sciendo

Acta Universitatis Bohemiae Meridionalis, Vol 23, No 1 (2020), DOI 10.2478/acta-2020-0002, ISSN 2336-4297 (online)

Influence of Russian Sanctions on Agricultural Trade between Russia and the European Union

Stanislava Kontsevaya, Luboš Smutka

Konsevaya Stanislava, PhD, Economics Department, Czech University of Life Sciences, Prague, Kamycka 129,165 21, Czech Republic.
Email: s.konsevaya@gmail.com

Professor Luboš Smutka, PhD, Head of the Department of Finance and Trade, Czech University of Life Sciences, Prague, Kamycka 129,165 21, Czech Republic. Email: smutka@pef.czu.cz

Abstract: The European Union is Russia's largest agricultural trading partner, and this cooperation has a long history. The imposition of sanctions on certain product groups in 2014 significantly affected trading relations. A gravity model helps us to understand and evaluate the characteristics of agricultural trade between countries. The aim of the research is to compare the agricultural trade flow between Russia and the European Union for the period 2000-2017, find some regularity, and estimate the influence of Russian sanctions using regression models for each European country and for particular types of agricultural products. The dataset sample consists of 12,096 observations and 29 countries. The gravity model of the dependence on Russia of imports and exports from each European country takes into account such variables as GDP (US dollar), distance (km) and dummies (a common border, common language, common history and seaport availability). The findings of the research are as follows: the classical gravity model is feasible for imports from Russia to EU countries. Thus, the smaller the distance between countries, the greater the trade flow between them, and the larger the GDP of both countries, the greater the trade flow between them. In addition, the gravity model is feasible not only for countries, but also for the particular group of products. The results of the cluster analysis show the impact of sanctions on each of 24 groups of products imported into Russia (not just those products that have been under Russian sanctions). It is possible to say that the impact of sanctions is deeper than previously thought.

Keywords: gravity model, international trade, panel data

JEL Classification**:** Q1 F1 F510

DOI: 10.2478/acta-2020-0002

1 Introduction

In recent decades, the globalization of economic processes has continued, and international trade has been growing continuously, faster than output. The creation of the GATT, then WTO and other forms of preferential trade agreements, and the establishment of international institutions to facilitate and promote trade, one way or another, simplify the exchange of products and services. The international trade process, representing alternative production technology, modifies and internationalizes traditional technologies. The global model of production is becoming more and more familiar. Its various intermediate components are produced in different countries on different continents, and many large manufacturing firms became transnational a long time ago. Almost all countries, except for Cuba, North Korea and Iran, are actively involved in international trade. The recent economic crisis has revealed that although such a model of the global economy implies greater diversification, serious problems of the key trade participants will be transferred along the product chain to almost all economies in the world. In such circumstances, it is critical to understand the mechanisms and limitations of international trade in agricultural products, as well as the factors that affect the volume and direction of trade flows. Exploring trade flows and testing the hypothesis about the application of the gravity model in relation to agriculture will help us to understand the patterns that govern agricultural trade between Russia and the EU countries.

Traditionally, gravity models were used in international trade (utilizing pooled ordinary least squares approach), but Koo (1994) in his work "A gravity model analysis of meat trade policies" proved that for one product, utilization of both pooled and time sampling is more efficient. Using the panel data allows countries to take into account both temporary effects and individual characteristics when building their foreign trade relations. Koo was the first to build such a model for the specific product group. The article was devoted to the search for factors influencing the global trade in meat and meat products. The achievement of this article is a theoretical justification for the possibility of using the gravity model for one industry. However, Koo notes the limitations of using such a model. He argues that utilization of the gravity model for one product or one product group is possible only when using panel data. Previously, his gravity model was commonly built for spatial sampling. Assessment of meat trade flows between countries proved that the control variables, such as income and distance, remained significant regardless of the products. The optimal model in the study was a model with deterministic individual effects. An additional verification criterion, in addition to the Hausman and Breusch-Pagan tests, was the introduction of a dummy variable for individual meat exporting countries. More recent studies have also built a gravity model for estimating tourist flows (Mehmet, 2010), the trade in services (Keith, 2006), and the wine trade (Dascal 2002).

