraine on the world stage, pushing for stricter penalties against aggressors and solidarity within NATO and the E.U. This firm support indicates Lithuania's historical awareness of the menace of foreign invasion and its will to fight for the values of independence and sovereignty. As Lithuania navigates the challenges posed by the geopolitical crisis, long-term planning and diversification is the key to ensuring sustainable economic development.

After the descriptive statistic had been conducted the correlation analysis was made, the results are presented in Table 4.

Military spending (0.31) and renewable energy consumption (0.74) positively correlate with economic development. This implies that increasing defense expenditures and a rise in the use of renewable energy during the Ukraine crisis may significantly impact economic dynamics. The economic significance of commerce and migration in the face of geopolitical changes is demonstrated by the positive connections between immigrants from Ukraine (0.30) and trade flows, such as Lithuania-Ukraine exports (0.23), Ukraine-Lithuania imports (0.23), and Lithuania-Russia exports (0.25).

On the other hand, several factors exhibit a negative impact, particularly FDI to Lithuania (−0.16) and the long-term interest rate (−0.73). Reduced foreign direct investment indicates external constraints on Lithuania's economy, while high interest rates probably stifle investment and growth. There is little link between the unemployment

Table 4. Correlation coefficients between economic growth and chosen variables (source: created by author)

Variable	r
FDI to Lithuania	−0.16
Military spending	0.31
Immigrants from Ukraine	0.30
Lithuania-Ukraine export	0.23
Lithuania-Russia import	0.26
Ukraine-Lithuania import	0.23
Lithuania-Russia export	0.25
Inflation	0.05
Business confidence index	0.11
Long-term interest rate	−0.73
Unemployment rate	0.01
Consumption of renewable energy	0.74

Table 5. Significance coefficients of correlation by t-Students (source: created by author)

Variable	T criterion	t-distribution
FDI to Lithuania	−0.72	1.71
Military spending	1.8	
Immigrants from Ukraine	1.9	
Lithuania-Ukraine export	1.05	
Lithuania-Russia import	1.20	
Ukraine-Lithuania import	1.05	
Lithuania-Russia export	1.15	
Inflation	0.22	
Business confidence index	0.49	
Long-term interest rate	−0.77	
Unemployment rate	0.04	
Consumption of renewable energy	4.9	

rate (0.01) and inflation (0.05), indicating that both variables have no direct impact on short-term growth during this time. The correlation coefficients were checked for significance using the Pearson criterion. Coefficients presented in Table 5.

Correlation coefficients are significant when the calculated T-criterion > t-distribution. It is appropriate to utilize these indicators while creating a regression model. If the calculated value of t exceeds the critical T, the null hypothesis is rejected, and the correlation coefficient is considered significant. This means that the relationship between the variables is genuine and not random. Considering the results presented in Table 8, the relationship between military spending, emigrants from Ukraine, and renewable energy consumption with economic growth in Lithuania is statistically significant so these factors are considered to be included in the regression model.

After conducting a correlation analysis of the data to determine the basic parameters and relationships between variables, various models were tested using the method

of SEM, including linear and nonlinear regressions. Since data for the aid indicator to Ukraine are presented only for 2022 and 2023, this indicator was not included in the model when choosing the best one. Therefore, a linear model for 2002–2021 was initially used, and then a forecast was made for 2022 and 2023. Firstly, a linear model is presented:

$$Y = 0.70 - 0.47(X_1) + 132(X_2) + 0.02 * (X_3), \quad (4)$$

where Y – economic growth; X_1 – military spending; X_2 – immigrants from Ukraine; X_3 – renewable energy consumption.

Next, the linear model was tested for statistical significance. The results are presented in Table 6.

The results presented in Table 6 show that the linear model was reliable. Since $P\text{-value} < 0.05$, $F\text{-significance}$ tends to be 0, the calculated $t\text{-statistics} = 1.7$ and less than the regression $t\text{-statistic}$. Taking the model parameters, economic growth for Lithuania for 2022 was predicted. As a result, 2.6% was obtained; the actual value for 2022 is 1.16%.

In the next stage, a nonlinear model was created to compare and find the best model:

$$Y = \exp(-1.06 - 0.16(X_1) + 37.7(X_2) + 0.87 * \log(X_3)), \quad (5)$$

where Y – economic growth; X_1 – military spending; X_2 – immigrants from Ukraine; X_3 – renewable energy consumption.

The results presented in Table 7 confirm the statistical validity of the model.

As for the non-linear model, the predicted value of economic growth for Lithuania for 2022 was calculated to be 1.08%, compared to the current value of 1.16%.

