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The Impact of Russia's Import Embargo on the EU Countries' Exports

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Abstract: Political unrest inevitably has consequences for a national economy. International trade in a globalised world has great importance for countries. Unfortunately, due to various political events, countries apply some restrictions to each other. In 2014, Western countries imposed sanctions on trade with Russia, due to the annexation of Crimea. As a response, Russia announced an embargo on importing of some goods from European and North American countries, as well as Australia. The current study investigates the economic impact on EU countries due to the mentioned embargo. The EU countries were grouped according to the average for 1998–2018 exports of products to Russia using a cluster analysis. After the clustering, the gravity model was employed to develop the equations representing the international trade between each cluster and Russia. Although Russia declared an embargo on countries associated with the same group of goods, the economic impact on their economies was different. This study has a couple of limitations. The research reflects only the impact of the embargo on exports regardless of some possible indirect effects; the study assesses the export of all sectors due to limited data; and because the restrictions are applied only to the food sector, the research shows only relative changes in exports.

Keywords: embargo; embargo impact on economy; international trade; political decisions; cluster analysis; gravity model

JEL Classification: F1; F51; F62

1. Introduction

Political decisions have been examined by a wide range of scholars from different fields of science. It is a broad topic, as political decisions can change the political situation of a country, and they are also tightly linked to the economic situation of that country as well. Hence, the impact of political decisions is a topic gaining higher interest from the scientific community. For instance, there are scientists who have investigated the influence of political decisions on the performance of investment funds (Witkowska et al. 2019; García Costa et al. 2019). Other scholars have sought to find out if there was an interface between political decisions and macroeconomic variables (Tkáčová et al. 2018; Battaglini and Coate 2008; Sasongko and Huruta 2018). Furthermore, the impact of political decisions on economic relations between countries has also been examined (Maxim and van der Sluijs 2011; Gil-González et al. 2008). However, studies that have analysed the influence of political decisions on economic relations were conducted some time ago and were fragmented. Hence, there is a gap in the scientific knowledge because current situations regarding the interface between economic relations and political decisions have been unexplored. One such field is Russia's embargo, which is a political decision that has changed the situation in world trade. The European Union and the United States of America imposed sanctions on Russia, in 2014, due to the annexation of Crimea, and, in response, Russia announced the embargo on the import of some goods from the EU countries, Norway, the USA, Australia, and Canada. The current topic is not widely investigated in the scientific literature and there are only a few evidences of the embargo impact on international trade between the countries mentioned above, although international trade has been researched by many scientists (e.g., Yang and Nie 2020; Ge et al. 2019; Wang and Kong 2019).

The investigation of the Russian embargo helps to determine the impact the restrictions have on trade between nations. We analysis the embargo of Russia on the EU countries represented in this paper. The theoretical framework helps to understand the interaction between political decisions and economic relations. In addition, based on a review of scientific articles we can divide the political decisions that affect economic ties into groups. For the analysis, the research examines the statistics on export, gross domestic product, population, the distance between capitals, and common borders of the EU countries and Russia. This paper shows the impact of Russia's embargo on EU countries economy using statistics. It is believed that the Russian embargo on its imports has a different effect on exports from the various EU countries. This study assesses the changes in total exports of EU counties, notwithstanding the embargo imposed on only some products. The EU countries were able to launch active trade with Russia for products that were not subject to this embargo, thus, compensating export losses, by adapting to market conditions. Hence, the current research aims to evaluate the impact of Russia's embargo on the economies of the EU countries based on an investigation of the effect of a political decision such as Russia's embargo on economic relations with the EU countries expressed through the export volume.

2. Theoretical Background

International relations deal with the foreign policy of the states within the framework of a global system, including the influence of international organisations, non-governmental organisations, and international corporations, as well as other aspects of relations between states. International relations theories are based on various social sciences disciplines, i.e., political science, economics, history, law, philosophy, and sociology (Hodder 2017). There are many examples of political decisions that have changed the economic relations of a state. Politicians make economical modifications by changing laws, setting taxes, customs or quotas, and also by imposing embargos or sanctions. Moreover, the government can provide compensations, scholarships, or other promotions to increase some economic sector or indicator of the state.

The analysis of international economic relationships is essential for understanding how they could be expressed and what indicators reflect them. The leading indicator, which summarises the development of a country's economy, is the gross domestic product (GDP) (Stremousova and Buchinskaia 2019). The GDP is also an essential indicator for analysing inflation. In other words, usually, the higher the GDP, the higher the inflation rate is. "Under annual inflation targeting (IT), the full impact of adverse supply shocks is felt as lost real GDP" (Bhandari and Frankel 2017). The GDP growth stimulates the supply. Hence, the GDP is still one of the most critical indicators for analysing a country's economy, and various political decisions could influence its changes.

The external sector and foreign trade are the most prestigious groups of indicators for the analysis of international relations. These indicators consist of the current account balance, the export of goods, the annual change in the export of products, the import of goods, the annual change in the import of goods, and the foreign direct investment (Official Statistic Portal 2019).

One more factor that could have an impact on export is government regulations. An analysis by Dou et al. (2015) showed that domestic and also foreign policy could influence trading. Their research on the relationship between trades of food and food safety set by the importing countries and the exporting country showed that some prohibitions and restrictions by importing countries harm an exporting country's exports (Dou et al. 2015). Some political decisions, such as trade agreements, can have a positive impact on trading for both importing and exporting countries. An excellent example of it is the North American Free Trade Agreement (NAFTA). The relationship between the USA and

Mexico became better after signing the NAFTA, and the export of both countries increased (Bejan 2011). Some agreements do not exist for a long time. Moreover, changes in the government of countries can modify the volume of export drastically.

Imports are also an important indicator for analysing economic relations between countries. Imports could offer access to the newest technology and inputs combination, which, in turn, could lead to developing a new product or improving an existing product to export (Castellani and Fassio 2019). Imports help a country to be more globalised and to enhance some sectors. Additionally, consumers have a more extensive range of products and a more comprehensive range of prices. However, the government protects the domestic market from big foreign competitors by imposing duties or tariffs. The import of final goods is always taxed to extract and shift rents from international firms, while the import of intermediate goods could be both taxed or subsidised (Wang et al. 2011).

Moreover, Wang et al. (2011) found that a charge on final goods could both increase and decrease the domestic price of those goods. Local producers gain benefits after the introduction of custom duties. They fill the demand by expanding their production. Furthermore, as the prices of imported products rise, they can raise their rates to the level of the customs' guarantee and gain higher profits. In summary, imports give benefits by providing better quality goods and services and widening the range of choices, but if imports exceed exports, a country suffers losses.

Some political decisions only impact the national economy, but sometimes they also affect global economic relations. The interface between political decisions and the economy can be expressed in different ways. Some political decision can affect the indicators of a country's national and international economic relations either positively or negatively. One of the decisions that can significantly influence economic relations is related to sanctions or embargos. Venkuviene and Masteikiene (2015) researched how the economic embargo by the Russian Federation affected the European economy and economic relations. They found that it changed the economies of CEE (Central and Eastern European) countries negatively, i.e., the export of dairy and meat sectors fell (main sectors in CEE countries that collect most of the GDP). Similarly, expedition and logistic companies felt significant losses (Venkuviene and Masteikiene 2015).

Furthermore, Gharehgozli (2017) analysed the United States sanctions on Iran. The results showed that they reduced Iran's real GDP by more than 17% (Gharehgozli 2017). Another example of sanctions would be the Western financial sanctions on the Russian Federation which were analysed by Gurvich and Prilepskiy (2015). The sanctions decreased foreign direct investment in the Russian Federation. In addition, there were fewer borrowing opportunities for companies and banks not directly targeted by the sanctions and lower capital inflow into the government debt market.

Moreover, the drop in prices led to GDP losses of 8.5% (Gurvich and Prilepskiy 2015). Furthermore, the United Nations and the United States economic sanctions on target states harmed the economy too. The sanctions reduced the annual real per capita GDP growth rate by more than 2% and led to an aggregate decline in GDP of 25.5% (Neuenkirch and Neumeier 2015).

Political decisions can also affect currency which is also essential for foreign trade. Orăştean (2013) analysed the decision by China and Japan to use only the yen and yuan in bilateral trade. It turned out that this decreased the value of the dollar (Orăştean 2013). It cannot be concluded that all these political decisions were made to negatively impact the economy and economic relations of other countries. It should be highlighted that political decisions that harm economic relations can have a positive effect in another field.

Nevertheless, some political decisions have a positive effect on the economy and economic relations. Monticelli et al. (2017) give an example about institutions in Brazil that were created and played an important role in the development and consolidation of the wine industry, also fostered relationship strategies that were based on the participation of wineries and its internationalisation. It helped to promote and improve the winery industry and boost foreign trade. Another political decision that has a significant positive impact on economic relations is related to agreements and organisations. Nápoles (2017) conducted research on how Mexico's accession into the North American

Free Trade Agreement (NAFTA) impacted its economy and economic relations. The results showed that Mexico's GDP increased from 1.7% to 2.6%, GDP per capita increased from −0.4% to 1.2% and export increased from 6.1% to 8.4% (Nápoles 2017). Another free trade agreement was made between the EU and Canada that eradicated 6.5% of import duties (Hübner 2016).