Dascal's paper "An analysis of the EU wine trade" was based on Koo's theoretical background for building the gravity model for the wine trade. In their work, the researchers paid attention to the theoretical foundations for building the gravity model of foreign trade. In their work, the authors sought to find factors influencing the export of wine. The analysis included the GDP per capita variables of partner countries, distance, EU membership, wine production index, and exchange rate. As a result of the assessment, it was found that countries with higher GDP per capita export more wine, with an increase in the index of wine production, so wine exports increase. The only unexpected conclusion was that the remoteness of countries has a positive impact on wine exports.

Another important study involved the construction of a gravity model of foreign trade for the agricultural sector of Egypt (Assem, 2005). In this study, the authors focused on the selection of control variables to search for factors influencing foreign trade in the agricultural sector. In their research, they used the UN Comtrade and FAO databases to collect information

on the volume of foreign trade between countries. The top 50 importers of Egypt were selected for the analysis. When analyzing the list of Egypt's trading partners, it was found that the top 96 trading partners of Egypt generated 96.6% of foreign trade, but the top 50 corresponded to 94.5% of trade. As an independent variable for the analysis, the GDP of partner countries and GDP per capita was used in an alternative model, along with the presence of a common state language and a common border, and the distance between capitals. The coefficient of openness of the economy was also used as an experiment. As a result of the analysis, the experimental parameter turned out to be insignificant, GDP per capita had a negative impact on the volume of Egyptian exports to the agro-industrial complex as opposed to GDP, and the presence of Arabic and a common border contributed to an increase in exports. As noted in the article (Mehmet, 2010), when constructing the gravity model, regardless of whether it is common for the industry, the researchers relied on the basic formulation of the gravitational model, supplementing it with the variables of interest.

The aim of the research is to compare the agricultural trade flow between Russia and the European Union for the period 2000-2017, find some regularity, and estimate the influence of Russian sanctions.

Research question – are all countries and all agricultural commodities affected by Russian sanctions?

In order to achieve this aim, the tasks of the research were set as follows:

1) Estimating the current conditions of agricultural trade in Russia and the European Union;

2) Making regression models for countries and for particular types of agricultural products;

3) Making a cluster analysis for a particular group of agricultural products.

2 Methods

The research involves a dataset with data concerning the export and import of agricultural products (24 types) from each of the 28 countries of the EU for 18 years. The data sources are the UN Comtrade, FAOSTAT, and World Bank databases for the period 2000-2017. The data was under cleaning process and check normality. In order to eliminate the influence of inflation, the data was transformed into constant-price form using the annual producer price index from FAOSTAT for import and export trade flows and constant-price GDP. The software STATA 15 was used for calculations. A gravity model was made for the econometric analysis of trade flows. This method is quite popular as its results can be easily compared with intuitive results. The first model was suggested by Timbergen (1962). It was very simple and consisted of import and export trade with variables such as GDP imports, GDP exports and distance.

The suggested model shows a dependence between imports, exports, GDP RU, GDP EU, distance and dummy variables (border, language, history, availability of seaports) (Kontsevaya, 2020).

$$F(\text{agri trade flow}) = Imp_i \times Exp_i \times GDP_i \times GDPru \times D_i \times B_i \times L_i \times H_i \times S_i \times SN_i \quad (1)$$

Where:

i – one of the 28 EU countries

Imp_i – imports from Russia to each of the EU countries in US dollars

Exp_i – exports to Russia from each of the EU countries, US dollars

D_i – distance between the capitals of each EU country and Russia (Moscow or Saint Petersburg), km

B_i – availability of a common border

L_i – related language
H_i – a common history
S_i – availability of seaports
SN_j – sanctions