Considering the results of the two models, although the linear and nonlinear models were statistically reliable, the nonlinear model predicted more accurately until 2022. Therefore, the indicator of aid to Ukraine was added to the nonlinear model, and new indicators were calculated for the model, which has the form:

$$Y = \exp(-0.97 - 0.20(X_1) + 55.4(X_2) + 0.8 \log(X_3) - 0.1X_4^2), \quad (6)$$

Y – economic growth; X_1 – military spending; X_2 – immigrants from Ukraine; X_3 – consumption of renewable energy; X_4 – military aid to Ukraine.

The model was checked on significance, and the results are presented in Table 8.

The model is statistically significant and may be used to forecast the dependent variable, as indicated by the low $F\text{-significance}$ value (less than 0.05). A significant association between the independent and dependent variables is shown by a low $P\text{-value}$ (less than 0.05), and $t\text{-statistics}$ is higher than the calculated T criteria.

The impact is described in such a way: the coefficient -0.20 indicates a negative linear impact of military spending on economic growth. An increase in military spending per unit reduces economic growth by about 20% (in the context of the logarithmic form of the model), which may indicate the adverse economic effects of military spending on growth, while the constant value is -0.97 .

The coefficient of 55.4 indicates the positive impact of Immigrants from Ukraine on economic growth. This

Table 6. Coefficients of significance for model (4) (source: created by author)

Indicator	Name of indicator	R-square	F-significance	P-value	t-statistical
Military spending	X_1	0.89	5.8E-08	8.05E-05	-5.24
Immigrants from Ukraine	X_2			0.00	2.98
Consumption of renewable energy	X_3			3.52E-06	6.9

Table 7. Coefficients of significance for model (5) (source: created by author)

Indicator	Name of indicator	R-square	F-significance	P-value	t-statistical
Military spending	X_1	0.87	1.8E-07	0.00	-4.01
Immigrants from Ukraine	X_2			0.03	2.33
Consumption of renewable energy	X_3			7.339E-06	6.49

Table 8. Coefficients of significance for model (6) (source: created by author)

Indicator	Name of indicator	R-square	F-significance	P-value	t-statistical
Military spending	X_1	0.86	0.0001	4.9E-06	-6.54
Immigrants from Ukraine	X_2			0.00	-4.17
Consumption of renewable energy	X_3			0.04	2.14
Military support to Ukraine	X_4			9.9E-07	7.42

means that a unit increase in the number of Immigrants contributes to economic growth by 55.4 units, highlighting the importance of emigration as a factor in economic development, possibly through increased labor resources and productivity.

The coefficient of 0.8 reflects renewable energy consumption's positive but gradual effect on economic growth. The non-linear logarithmic relationship indicates that an increase in the use of renewable energy by a certain percentage contributes to economic growth but with a decreasing effect at high consumption levels.

The quadratic indicator of -0.1 shows a non-linear effect of aid to Ukraine on economic growth, and this effect decreases at high values of X_4 . This means that aid may have a small or positive effect at initial levels, but economic growth declines as aid increases significantly. This may indicate the effect of diminishing returns from significant aid spending.

According to the results, the conflict in Ukraine is affecting Lithuania's economy in many aspects. Military spending may be necessary for national security. However, it is a drag on growth, whereas immigration from Ukraine is a significant growth engine, contributing to improvements in productivity and an enriched labor market. Finally, military assistance to Ukraine illustrates that while geopolitical alignment can positively affect the economy, excessive aid can harm the economy. These observations underscore the importance of balancing short-term policy responses to local stresses with long-term economic responses to keep the economy on track.

5. Conclusions

This study investigated the impact of the ongoing war in Ukraine on Lithuania's economic growth, highlighting key factors that have influenced the country's economic trajectory from 2002 to 2023. The findings demonstrate that several critical variables, including military spending, military support to Ukraine, immigration from Ukraine, and the consumption of renewable energy, have shaped Lithuania's economic landscape in the context of the conflict.

Specifically, the analysis reveals that while military spending and military assistance to Ukraine have had a negative impact on economic growth due to the opportunity costs and resource allocation required, immigration from Ukraine and the increased consumption of renewable energy have provided positive economic contributions. The influx of immigrants has bolstered the labor market and productivity, while the adoption of renewable energy has enhanced Lithuania's economic resilience and reduced dependence on external energy supplies. These findings emphasize the complex interplay between military, energy, and immigration policies in the context of a nation facing regional instability.