A government also makes some different decisions to improve its economy, economic relations, or society. Imbruno (2016) explained the decision of China that began a process of phasing out the quantitative planning of trade flows and reformed its trade regime using conventional policy instruments, such as tariffs and quotas. The process had a positive effect because the average tariff rate decreased from 56% to 15%, the share of imports under quota/license regulation fell to 8.5%, and the number of firms with the right to trade abroad increased from "twelve state-owned firms" to 35,000 (Imbruno 2016). In addition, a government controls tariffs and duties a lot and sometimes it affects foreign countries. According to Mitra and Shin (2012), tariff reductions in China increased firm-level labour-demand elasticity in Korea. Moreover, the liquefied natural gas (LNG) import quota introduced in Lithuania decreased natural gas prices (Schulte and Weiser 2019). All political decisions are made to somehow improve the level of the economy, economic relations, or society in a country, as well as relationships with other countries.

However, some political decisions have both negative and positive impacts. One of the significant political decisions was the introduction of the euro in Lithuania. The introduction of the euro in the short term positively impacted the growth of Lithuania's international trade and the reduction of interest rates and the most significant negative influence of the introduction of the euro was linked to the growth of inflation and price levels (Januškevičius 2017). Moreover, the rise of excise duty for alcohol and cigarettes and change of the alcohol control law in Lithuania also had positive and negative impacts. Alcohol and tobacco prices increased, and this reduced the level of trade. However, consumption of alcohol decreased by about 2% which meant a better standard of society's health (The Department of Statistics of the Republic of Lithuania 2017).

It can be concluded that almost all political decisions have positive and negative impacts. Nevertheless, sometimes the effect is minimal, and therefore it seems that the influence of a decision is only positive or negative.

On the basis of the analysed information, we can divide the impact of political decisions into groups (Table 1). The impact can be negative, positive, or both negative and positive. Moreover, political decisions can have an impact at a national, global, or national and global level, as well as an effect on the economy, society, or relations with other countries.

Table 1. Possible impacts of political decisions on various indicators (designed by authors).

Agreements and Memberships in Organisations	
Positive impact	Increase the value of export and GDP Lower prices and taxes
Negative impact	Reduces the value of the currency A higher level of inflation Lower GDP
Embargo and Sanctions	
Positive impact	Protection of local businesses
Negative impact	Reduces the volume of export Lower GDP and FDI Fewer borrowing opportunities and lower capital inflows
Help for Local Businesses and Changes in Local Policy	
Positive impact	Internationalisation of businesses Increase the volume of exports Lower prices Higher social indicators
Negative impact	Higher prices A higher level of inflation

After the analysis of theoretical aspects of the influence of political decisions on a country's economic relations, we can conclude that economic relations and politics are strongly related all the time. It is possible to analyse economic relations through economic indicators such as gross domestic product (GDP), imports, exports, and others. According to the scientific articles, it is possible to group political decisions as follows: agreements and memberships in organisations, embargos and sanctions, help for local businesses, and changes in domestic policy. Political decisions can have negative, positive, or both negative and positive impacts. Moreover, political decisions can have an effect at a national, global, or national and global level, as well as on the economy, society, or relations with other countries.

3. Methodology

In order to more precisely investigate the international trade between the EU and Russia, a cluster analysis was performed. The purpose of cluster analysis was to identify the relatively homogeneous groups of the EU countries based on the average of exports to Russia for 1998–2018. For the purpose of assessing the level of dissimilarities across the EU countries, a cluster analysis based on hierarchical ascendant classification (HAC) was implemented. The first step of the HAC procedure was estimation of the dissimilarities between any pair of objects (Coudert et al. 2020), or in the current case, countries. The similarity coefficient is defined by the Euclidean distance between country i and country j:

$$d\left(X_i,\ X_j\right) = \sqrt{\sum_{t=T_1}^{T_N}\left(X_{i,t} - X_{j,t}\right)^2} \tag{1}$$

where $d\left(X_i,\ X_j\right)$ is the Euclidean distance between X_i and X_j, $X_{i,t}$ is the average export to Russia from country i at period t ($t = T_1, \ldots, T_N$), and $X_{j,t}$ is the average export to Russia from country j at period t ($t = T_1, \ldots, T_N$).

For cthe lustering procedure, Ward's linkage was selected as the agglomerative method. Ward's linkage is based on the distance between the centroids of two clusters (Coudert et al. 2020):

$$d_W(A,\ B) = \frac{2n_A n_B}{(n_A + n_B)}\left\|\overline{X}_A - \overline{X}_B\right\|^2 \tag{2}$$

where $d_W(A,\ B)$ is the distance between the centroids of the two clusters $\overline{X}_A$ and; A and B are clusters; and n_A, n_B is the number of objects within the clusters.

After the cluster analysis was performed, the gravity model was selected to investigate the international trade between each cluster and Russia. The gravity model is a mathematical model based on Newton's gravitational theory, that states that "the gravitational force between two bodies is proportional to the product of their masses and inversely proportional to the square of the distance between them" (Knox 2011). Usually, the model is used to research import and export issues (Nguyen 2019; Pinilla and Rayes 2019; Shahriar et al. 2019; Riedel and Slany 2019).

The traditional gravity equation explains the bilateral trade flow X_{ij} between countries and is expressed by the following equation (Anderson 2011):

$$X_{ij} = \frac{Y_i \times Y_j}{d_{ij}} \tag{3}$$

where X_{ij} is the bilateral trade flow from country i to country j, Y_i is the economic dimensions of the country I, Y_j is the economic dimensions of the country j, and d_{ij} is the distance between countries i and j

Following the econometric evaluation of the traditional gravity equation, new variables are included in the equation (Fetahu 2014):

$$X_{ij} = G \times \frac{Y_i \times Y_j}{d_{ij}} \times n_{ij} \quad (4)$$

X_{ij} is the volume of trade between the two countries i and j, Y_i is the economic indicator of country I, Y_j is the economic indicator of country j, d_{ij} is the distance between countries i and j, G is Constanta, and n_{ij} is the error term with expectation equal to 1.

The Mellor (1964) gravity model equation was expressed by using the traditional gravity model equation in the calculation of bilateral trade flows by the natural logarithmic function in order to get more accurate results (Doumbe and Belinga 2015):

$$\ln Y_{ij} = \alpha_0 + \alpha_1 \ln X_i + \alpha_2 \ln X_j + \alpha_3 \ln d_{ij} \quad (5)$$

where X_{ij} is a dependent variable; α_0, α_1, α_2, α_3 are coefficients; and X_i, X_j, d_{ij} are independent variables.

According to the theory of gravity equation, an initial gravity equation is proposed, based on which regression analysis is performed:

$$\ln E_t = \alpha_0 + \alpha_1 \ln EUGDP_t + \alpha_2 \ln RUGDP_t + \alpha_3 \ln Pop_t + \alpha_4 \ln Km + \alpha_5 \ln Bor \quad (6)$$

where:

E_t is the export volumes of the European Union products to Russia. The export data variable in the research is the size of the European Union export as a whole and the export size of each European Union country in thousands of dollars.

$EUGDP_t$ is the Gross domestic product of the EU countries. This variable in the research is understood as the gross domestic product of the European Union as a whole or individual EU country in billions of dollars. It is assumed that larger countries tend to be more active in international trade than smaller countries, taking into account the theory of international trade.

$RUGDP_t$ is the Russian gross domestic product. EU exports are believed to be influenced by Russia's macroeconomic situation, which is reflected in GDP.

Pop_t is the population of the EU countries, which allows one to evaluate the size of the market of each country. Countries with more populations are expected to be more active in international trade, but according to the theory of international trade, larger countries may be reluctant to export much.

Km is distance. The variable between countries expresses the geographical distance of the capitals of the 28 EU countries to the Russian capital Moscow. According to the gravity model theory, the further the distance, the smaller the trade, because of transport costs, the convenience of transportation and the closer markets, closer countries are more active in trade.

Bor is a common EU country's border with Russia. This fictitious variable (called pseudo-variable in scientific literature) is expressed as 0 (the country has no common border with Russia) or 1 (the country has a common border with Russia). Countries with a common border are expected to be more active in cross-border trade than countries that do not have a common border.

The expected signs of the slopes are presented in Table 2.

All the variables of the gravity equation are logarithmic. Although the gravity equation is written as a log-log function but based on gravity theory, this function is analysed as a linear regression equation. Various methods are used in the research for regression analysis of the gravity equation. The gravity model significance assessment is made by using the least-squares method, which allows one to estimate the coefficients of independent variables and the significance of the model by minimising residual errors.

Table 2. Expected values of the variables of the gravity equation (designed by author).