It should be noted that the variable Distance is the distance between the capital of each EU country and Moscow, excluding four countries – Finland, Estonia, Latvia, and Sweden. In the case of these countries, the distance is taken between the capital and Saint Petersburg. All studies implementing the gravity model as a research method suffer from the approximation of transportation costs. The standard solution is to create proxy variables for the distance between countries and the presence of a common border. In this case, the distance between capitals is taken as the distance between countries, but the distance between capitals does not accurately describe transportation costs. Utilization of these proxies does not allow for an assessment of the quality of road surfaces over which products will be transported, or of tariff and non-tariff restrictions in trade, and it does not reflect transport costs that depend on the delivery of goods by ship, truck or railway. However, there is an alternative approach to solving this problem. The given resource (Dist, 2020) provides an opportunity to calculate the duration of transportation, depending on the type of transport used. Thus, the unit of measurement of transport costs will not be kilometres, but rather travel time, taking into account road surfaces, duration of customs clearance and waiting time at a border. Troekurova (2014) states that this indicator slightly improves the results of the study. However, these improvements are not significant.

Import and export flow data is measured in thousands of US dollars taken from UN Comtrade (2020).

The data on the GDP of Russia and each country of the European Union are taken from the World Bank website (2020); they will be converted into billions of US dollars. It was not possible to use thousands of US dollars as a unit to measure GDP because STATA did not accept such large numbers. During data processing, data on imports, exports and GDP were adapted to 2010 prices by means of the producer price index from the FAO website (2020).

The Border variable indicates the presence of a common border. This dummy variable varies from 0 to 1.

The Language variable indicates the presence of a common language. This variable was used in the work of Troekurova (2014) and is brought about due to the absence of expenses for translating documents and easier communication between partners. The dummy variable varies from 0 to 1.

The History variable was selected due to a common value judgment. It takes into consideration the intensity of interactions between the countries over the past 200 years. For example, Russia and Germany have been interacting quite actively over the past 200 years, whereas Russia and Ireland have had only a few contacts. The dummy variable varies from 0 to 1.

The Sea Port variable indicates access to the sea. Commercial shipping by sea is several times cheaper than shipping by air and or by land. In the author's opinion, it should reduce a country's trade costs significantly.

The gravity model, made in terms of research, presented the dependence of the volume of each of 24 imported/exported products. The used dataset included more than 24,000 observations. Several types of econometric models were used in the research (OLS, GLS).

Various tests were carried out for data heteroscedasticity and missing variables, and for choosing the best model (Ramsey test, White test, Breusch-Pagan test, Hausman test).