The results highlight the need for strategic policy interventions to mitigate the negative economic effects of the conflict and capitalize on the potential benefits offered by immigration and renewable energy. The findings also

stress the importance of smart defense spending, labor market integration, and a greater investment in renewable energy to ensure sustainable economic growth.

In light of the economic challenges faced by Lithuania due to the ongoing conflict in Ukraine, it is essential for policymakers to implement strategic measures that foster resilience, stability, and sustainable growth. The following policy recommendations aim to address these challenges by focusing on key areas such as energy diversification, trade diversification, labor market integration, and the stabilization of inflation. By adopting these recommendations, Lithuania can mitigate the negative impacts of the conflict while positioning itself for long-term economic success.

Rather than simply increasing military spending, Lithuania should focus on smart defense technologies that offer a high return on investment, such as cybersecurity, drones, and defense research and development. This helps to enhance national security while minimizing the negative economic impact of military expenditures. Immigrants from other countries can improve the labor market dynamics and help to decrease unemployment rates, in order to achieve this, the country could develop programs in order to integrate immigrants into Lithuanian workforce.

The country may invest in renewable energy sources to promote resilience and decrease dependence on energy imports. Increase government subsidies for renewable energy projects, such as wind and solar farms, and incentivize private sector participation in energy diversification. Additionally, long-term contracts for renewable energy production should be made more attractive to encourage both domestic and foreign investment.

Despite the valuable insights offered by this study, several limitations must be acknowledged. First, the analysis relies on a specific set of macroeconomic indicators and may not account for all relevant factors influencing Lithuania's economy during this period. For example, the potential impact of foreign direct investment, business confidence, and trade with other countries could be further explored in future research.

Additionally, the study's reliance on publicly available data from the World Bank and other macroeconomic sources means that the analysis may be limited by data availability and the quality of national statistical reporting, especially during periods of conflict. The exclusion of qualitative factors, such as the social and psychological effects of the war, could also present a gap in fully understanding the broader implications for Lithuania's economic and social fabric.

Future research could build upon this study by exploring the long-term economic impacts of regional conflicts on neighboring economies, with a particular focus on the role of political and institutional factors in shaping economic outcomes. Additionally, further research could examine the effects of specific policy interventions, such as targeted investments in specific sectors (e.g., technology, infrastructure, or healthcare), on economic resilience in post-conflict settings.

In conclusion, this study offers a comprehensive understanding of the complex relationships between military spending, immigration, renewable energy, and economic growth in a country affected by conflict. The policy recommendations provided aim to guide Lithuania towards a path of economic resilience and sustainable growth, though ongoing research will be essential to further refine these strategies and adapt to evolving circumstances.

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LIETUVOS EKONOMINĖ TRAJEKTORIJA UKRAINOS KONFLIKTO ŠEŠĖLYJE

K. Kizilova

Santrauka

Šiuo metu vykstanti situacija tarp Rusijos ir Ukrainos sukėlė didelį atgarsį Europoje, paveikdama ir netoliese esančių šalių, tokių kaip Lietuva, ekonomikas. Lietuva, kaip Europos Sąjungos narė, atsidūrė sudėtingoje padėtyje dėl savo istorinių ir politinių ryšių su Rusija ir Ukraina. Taikant tokius metodus kaip literatūros apžvalga, koreliacijos ir regresinė analizė, struktūrinių lygčių modeliavimas, šiame tyrime gilinamasi į tai, kaip karas veikia Lietuvos ekonomiką – įskaitant prekybos pokyčius, energetinį saugumą ir investicijų perskirstymą. Dėl sankcijų Rusijai, kuri yra svarbi Lietuvos prekybos partnerė, buvo sutrikdyti įprasti prekybos keliai. Tai privertė Lietuvą ieškoti naujų rinkų ir alternatyvių energijos šaltinių. Tuo pačiu metu Lietuva buvo priversta didinti karines išlaidas ir susiduria su didesniu neapibrėžtumu dėl konflikto, kuris paveikė fiskalinę politiką bei investuotojų pasitikėjimą. Konfliktas taip pat paspartino Lietuvos orientaciją į Vakarų rinkas ir sustiprino darbo rinką. Šiame darbe nuodugniai nagrinėjama Lietuvos ekonominė kelionė kintančiame saugumo, ekonominių rodiklių ir politikos atsako kontekste. Rezultatai pabrėžia tiek Lietuvos ekonomikos silpnąsias, tiek stiprias puses nuolatinio geopolitinio konflikto akivaizdoje.

Reikšminiai žodžiai: geopolitinis konfliktas, ekonomikos augimas, karas, ekonominis stabilumas.