Variable	Name of Variable	Expected Values of the Coefficients of Variables
ln*ESGDP*	Logarithmic GDP of EU countries	+
ln*RUGDP*	Logarithmic Russian GDP	+
ln*Pop*	Logarithmic population in EU countries	+/–
ln*Km*	Logarithmic distance between EU countries' capitals and Moscow	–
ln*Bor*	Logarithmic variable that shows a common border with Russia	+

In order to test the validity of the developed equations, several tests were used. In order to test if the data were normally distributed, Kolmogorov–Smirnov and Shapiro–Wilk tests were employed. The Kolmogorov–Smirnov test is the most frequently used test of normality and could be written as follows (Steinskog et al. 2007):

$$d = \sup_x \left| F_0(x) - S_n(x) \right| \tag{7}$$

where d is the Kolmogorov–Smirnov statistic, $F_0(x)$ is the cumulative population distribution under the null hypothesis H_0, and $S_n(x)$ represents an empirical cumulative distribution function.

The Shapiro–Wilk statistic could be defined as a ratio of the best estimator of variance to the corrected sum of squares estimator of the variance (Razali and Wah 2011; Ahad et al. 2011; Shapiro and Wilk 1965):

$$W = \frac{\left(\sum_{i=1}^{n} a_i y_i\right)^2}{\sum_{i=1}^{n} (y_i - \overline{y})^2} \tag{8}$$

where W is the Shapiro–Wilk statistic, $y_i(y_1, \ldots, y_n)$ represents a random sample, and $\overline{y}$ is the sample mean.

$$a_i = (a_1, \ldots, a_n) = \frac{m^T V^{-1}}{(m^T V^{-1} V^{-1} m)^{\frac{1}{2}}} \tag{9}$$

where $m^T = (m_1, \ldots, m_n)$ is the vector of the expected values of standard normal order statistics and $V = n \times n$ is the covariance matrix.

In order to calculate the relationship between the variables, Spearman correlation coefficient was employed. It was selected as the data was not normally distributed. Moreover, the adjusted coefficient of determination (R^2_{adj}) was calculated in order to check the accuracy of the model. Furthermore, the variance inflation factor (VIF) was computed in order to find out if there was a multicollinearity problem.

4. Results and Discussion

According to the gravity model, research was carried out to assess the change in the value of EU exports to Russia due to the Russian embargo on imports. The investigation was based on data from all 28 EU member states for the years 1998–2018. In the article, the equations are based on the data for 1998–2018, and from 2014 the forecasted values were calculated and compared with the real values. The forecasting of the values of ln$EUexpRU_{2014}$, ln$EUexpRU_{2015}$, ln$EUexpRU_{2016}$, ln$EUexpRU_{2017}$, and ln$EUexpRU_{2018}$ of the first group of countries will be performed when the equations of the gravity model of all the groups of countries will be formed, and the suitability of each gravity model for forecasting will be evaluated.

All 28 countries of the European Union are divided into four groups using cluster analysis according to the average for 1998–2018 exports of products to Russia (see Table 3). The dendrogram of cluster analysis is presented in Appendix A. The first group or Cluster 1 countries had the lowest average export of products to Russia, whereas the countries in Group 4 or Cluster 4 had the highest average export. This grouping of countries into clusters allows for a more appropriate gravity equation, as the data for countries with similar export volumes are used for regression analysis. Regression analysis is performed for each group of countries, and a gravitational equation is made for calculating the projected exports of each country's products, for 2014–2018, to Russia.

Table 3. Cluster membership (authors' calculation).

Cluster 1	Cluster 2	Cluster 3	Cluster 4
Latvia	Estonia	Belgium	Germany
Slovenia	Slovak Republic	United Kingdom	
Romania	Denmark	Finland	
Bulgaria	Hungary	Poland	
Greece	Spain	France	
Ireland	Sweden	Netherlands	
Cyprus	Austria	Italy	
Malta	Czech Republic		
Luxemburg	Lithuania		
Portugal			
Croatia			

The regression analysis of the first cluster is based on the data from Latvia, Slovenia, Romania, Bulgaria, Greece, Ireland, Cyprus, Malta, Luxemburg, Portugal, and Croatia for the years 1998–2018. First of all, the normality test of all variables of the first group of countries is performed. After the normality check, the probability p-value for all variables is lower than the significance level α (p-value < 0.05), therefore, the variables are not distributed in the normal distribution (see Table 4).

Table 4. Test of normality of Cluster 1 (authors' calculations).

	Kolmogorov–Smirnov [a]			Shapiro–Wilk		
	Statistic	**df**	***p*-Value**	**Statistic**	**df**	***p*-Value**
ln*EUexpRU*	0.148	230	0.000	0.850	230	0.000
ln*EUGDP*	0.088	230	0.000	0.965	230	0.000
ln*RUGDP*	0.230	230	0.000	0.865	230	0.000
ln*Pop*	0.114	230	0.000	0.924	230	0.000
ln*Km*	0.166	230	0.000	0.900	230	0.000
ln*Bor*	0.533	0.000	0.000	0.325	230	0.000

[a] Lilliefors significance correction.

Correlation analysis of variables is performed after the evaluation of the distribution of the variables according to the normal distribution. Since the data for all variables are not distributed according to the normal distribution, the Spearman correlation coefficient is calculated. There is an average positive correlation between ln*EUexpRU* and ln*EUGDP*, ln*RUGDP*, ln*Pop,* and ln*Bor*. In other words, with the increasing values of ln*EUGDP*, ln*RUGDP,* and ln*Pop* variables, the value of the ln*EUexpRU* increases. Moreover, if a country has a common border with Russia, ln*EUexpRU* also increases. There is an average negative correlation between ln*EUexpRU* and ln*Km*, which shows that the further the distance from Russia, the smaller the export volume.

Later the correlation between the dependent and the independent variables is assessed, the calculated probability p-value of all variables is lower than the significance level α (p-value < 0.05), and therefore there is a statistically significant linear relationship between these variables.

The least-squares method is used to assess the significance of the model and its variables. The probabilities of all independent variables are lower than the significance level α (p-value < 0.05), except ln*Bor*, therefore, ln*Bor* is removed from the model. After recalculation, the probabilities of all independent variables are lower than the significance level α (p-value < 0.05), and therefore it means that these variables are significant. When evaluating the multicollinearity of the variables, the values of VIF of all independent variables are less than 5, therefore, there is no multicollinearity between the variables.

The accuracy of the model is estimated by the calculated adjusted coefficient of determination with a value of R^2_{adj} =0.564. In other words, the variation of independent variables determines 56% of the variation of the dependent variable.

On the basis of the calculated coefficients of independent variables, the gravity model equation is developed as follows:

$$\ln EUexpRU_t = 4.067 + 0.339 \ln EUGDP_t + 0.739 \ln RUGDP_t + 0.638 \ln Pop_t - 2.063 \ln Km \quad (10)$$

This gravity model equation shows that the export volume to Russia of the first group of countries would be 4.067 if other indicators were equal to zero. However, other indicators cannot be equal to zero, and it means that this number anchors the regression line in the right place. Furthermore, if the GDP of the first group of countries were to increase by one unit, export volume to Russia of the first group of countries would increase by 0.339 units. Additionally, if the GDP of Russia were to increase by one unit, export volume to Russia of the first group of countries would increase by 0.739 units. Moreover, if the population of the first group of countries were to increase by one unit, export volume to Russia of the first group of countries would increase by 0.638 units. However, if the distance between the first group of countries and Russia were to increase by one unit, export volume to Russia of the first group of countries would decrease by 2.063 units. To summarise, the changes in distance between countries and Russia would make the most significant changes in export volume to Russia of the first group of countries.

Similarly, to the case of Cluster 1 of countries, a regression analysis of the second group (or Cluster 2) is performed. Cluster 2 includes Estonia, Slovak Republic, Denmark, Hungary, Spain, Sweden, Austria, Czech Republic, and Lithuania. After assessing the normality test of the variables of Cluster 2, the data for all variables are not distributed according to the normal distribution, as the probabilities *p*-values are below the significance level α (see Table 5).

Table 5. Test of normality of Cluster 2 (authors' calculations).

	Kolmogorov–Smirnov [a]			Shapiro–Wilk		
	Statistic	**df**	***p*-Value**	**Statistic**	**df**	***p*-Value**
ln*EUexpRU*	0.100	189	0.000	0.956	189	0.000
ln*EUGDP*	0.075	189	0.011	0.974	189	0.001
ln*RUGDP*	0.230	189	0.000	0.865	189	0.000
ln*Pop*	0.216	189	0.000	0.899	189	0.000
ln*Km*	0.266	189	0.000	0.843	189	0.000
ln*Bor*	0.481	189	0.000	0.513	189	0.000

[a] Lilliefors significance correction.