3 Results

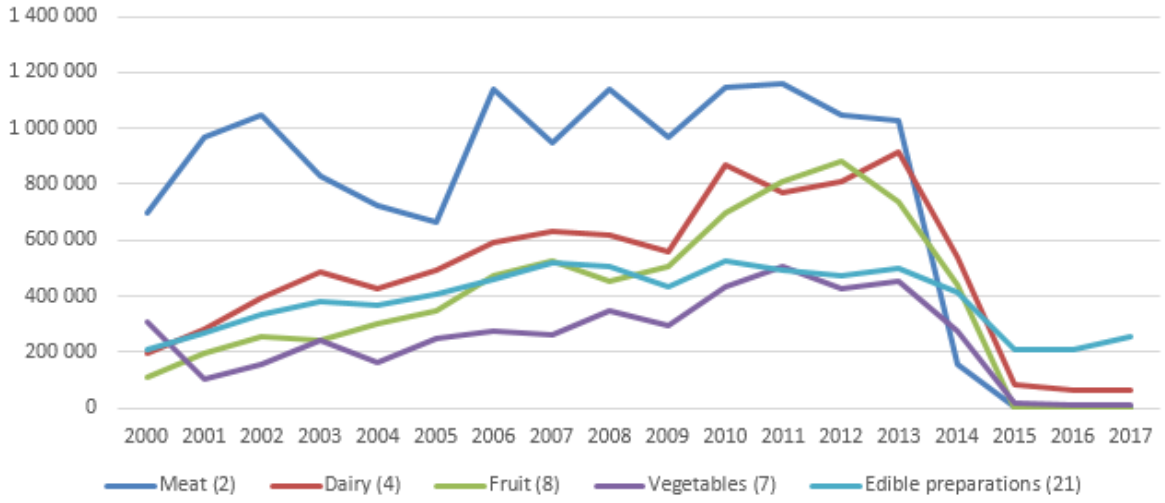
3.1 Influence of Russian Sanctions

On 7 August 2014, Canada, Australia, Norway, the United States and the European Union countries imposed sanctions against Russia, and Russia, in turn, introduced counter-sanctions against Western countries, including an embargo on the supply of certain types of agricultural products (certain types of meat, fish, milk and dairy products, vegetables, fruits and nuts), raw materials and foodstuffs, whose country of origin was the state that made the decision to impose economic sanctions against Russia. This export trade flow diminished as a result, and the import substitution policy that was pursued earlier gained particular importance; it is now one of the key and most relevant areas of agricultural development and will be for the foreseeable future. Meat, dairy products and fruits account for 58.6% of the total banned amount. The European Union is most influenced; Australia, Canada and Norway are less affected.

Despite the fact that the sanctions were not aimed directly at Russian producers of agricultural products, Russian producers benefited from their introduction. This happened because the introduction of sanctions led to a significant weakening of the ruble, and as a result, exporting agricultural products became more profitable. However, the sanctions also led to a drop in competition in the agricultural market, which almost inevitably leads to lower quality. Consumers outside Russia are still more demanding with regard to the quality of products, and therefore it is not surprising that those products that were previously supplied to the Western market also became lower-quality and, accordingly, less attractive to EU consumers (Zhuravleva, 2016).

The three countries that felt the greatest impact from the import ban are Estonia, Latvia and Lithuania. Agricultural trade with Russia accounts for more than 60% of their total agricultural trade. For countries from the former Eastern Bloc (Poland, the Slovak Republic, Hungary and the Czech Republic) and their close neighbor, Finland, this agricultural trade accounts for only 20%. For the remaining EU countries, the share of Russian exports is less than 10%; this amount is relatively small and can be easily redistributed to other countries. Figure 1 presents the commodities most affected by the Russian ban – meat, dairy, fruits and vegetables, which account for 80% of the total amount of banned agricultural products.

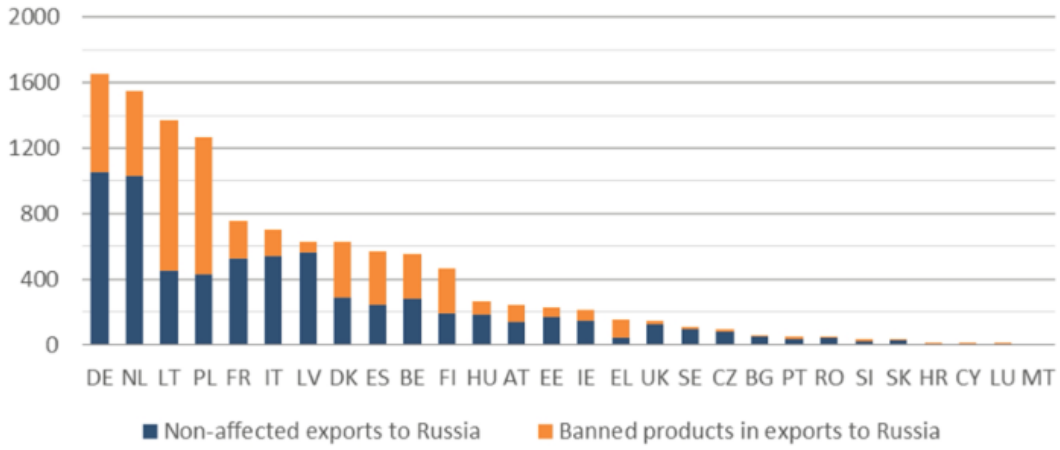
Figure 1: Five banned products accounted for 80% of the Russian ban (millions of US dollars)