The correlation analysis of the variables shows that there is an average positive correlation between ln*EUexpRU* and ln*EUGDP*, *lnRUGDP*, and ln*Pop*. There is a weak positive correlation between ln*EUexpRU* and ln*Km*, and there is a weak negative correlation between ln*EUexpRU* and ln*Bor*. In assessing the significance of the correlations between variables, there is a statistically significant linear relationship between ln*EUexpRU* and ln*EUGDP*, ln*RUGDP*, and ln*Pop*. There is no statistically significant linear relationship between ln*EUexpRU* and the independent variables ln*Km* and ln*Bor*; therefore, it should be removed from the model. After the recalculation, in Table 6, it is seen that the probability of ln*Pop* and ln*EUGDP* are higher than the significance level α (p-value < 0.05). Although there are two insignificant variables in the model, only one variable is removed from the model until all variables become significant, ln*Pop* is removed from the model.

Table 6. Regression of ordinary least squares of Cluster 2 (authors' calculations).

Coefficients [a]			
Model *	**Unstandardised Coefficients**		***p*-Value**
	B	**Std. Error**	
(Constant)	−0.512	1.044	0.624
ln*EUGDP*	0.093	0.047	0.051
ln*RUGDP*	0.969	0.047	0.000
ln*Pop*	0.017	0.068	0.801

[a] dependent variable, ln*EUexpRU* and * initial model.

After recalculation, the probabilities of other independent variables, ln*EUGDP* and ln*RUGDP*, are lower than the significance level α (p-value < 0.05); therefore, variables are significant. For multicollinearity, all VIF values are less than 5, so there is no multicollinearity between the variables.

The model accuracy estimation shows that the model's accuracy is 79%, as the calculated corrected determination factor $R^2_{adj} = 0.786$. In other words, the variation of independent variables determines 79% dependent variable variation.

On the basis of the calculated coefficients of independent variables, the gravity equation of the second group (or Cluster 2) of countries is formed:

$$\ln EUexpRU_t = -0.289 + 0.103 \ln EUGDP_t + 0.964 \ln RUGDP_t \tag{11}$$

This gravity model equation shows that the export volume to Russia of the second group of countries would be −0.289 if other indicators were equal to zero, although other indicators cannot be equal to zero and it means that this number anchors the regression line in the right place. Furthermore, if the GDP of the second group of countries were to increase by one unit, export volume to Russia of the second group of countries would increase by 0.103 units. In addition, if the GDP of Russia were to increase by one unit, export volume to Russia of the second group of countries would increase by 0.964 units. It shows that the changes in the GDP of Russia would make the most significant changes in export volume to Russia of the second group of countries.

After performing the gravity model equation of the second group of countries, a regression analysis of Cluster 3, including Belgium, United Kingdom, Finland, Poland, France, Netherlands, and Italy is performed. When assessing the normality of the variables in the third group (Cluster 3), it was found that all variables were not normally distributed (see Table 7).

Table 7. Test of normality of Cluster 3 (authors' calculations).

	Kolmogorov–Smirnov [a]			**Shapiro–Wilk**		
	Statistic	**df**	***p*-Value**	**Statistic**	**df**	***p*-Value**
ln*EUexpRU*	0.106	146	0.000	0.950	146	0.000
ln*EUGDP*	0.127	146	0.000	0.923	146	0.000
ln*RUGDP*	0.230	146	0.000	0.865	146	0.000
ln*Pop*	0.231	146	0.000	0.826	146	0.000
ln*Km*	0.363	146	0.000	0.703	146	0.000
ln*Bor*	0.449	146	0.000	0.567	146	0.000

[a] Lilliefors significance correction.

Between ln*EUexpRU* and the independent variables ln*EUGDP*, ln*RUGDP*, and ln*Pop* is an average positive correlation. There is a weak negative correlation between ln*EUexpRU* and, ln*Km*, ln*Bor*. When evaluating the correlation between the variables, it was found that a statistically significant linear relationship exists between ln*EUexpRU* and ln*EUGDP*, ln*RUGDP*, ln*Pop* as the calculated probabilities are lower than the significance level α (p-value < 0.05). There is no statistically significant linear relationship between ln*EUexpRU* and ln*Km*, ln*Bor* because probabilities are higher than the significance level α (p-value < 0.05). These variables are removed from the model.

When assessing the parameters of the model variables, the probability of independent variables ln*EUGDP* and ln*Pop* are higher than the significance level α (p-value < 0.05), therefore, all these variables are insignificant (see Table 8). Although there are two insignificant variables in the model, only one variable is removed from the model until all variables become significant.

Table 8. Regression of ordinary least squares of Cluster 3 (authors' calculations).

Coefficients [a]			
Model *	**Unstandardised Coefficients**		***p*-Value**
	B	**Std. Error**	
(Constant)	3.065	0.812	0.000
ln*EUGDP*	0.105	0.059	0.075
ln*RUGDP*	0.800	0.043	0.000
ln*Pop*	−0.012	0.059	0.834

[a] dependent variable, ln*EUexpRU* and * initial model.

The insignificant ln*Pop* variable is selected to remove from the model. After removing the variable, the parameters of the model variables are recalculated. After the recalculation, the probabilities of the model variables, ln*EUGDP* and ln*RUGDP*, are lower than the significance level α (p-value < 0.05), and therefore, these variables are significant. The VIF values of these variables are less than 5; therefore, there is no multicollinearity between the variables.

The adjusted determination coefficient of the gravity model of the third group of countries is R^2_{adj} = 0.776. The accuracy of the model is 78%; therefore, the model is not entirely accurate.

On the basis of the estimated significant variables of the model and their estimated coefficients, a gravity model equation of the third group of countries is formed:

$$\ln EUexpRU_t = 2.948 + 0.095 \ln EUGDP_t + 0.803 \ln RUGDP_t \quad (12)$$

This gravity model equation shows that the export volume to Russia of the third group of countries would be 2.948 if other indicators were equal to zero. However, other indicators cannot be equal to zero, and it means that this number fixes the regression line in the right place. Furthermore, if the GDP of the third group of countries were to increase by one unit, export volume to Russia of the third group of countries would increase by 0.095 units. Moreover, if the GDP of Russia were to increase by one unit, export volume to Russia of the third group of countries would increase by 0.803 units. It could be concluded that the changes in the GDP of Russia would make the most significant changes in export volume to Russia from the third group of countries.

Finally, the analysis of Cluster 4 (Group 4) is carried out. The fourth group includes only Germany. The average export of products of this country to Russia, compared to other EU countries, is highest.

The variables ln*Km* and ln*Bor* are removed from the model because there is only one country in this group; therefore, distance and border are the same throughout the period, and there is no point putting it into the model. After assessing the normality test of the variables of the fourth group country, it was found that all variables were not normally distributed (see Table 9).

Table 9. Test of normality of Cluster 4 (authors' calculations).

	Kolmogorov–Smirnov [a]			Shapiro–Wilk		
	Statistic	**df**	***p*-Value**	**Statistic**	**df**	***p*-Value**
ln*EUexpRU*	0.163	21	0.147	0.901	21	0.036
ln*EUGDP*	0.248	21	0.002	0.861	21	0.007
ln*RUGDP*	0.226	21	0.006	0.874	21	0.011
ln*Pop*	0.267	21	0.000	0.815	21	0.001

[a] Lilliefors significance correction.

The correlation analysis of the variables showed that there is a strong positive correlation between ln*EUexpRU* and the independent variables ln*EUGDP* and ln*RUGDP*. Between ln*EUexpRU* and ln*Pop*, there is an average negative correlation. There is a statistically significant linear relationship between ln*EUexpRU* and ln*EUGDP*, ln*EUGDP* independent variables when estimating the correlation relationship, as the calculated probabilities are below the significance level. There is no statistically significant linear relationship between ln*EUexpRU* and ln*Pop*; therefore, it is removed from the model.

During the evalution of the parameters of the model variables, it was found that the *lnRUGDP* variable is significant (see Table 10). The probability of the ln*EUGDP* variable is higher than the significance level α (p-value < 0.05); therefore, this variable is insignificant. This variable is removed from the model.

Table 10. Regression of ordinary least squares of Cluster 4 (authors' calculations).

Coefficients [a]			
Model *	**Unstandardised Coefficients**		***p*-Value**
	B	**Std. Error**	
(Constant)	10.260	5.422	0.075
ln*EUGDP*	−0.511	0.498	0.319
ln*RUGDP*	1.039	0.155	0.000

[a] dependent variable, lnEUexpRU and * initial model.

When the variables are recalculated, the probability of ln*RUGDP* variable is lower than the significance level; therefore, the variable is significant. When evaluating multicollinearity, the VIF value of the ln*RUGDP* variable is lower than 5; therefore, there is no multicollinearity between the variables. According to the date of the model of the fourth group of countries, the adjusted determination coefficient $R^2_{adj} = 0.956$. Therefore, the model accuracy is 96%.

According to the calculated coefficients of variables, the equation of the fourth group of the gravity model is formed as:

$$\ln EUexpRU_t = 4.729 + 0.886 \ln RUGDP_t \tag{13}$$

This gravity model equation shows that the export volume to Russia of the fourth group of countries would be 4.729 if other indicators would be equal to zero, although other indicators cannot be equal to zero and it means that this number fixes the regression line in the right place. Moreover, if the GDP of the fourth group of countries were to increase by one unit, the export volume to Russia of the fourth group of countries would increase by 0.886 units. In addition, the changes of this indicator would make the most significant changes in export volume to Russia of the fourth group of countries, as it is the only significant indicator in this gravity model.

When the equations of the gravity model of all four groups of countries are formed, the suitability of the models for forecasting according to residual errors is evaluated. For all four gravity models, the residual errors average is equal to zero. After checking the normality of residual errors, the probability of residual errors is equal to zero, which is less than the significant level. In other words, errors are distributed by a normal distribution. Moreover, the autocorrelation of model errors is evaluated. According to the autocorrelation graphs, remaining errors in all models come out of boundaries; therefore, there is autocorrelation. After evaluated all Gauss–Markov's assumptions, it can be said that predictions based on the computed gravity equations cannot be relied on entirely. These forecasts, based on retrospective data, would reflect export trends and help to assess the impact of the embargo on EU exports.

By compiling the gravity equation for each group of countries and evaluating the suitability of the models for forecasting $\ln EUexpRU_{2014}$, $\ln EUexpRU_{2015}$, $\ln EUexpRU_{2016}$, $\ln EUexpRU_{2017}$, and $lnEUexpRU_{2018}$, forecasting of all European Union countries is performed according to the gravity equations and time series method. For each country, $\ln EUexpRU_{2014}$, $\ln EUexpRU_{2015}$, $\ln EUexpRU_{2016}$, $\ln EUexpRU_{2017}$, and $\ln EUexpRU_{2018}$ prediction is performed according to the gravity equation of the group of countries for which the country was assigned.

For each country, export forecasts for 2014–2018 are made using the time series moving average model and the exponential smoothing method. These two methods are used to assess which model calculates the predicted (theoretical) export values as similar to the actual values. According to the method, which forecasted export values would correspond to the actual values, the export forecast for 2019 is performed.

Before calculation, the predicted values of independent variables of gravity equations are calculated. The values of $\ln Km$ and $\ln Bor$ do not change at different times, therefore, the values of these variables always remain the same. The $\ln EUGDP$, $\ln RUGDP$, and $\ln Pop$ forecasts for 2014–2018 are calculated for each country by both methods, and the results can be found in Appendix B.

Two predicted values of $\ln EUexpRU_{2014}$, $\ln EUexpRU_{2015}$, $\ln EUexpRU_{2016}$, $\ln EUexpRU_{2017}$, and $lnEUexpRU_{2018}$ for each country are calculated. These calculated values show what countries' export volumes could be based on retrospective information and without underestimating the impact of the embargo. The estimated predicted values $\ln EUexpRU_{2014}$, $\ln EUexpRU_{2015}$, $\ln EUexpRU_{2016}$, $\ln EUexpRU_{2017}$, and $\ln EUexpRU_{2018}$ are compared with actual values of European Union countries' export to Russia (see Appendix B). The values of the predicted independent variables which are calculated by the moving average method are more similar to the actual export values. For further analysis, only those $\ln EUexpRU_{2014}$, $\ln EUexpRU_{2015}$, $\ln EUexpRU_{2016}$, $\ln EUexpRU_{2017}$, and $\ln EUexpRU_{2018}$ values whose predicted values of independent variables are calculated using the moving average method are used.

After calculating the predicted $\ln EUexpRU_{2014}$, $\ln EUexpRU_{2015}$, $\ln EUexpRU_{2016}$, $\ln EUexpRU_{2017}$, and $\ln EUexpRU_{2018}$ export values of each country, they are compared to the actual export values. The negative difference between actual and predicted values means that based on the gravity model, the predicted exports were higher than the actual ones. In other words, the country exported less than it could export theoretically. This negative difference can be described as a country's export loss due to the Russian embargo, as countries could not export as much as they could have if Russia had not applied the import embargo.

Figure 1 shows the average of export differences of the first group countries for 2014–2018. The actual exports of Bulgaria, Croatia, Cyprus, Greece, Ireland, Latvia, Luxembourg, Malta, Portugal, Romania, and Slovenia were lower than predicted, resulting in export losses for these countries. Romania suffered the most significant loss (about $13 million). It cannot be concluded that all these countries suffered such significant losses because the model is not very accurate. The variation of independent variables determines only 56% of the variation of the dependent variable.

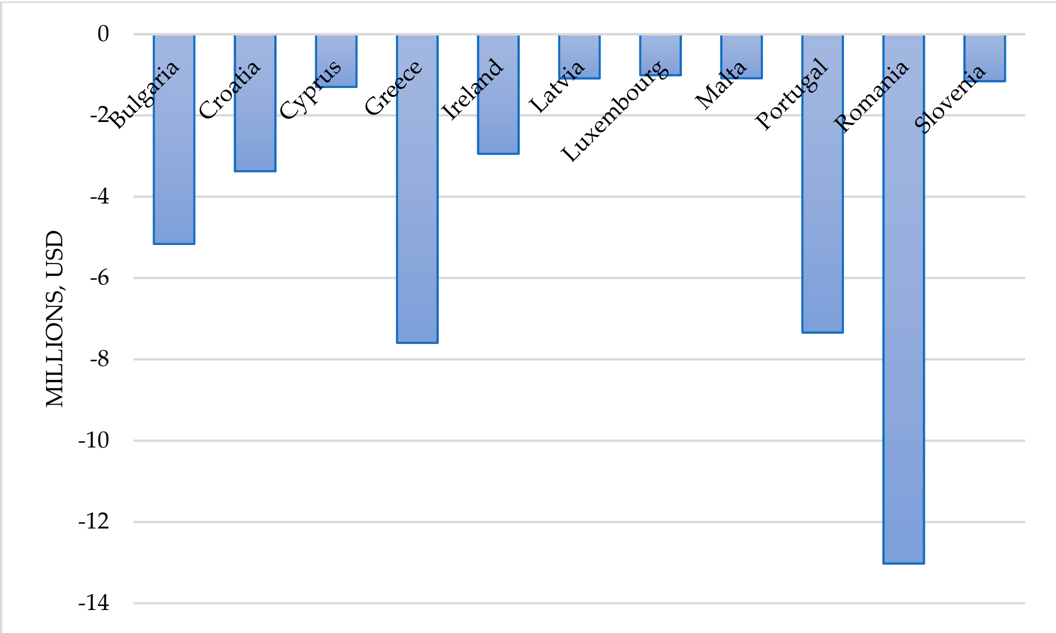

Figure 1. The average export differences of the first group countries for 2014–2018, USD (designed by authors).

Only Denmark suffered export losses from the second groups of countries (Figure 2). The actual exports of Austria, Czech Republic, Estonia, Hungary, Lithuania, Slovak Republic, Spain, and Sweden, for 2014–2018, were higher than expected, and the embargo had no negative impact on the export of products to Russia. According to the gravitational equation, Lithuania's export forecast for 2014–2018 was lower than actual exports. Thus, Lithuania did not suffer export losses. Although Lithuania has almost stopped exporting some of its products to Russia, the embargo did not have a negative impact on the entire export of Lithuanian products.

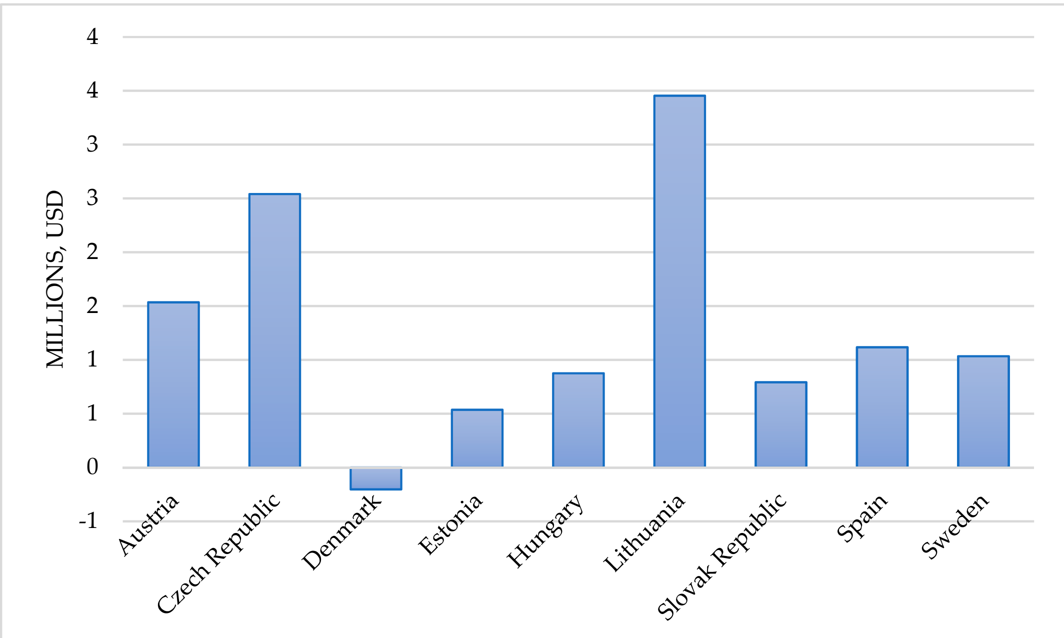

Figure 2. The average export differences of the second group countries for 2014–2018, USD (designed by authors).