Source: Comtrade database, author's own calculation

As can be observed in Figure 1, all products showed a dramatic drop but meat and dairy were most affected. In Russia, however, meat was substituted with imported products from Paraguay, Brazil and Belarus. More than half the import trade flow from Latvia and Poland to Russia consisted of banned products (see Figure 2).

Figure 2: Share of banned products in exports to Russia in 2013 (millions of Euros)



Source: (Smutka, 2014)

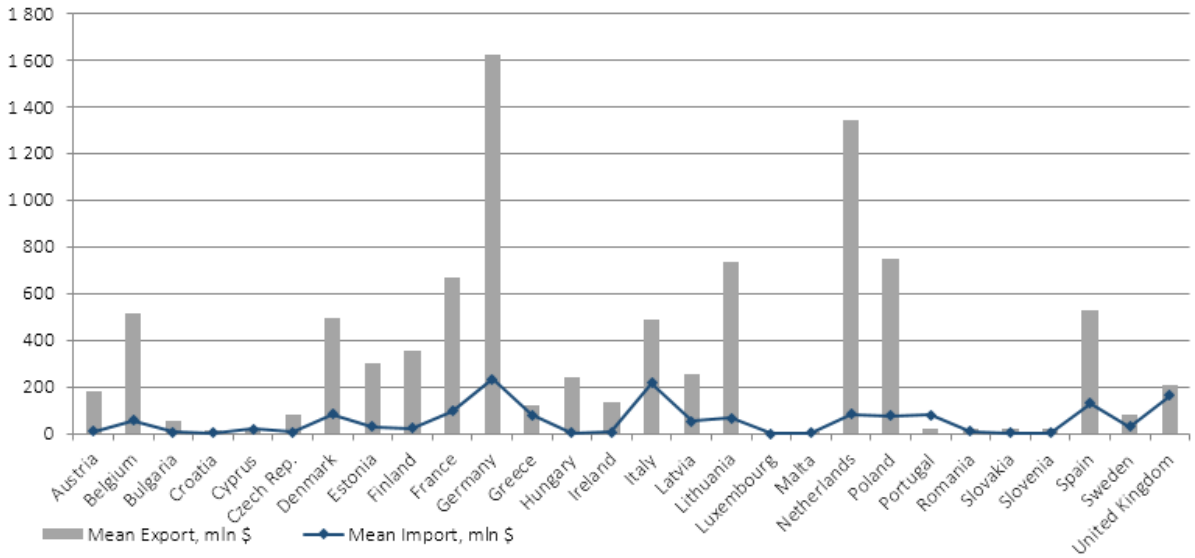
Smutka devoted his work to the Russian import ban. It increased the overall competitiveness of Russian agricultural trade; on the other hand, the competitiveness of certain product groups decreased (Svatos et al., 2016). As an example of the quality of import substitutions, there is an interesting study devoted to cheese. A paper by Mirzobobo, 2018, examines the preferences of Russian cheese consumers. Russian consumers do not consider Russian cheese to be hazardous to health, and they believe that buying local cheese is the right thing to do and supports Russian farmers and milk producers. However, the study also shows that with the growth of education and income level, people prefer foreign cheese.

3.2 Current economic trend between Russia and the European Union

Russia and the European Union are strong trading partners, and the European Union is the largest importer and exporter of agricultural products. During the period 2000-2017, the European Union's share of total imports into Russia was 37%, while agricultural products exported from Russia to the European Union accounted for only 14% of total exports from Russia.