The actual exports of Belgium, Finland, France, Italy, Netherlands, Poland, United Kingdom, and Germany, for 2014–2018, were higher than expected, and the embargo had no negative impact on the export of products to Russia (Figure 3). The difference in Germany is the biggest because, before the embargo, Germany's export to Russia was considerable and, after the embargo, Germany suffered significant losses, which explains why its forecast export is small. Although Germany lost a lot, it recovered quite fast, it started to export different production to Russia, and that is why its actual export remained large.

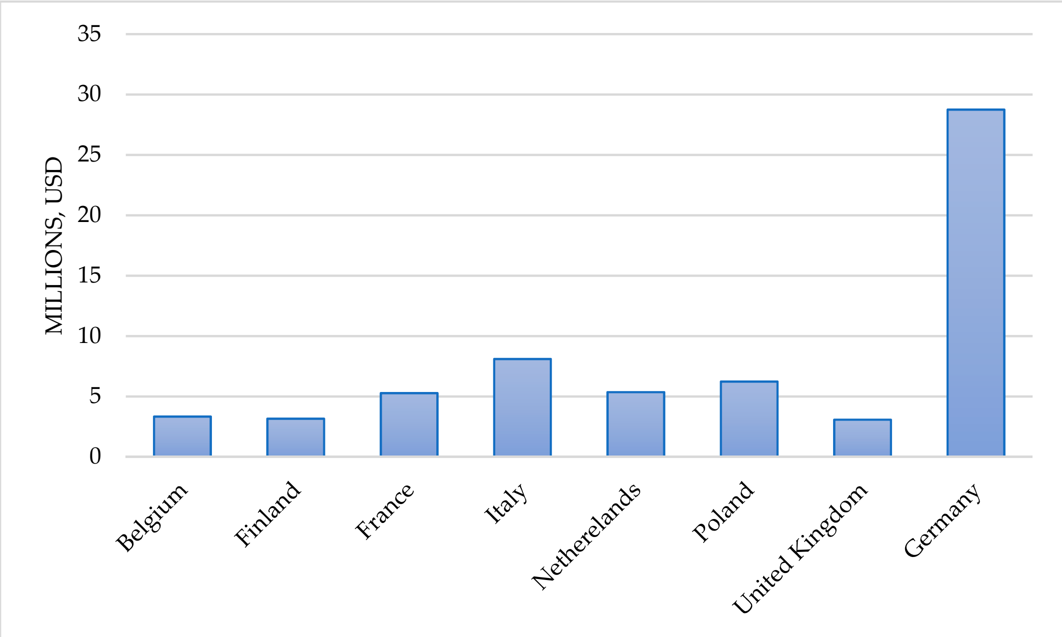

Figure 3. The average of export differences of the third and fourth group countries for 2014–2018, USD (made by author).

According to the European Union export variation for 2014–2018, the total loss of exports of products to Russia by all European Union countries amounted to USD 226,850 million.

It should be noted that the analysis of the export data of the products covered all the products. Therefore, these data cannot be understood as the loss caused only by the embargo of certain products announced by Russia. The embargo, of course, had the most significant impact on the decrease in exports of products to Russia, but other factors could have contributed to the decline in exports. Because none of the gravity models formed was 100% accurate, it can be concluded that the various factors not included in the gravity model also influenced the change in export volumes.

Taking into account the export losses of the European Union countries for 2014–2018, the most significant export losses were made by the countries that exported the least products to Russia, before the embargo was issued, because they did not try to find a solution. Countries that exported a lot before the embargo found a solution to recover. Most of them started to export different products for which the embargo was not imposed. Germany's export difference between actual and forecasted values for 2014–2018 was the highest in all EU countries because it was the largest exporter to Russia and, after the embargo, it suffered significant losses, forecasted values fell, but Germany recovered quite fast. Austria, Czech Republic, Estonia, Hungary, Lithuania, Slovak Republic, Spain, Sweden, Belgium, Finland, France, Italy, Netherlands, Poland, United Kingdom, and Germany did not suffer significant losses because of the embargo. In summary, the Russian embargo on imports has not had a negative impact on almost all countries of the European Union looking through a long-time perspective.

5. Conclusions

After an analysis of the theoretical aspects of the influence of political decisions on a country's economic relations, we conclude that economic relations and politics are strongly related. Economic relations can be analysed through economic indicators such as gross domestic product (GDP), imports, exports, foreign direct investments (FDI), and others. According to the scientific articles, political decisions can be divided into the following groups: agreements and memberships in organisations, embargos and sanctions, help for local businesses, and changes in domestic policy. Political decisions can have negative, positive or both negative and positive impacts. Moreover, political decisions can have an effect at a national, global or national and global level, and also an effect on the economy, society, or relations with other countries.

The analysis of international trade between the European Union and Russia requires an assessment of the significant gravity model factors. The gravity model helps to evaluate the impact of the embargo on EU exports and to make a prospective analysis. This model is used to analyse trade flows by selecting geographic, demographic, and economic variables of the model. The research consists of two parts. In the first part of the study, the correlation and regression analysis of the gravity equation is performed. In addition, the adjusted gravity equation is made, according to which the forecasts of the export volumes of each EU country to Russia for 2014–2018 are performed by using moving average and exponential smoothing methods. The projected export volumes are compared with the actual export volumes, and the impact of the embargo on each country's exports is assessed. EU countries are divided into groups by using cluster analysis to evaluate the effect of the embargo on each country. In the second part of the research, according to the equation of the gravity model, forecasting of export of products of every EU country to Russia is made for 2019 by using the moving average method.

The theoretical values of European Union exports to Russia for 2014–2018 were calculated by using the gravity method and compared with the actual values. It is estimated that the most significant export losses were made for the countries that exported the least number of products to Russia before the embargo was issued. Germany's export difference between actual and forecasted values for 2014–2018 was the highest in all EU countries because it was the largest exporter to Russia. After the embargo, it suffered significant losses, forecasts fell, but Germany recovered quite fast. Austria, Czech Republic, Estonia, Hungary, Lithuania, Slovak Republic, Spain, Sweden, Belgium, Finland, France, Italy, Netherlands, Poland, United Kingdom, and Germany did not suffer significant losses due to the embargo.

The results of the study could be useful for the EU countries public authorities that want to investigate the current state or predict future export volumes.

The current study has several limitations. The research reflects only the impact of the embargo on exports, while other factors may also affect export volumes. Moreover, due to the lack of data, the study assesses the export of all sectors.

6. Future Research Directions

To evaluate embargo impact more precisely other factors that could affect export volume should be assessed. Moreover, in future research, different export sectors could be evaluated separately, and analysis of the effect of a different factor on each industry could be conducted.