If we examine above mentioned 18 years in terms of export and import, the most active suppliers of agricultural products to Russia has been Germany and the Netherlands (Figure 3). If we consider the import of agricultural products from Russia, then the main trading partner is again Germany. There has also been active cooperation with Italy and England.

Figure 3 Average agricultural trade flow between Russia and the EU in 2000-2017 (billions of USD)

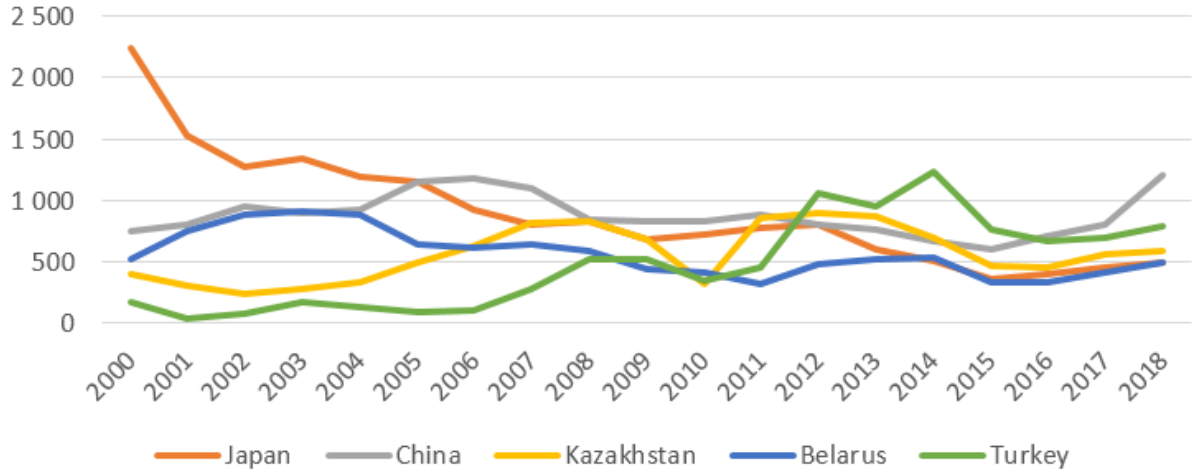


Source: Comtrade database, author's own calculation

However, Germany and the Netherlands have a large agrarian sector. Russia's share of the total exports of these countries does not exceed 10%. Poland and Lithuania are also significant trading partners for Russia, mostly because of a common history and their close proximity. For exports, the largest trading partner is Germany; trade with Italy, England and Spain is also active.

For a comparison of the effect of the Russian import ban, five main exporters and five main importers from outside the EU were considered.

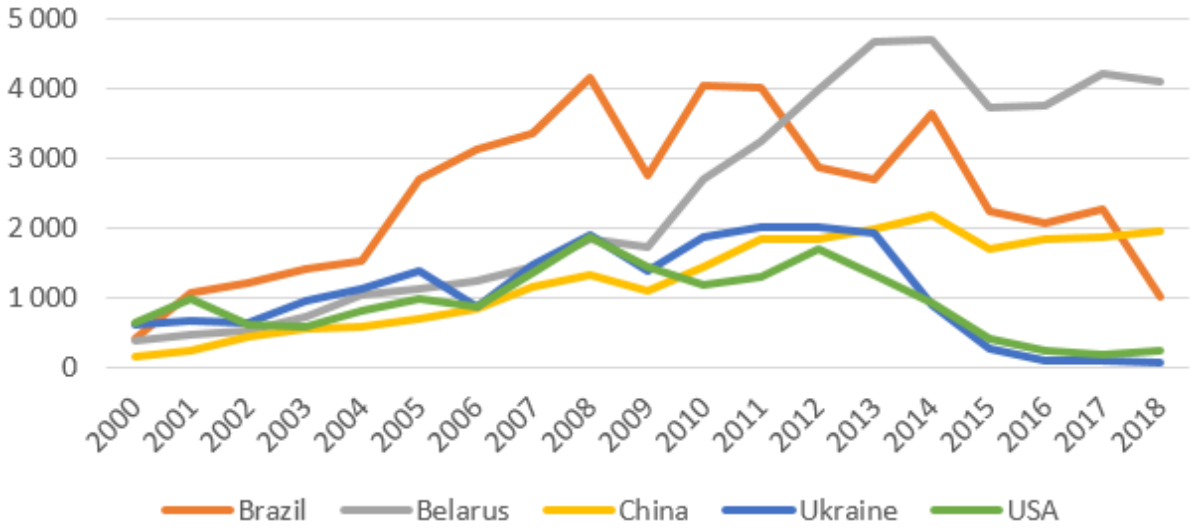
Figure 4. Five main importers to Russia from outside the EU, (millions of US dollars)