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Appendix A

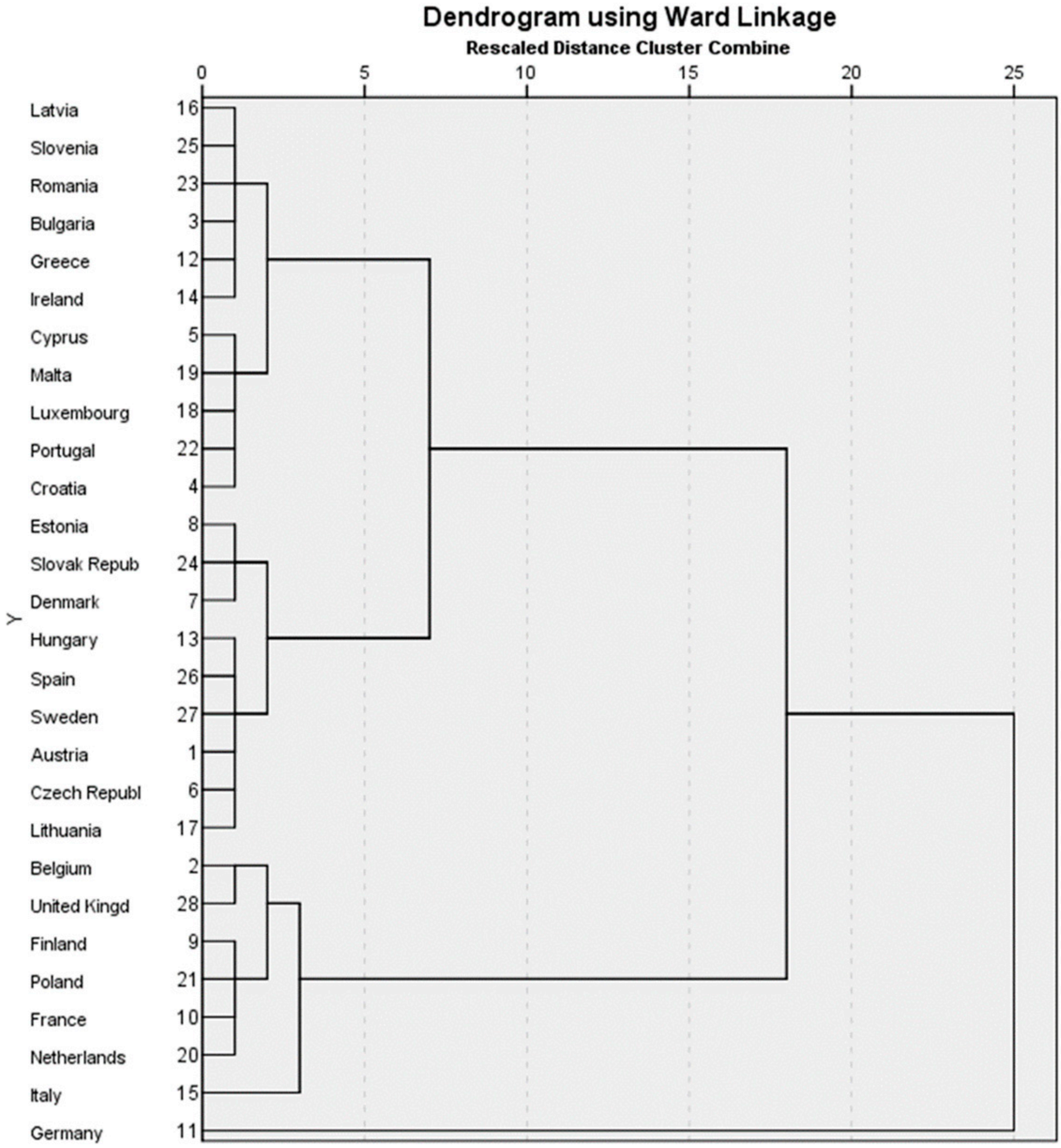

Figure A1. Dendrogram.

Appendix B

Table A1. Comparison of estimated predicted values with actual values of European Union countries' export to Russia.

Country	Year	Forecasted Values by Moving Average Method			Forecasted Values by Exponential Smoothing Method		
		FEUGDP	FRUGDP	Fpop	FEUGDP	FRUGDP	Fpop
Austria	2014	321,734.1	1,068,511	8,203,226	218,557.00	290,231.00	8,415,917.06
	2015	328,849.6	1,126,632	8,221,141	218,557.00	290,231.00	8,461,851.53
	2016	331,802.3	1,139,803	8,241,352	218,557.00	290,231.00	8,523,388.76
	2017	335,087.2	1,147,322	8,265,516	218,557.00	290,231.00	8,611,929.88
	2018	339,216.5	1,168,877	8,290,883	218,557.00	290,231.00	8,692,397.44
Belgium	2014	391,076.3	1,068,511	10,561,664	260,952.00	290,231.00	1,1057,617.29
	2015	399,345.4	1,126,632	10,598,086	260,952.00	290,231.00	1,1119,228.65
	2016	402,496.6	1,139,803	10,633,597	260,952.00	290,231.00	1,1178,251.32
	2017	406,045.7	1,147,322	10,669,256	260,952.00	290,231.00	1,1244,684.16
	2018	410,531.3	1,168,877	10,703,379	260,952.00	290,231.00	1,1298,205.58
Bulgaria	2014	34,320.94	1,068,511	7,722,006	13,227.00	290,231.00	7,329,212.68
	2015	35,644.12	1,126,632	7,693,987	13,227.00	290,231.00	7,287,444.84
	2016	36,452.83	1,139,803	7,666,665	13,227.00	290,231.00	7,244,821.42
	2017	37,336.16	1,147,322	7,639,671	13,227.00	290,231.00	7,199,302.71
	2018	38,386.1	1,168,877	7,612,781	13,227.00	290,231.00	7,150,580.85
Croatia	2014	45,177.25	1,068,511	4,341,468	25,346.00	290,231.00	4,274,680.10
	2015	45,912.88	1,126,632	4,335,900	25,346.00	290,231.00	4,260,744.55
	2016	46,113.22	1,139,803	4,329,756	25,346.00	290,231.00	4,243,030.28
	2017	46,403.21	1,147,322	4,322,436	25,346.00	290,231.00	4,216,849.64
	2018	46,843.1	1,168,877	4,314,025	25,346.00	290,231.00	4,185,531.32
Cyprus	2014	18,990.5	1,068,511	755,207.1	10,251.00	290,231.00	853,295.87
	2015	19,249.94	1,126,632	761,253.8	10,251.00	290,231.00	855,647.93
	2016	19,274.44	1,139,803	766,017.9	10,251.00	290,231.00	851,327.97
	2017	19,336.89	1,147,322	770,349.5	10,251.00	290,231.00	849,823.48
	2018	19,479.35	1,168,877	774,572.2	10,251.00	290,231.00	852,312.74
Czech Republic	2014	146,033.7	1,068,511	10,319,019	66,465.00	290,231.00	1,0496,462.46
	2015	149,668.1	1,126,632	10,330,396	66,465.00	290,231.00	1,0504,440.73
	2016	151,732.6	1,139,803	10,341,945	66,465.00	290,231.00	1,0521,357.87
	2017	154,014.6	1,147,322	10,353,097	66,465.00	290,231.00	1,0537,600.43
	2018	157,109.6	1,168,877	10,364,383	66,465.00	290,231.00	1,0558,210.22
Denmark	2014	263,132.6	1,068,511	5,436,804	176,991.00	290,231.00	5,580,072.68
	2015	268,418.5	1,126,632	5,448,006	176,991.00	290,231.00	5,603,653.84
	2016	270,321.6	1,139,803	5,459,768	176,991.00	290,231.00	5,631,684.42
	2017	272,514.5	1,147,322	5,472,793	176,991.00	290,231.00	5,669,467.71
	2018	275,382.1	1,168,877	5,486,592	176,991.00	290,231.00	5,709,118.36
Estonia	2014	15,049.75	1,068,511	1,357,889	5,621.00	290,231.00	1,324,689.73
	2015	15,732.59	1,126,632	1,355,414	5,621.00	290,231.00	1,320,254.37
	2016	16,131.67	1,139,803	1,353,162	5,621.00	290,231.00	1,317,562.18
	2017	16,545.47	1,147,322	1,351,203	5,621.00	290,231.00	1,316,753.09
	2018	17,051.45	1,168,877	1,349,425	5,621.00	290,231.00	1,316,194.05
Finland	2014	206,038.7	1,068,511	5,264,433	134,110.00	290,231.00	5,401,448.84
	2015	209,980.1	1,126,632	5,275,423	134,110.00	290,231.00	5,426,359.42
	2016	211,235.7	1,139,803	5,286,331	134,110.00	290,231.00	5,449,056.21
	2017	212,704.9	1,147,322	5,296,908	134,110.00	290,231.00	5,468,182.11
	2018	214,710.1	1,168,877	5,307,228	134,110.00	290,231.00	5,485,739.55
France	2014	2,188,928	1,068,511	62,857,376	1,505,184.00	290,231.00	6,5281,656.96
	2015	2,228,209	1,126,632	63,038,840	1,505,184.00	290,231.00	6,5611,961.98
	2016	2,239,944	1,139,803	63,228,698	1,505,184.00	290,231.00	6,6034,120.49
	2017	2,251,849	1,147,322	63,413,001	1,505,184.00	290,231.00	6,6382,286.75
	2018	2,268,641	1,168,877	63,591,805	1,505,184.00	290,231.00	6,6685,684.87
Germany	2014	2,923,185	1,068,511	81,898,499	2,246,306.00	290,231.00	8,0618,807.16
	2015	2,980,934	1,126,632	81,831,967	2,246,306.00	290,231.00	8,0693,135.08
	2016	3,003,276	1,139,803	81,796,721	2,246,306.00	290,231.00	8,0945,336.04
	2017	3,029,241	1,147,322	81,816,666	2,246,306.00	290,231.00	8,1560,510.02
	2018	3,062,810	1,168,877	81,851,916	2,246,306.00	290,231.00	8,2041,081.51
Greece	2014	235,079.0	1,068,511	10,956,004	144,644.00	290,231.00	1,1050,265.04
	2015	235,215.9	1,126,632	10,954,287	144,644.00	290,231.00	1,0988,536.02
	2016	233,075.6	1,139,803	10,948,938	144,644.00	290,231.00	1,0923,277.01
	2017	231,087.5	1,147,322	10,940,244	144,644.00	290,231.00	1,0853,512.51
	2018	229,707.8	1,168,877	10,931,642	144,644.00	290,231.00	1,0810,852.75

Table A1. *Cont.*

Country	Year	Forecasted Values by Moving Average Method			Forecasted Values by Exponential Smoothing Method		
		FEUGDP	FRUGDP	Fpop	FEUGDP	FRUGDP	Fpop
Hungary	2014	102,983.6	1,068,511	10,096,655	48,770.00	290,231.00	9,939,455.09
	2015	105,165.9	1,126,632	10,083,755	48,770.00	290,231.00	9,908,410.05
	2016	106,160.8	1,139,803	10,071,078	48,770.00	290,231.00	9,881,990.52
	2017	107,205.4	1,147,322	10,058,415	48,770.00	290,231.00	9,856,237.76
	2018	108,833.2	1,168,877	10,045,373	48,770.00	290,231.00	9,826,899.38
Ireland	2014	13,464.63	1,068,511	4,180,431	8,494.00	290,231.00	4,584,977.59
	2015	13,717.18	1,126,632	4,207,338	8,494.00	290,231.00	4,611,414.79
	2016	13,921.17	1,139,803	4,233,465	8,494.00	290,231.00	4,644,520.90
	2017	14,273.63	1,147,322	4,259,403	8,494.00	290,231.00	4,685,403.45
	2018	14,784.60	1,168,877	4,285,652	8,494.00	290,231.00	4,734,893.22
Italy	2014	1,792,526	1,068,511	58,047,629	1,267,952.00	290,231.00	5,9477,935.80
	2015	1,813,857	1,126,632	58,208,513	1,267,952.00	290,231.00	6,0130,301.90
	2016	1,814,931	1,139,803	58,352,241	1,267,952.00	290,231.00	6,0462,956.95
	2017	1,817,828	1,147,322	58,473,994	1,267,952.00	290,231.00	6,0564,253.98
	2018	1,824,281	1,168,877	58,579,767	1,267,952.00	290,231.00	6,0576,849.49
Latvia	2014	19,297.19	1,068,511	2,234,802	7,178.00	290,231.00	2,051,653.95
	2015	20,008.24	1,126,632	2,221,076	7,178.00	290,231.00	2,026,560.98
	2016	20,395.89	1,139,803	2,208,022	7,178.00	290,231.00	2,006,328.49
	2017	20,780.68	1,147,322	2,195,440	7,178.00	290,231.00	1,987,642.74
	2018	21,267.85	1,168,877	2,183,173	7,178.00	290,231.00	1,968,879.37
Lithuania	2014	28,354.19	1,068,511	3,302,775	11,241.00	290,231.00	3,015,991.65
	2015	29,547.00	1,126,632	3,281,640	11,241.00	290,231.00	2,979,731.82
	2016	30,213.17	1,139,803	3,261,619	11,241.00	290,231.00	2,950,496.91
	2017	30,885.68	1,147,322	3,241,984	11,241.00	290,231.00	2,919,527.46
	2018	31,723.40	1,168,877	3,222,280	11,241.00	290,231.00	2,883,715.73
Luxembourg	2014	40,088.38	1,068,511	470,556.9	19,341.00	290,231.00	525,404.11
	2015	41,624.88	1,126,632	475,211.2	19,341.00	290,231.00	537,542.05
	2016	42,492.00	1,139,803	480.086	19,341.00	290,231.00	550,250.03
	2017	43,360.05	1,147,322	485,147.2	19,341.00	290,231.00	563,249.51
	2018	44,314.10	1,168,877	490,423.2	19,341.00	290,231.00	576,958.26
Malta	2014	6746.19	1,068,511	402,728.9	3,682.00	290,231.00	418,918.35
	2015	7014.18	1,126,632	404,299.2	3,682.00	290,231.00	424,171.17
	2016	7219.00	1,139,803	406,265.4	3,682.00	290,231.00	431,931.09
	2017	7441.47	1,147,322	408,589.1	3,682.00	290,231.00	441,173.04
	2018	7707.10	1,168,877	411,174.5	3,682.00	290,231.00	450,735.02
Netherlands	2014	687,947.3	1,068,511	16,278,185	438,610.00	290,231.00	1,6716,844.41
	2015	699,973.8	1,126,632	16,310,603	438,610.00	290,231.00	1,6773,066.70
	2016	703,622.4	1,139,803	16,343,387	438,610.00	290,231.00	1,6836,896.35
	2017	707,845.1	1,147,322	16,376,847	438,610.00	290,231.00	1,6908,008.18
	2018	714,064.8	1,168,877	16,412,080	438,610.00	290,231.00	1,6994,757.59
Poland	2014	341,270.4	1,068,511	38,213,460	172,050.00	290,231.00	3,8064,910.44
	2015	353,271.2	1,126,632	38,201,954	172,050.00	290,231.00	3,8041,383.22
	2016	360,176.6	1,139,803	38,191,046	172,050.00	290,231.00	3,8023,498.61
	2017	366,053.7	1,147,322	38,179,265	172,050.00	290,231.00	3,7995,353.81
	2018	374,080.8	1,168,877	38,168,950	172,050.00	290,231.00	3,7984,158.90
Portugal	2014	191,397.3	1,068,511	10,440,249	124,159.00	290,231.00	1,0520,884.38
	2015	193,667.8	1,126,632	10,439,488	124,159.00	290,231.00	1,0474,092.69
	2016	193,992.9	1,139,803	10,435,895	124,159.00	290,231.00	1,0424,457.35
	2017	194,643.9	1,147,322	10,430,918	124,159.00	290,231.00	1,0382,893.67
	2018	195,899.1	1,168,877	10,424,851	124,159.00	290,231.00	1,0346,233.34
Romania	2014	114,843.3	1,068,511	21,271,137	42,815.00	290,231.00	2,0120,793.76
	2015	119,830.6	1,126,632	21,193,265	42,815.00	290,231.00	2,0034,052.38
	2016	123,056.4	1,139,803	21,119,787	42,815.00	290,231.00	1,9952,349.69
	2017	126,500.6	1,147,322	21,048,235	42,815.00	290,231.00	1,9856,331.85
	2018	130,745.9	1,168,877	20,978,041	42,815.00	290,231.00	1,9750,340.92
Slovak Republic	2014	58,586.94	1,068,511	5,384,965	22,804.00	290,231.00	5,403,614.15
	2015	61,088.24	1,126,632	5,386,788	22,804.00	290,231.00	5,409,781.58
	2016	62,573.00	1,139,803	5,388,708	22,804.00	290,231.00	5,415,565.29
	2017	64,010.47	1,147,322	5,390,684	22,804.00	290,231.00	5,420,908.64
	2018	65,600.4	1,168,877	5,392,917	22,804.00	290,231.00	5,428,125.82
Slovenia	2014	37,403.63	1,068,511	2,012,002	22,147.00	290,231.00	2,053,744.93
	2015	38,142.76	1,126,632	2,014,889	22,147.00	290,231.00	2,057,414.96
	2016	38,419.5	1,139,803	2,017,555	22,147.00	290,231.00	2,060,144.48
	2017	38,747.95	1,147,322	2,020,010	22,147.00	290,231.00	2,062,166.24
	2018	39,238.2	1,168,877	2,022,304	22,147.00	290,231.00	2,064,030.62

Table A1. *Cont.*

Country	Year	Forecasted Values by Moving Average Method			Forecasted Values by Exponential Smoothing Method		
		FEUGDP	FRUGDP	Fpop	FEUGDP	FRUGDP	Fpop
Spain	2014	1,114,730	1,068,511	43,605,775	616,885.00	290,231.00	4,6654,103.53
	2015	1,130,281	1,126,632	43,776,741	616,885.00	290,231.00	4,6583,151.27
	2016	1,134,137	1,139,803	43,925,231	616,885.00	290,231.00	4,6516,358.13
	2017	1,139,604	1,147,322	44,057,593	616,885.00	290,231.00	4,6478,228.57
	2018	1,148,471	1,168,877	44,181,065	616,885.00	290,231.00	4,6502,633.78
Sweden	2014	402,284.1	1,068,511	9,104,902	267,225.00	290,231.00	9,483,755.09
	2015	412,409.3	1,126,632	9,136,664	267,225.00	290,231.00	9,564,309.54
	2016	417,170.9	1,139,803	9,170,591	267,225.00	290,231.00	9,655,832.27
	2017	422,172.7	1,147,322	9,206,403	267,225.00	290,231.00	9,753,424.64
	2018	427,844.4	1,168,877	9,245,841	267,225.00	290,231.00	9,874,288.82
United Kingdom	2014	2,311,879	1,068,511	60,732,315	1,641,822.00	290,231.00	6,3459,803.01
	2015	2,354,493	1,126,632	60,945,188	1,641,822.00	290,231.00	6,3905,479.01
	2016	2,384,635	1,139,803	61,163,520	1,641,822.00	290,231.00	6,4390,322.00
	2017	2,399,608	1,147,322	61,385,574	1,641,822.00	290,231.00	6,4886,439.00
	2018	2,411,626	1,168,877	61,606,724	1,641,822.00	290,231.00	6,5347,506.00

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