Source: Comtrade database, author's own calculation

Figure 4 shows five countries that buy products in Russia. These importers account for a little less than 50% of the entire import trade flow. The main trading products are fish and cereals. It can be clearly seen that the trend is quite stable, and not so many are affected by the import ban.

Figure 5. Five main exporters to Russia from outside the EU (millions of US dollars)



Source: Comtrade database, author's own calculation

Figure 5 shows five countries that sell products to Russia. These exporters account for more than 40% of the entire export trade flow. The main trade products are fruits and meat. The trend for Belarus is the highest because of re-export. There is a decreasing trend for Ukraine and the USA. The Ukrainian trend was affected by the war in 2013, and the USA was affected by the political situation and the ban. Only China is a stable trading partner.

3.3 Gravity model application (per country)

A basic gravity model for the analysis of import and export flows across countries was specified. Seven types of models were built and checked according to the BLUE assumption. After comparison tests, the best model was chosen.

Firstly, a simple linear regression model (1st OLS) was built for import and export trade flow. The model shows a marvellous result: The F-statistic and t-statistic are statistically significant and R-square is quite high (Table 1 and Table 2). The testing omitted variables and the BLUE assumption shows poor results. Afterwards, a robust OLS model was investigated, along with two OLS models with logarithm. After applying the Ramsey test, Breusch-Pagan test and White test, all these models show that the BLUE requirements are not undertaken. Every model has heteroscedasticity problems. A possible solution for the problem of BLUE is the utilization of the models based on the panel data – OLS panelled model with fixed effect and OLS panelled model with random effect. It is possible to obtain effective unbiased estimates by constructing a regression using the generalized least squares method (GLS). In such a regression, it is possible to get rid of autocorrelation and heteroscedasticity, but in its structure this regression is still cross-cutting and does not take into account individual effects. Due to the focus of the study, it is incorrect to use models that give stable but ineffective estimates, so it was decided to evaluate the model using generalized least squares (GLS). The GLS model turns out to be BLUE, and, since the errors in the transformed equation are serially uncorrelated and homoscedastic, the t- and F-statistics from the transformed equation are valid (Wooldridge, 2004). A model with fixed effects is based on the premise that the observations in the sample have a unifying characteristic, which is incorrect in relation to this sample. In addition, a model with fixed effects does not evaluate invariant variables. In this model, such variables include the presence of a common border and a common language, etc. All dummy variables were omitted. As a result, the model with random individual effects was selected on the basis of the specification.

Table 1 Regression models – Imports from Russia to the EU

Variables	1st OLS	2nd OLS Robust	3rd OLS ln	4th OLS	5th Gravity Panel Random effects GLS	6th Gravity Panel Random effects ML	7th Gravity Panel Fixed
lnDist	8.619**	8.619**	-0.0879	-0.0879	-0.113	-0.112	omitted
Border	31,318***	31,318***	1.928***	1.928***	1.921	1.913*	omitted
Language	-22,151***	-22,151***	-0.767***	-0.767***	-0.675	-0.688	omitted
History	18,557**	18,557***	0.385	0.385*	0.326	0.340	omitted
Sea Port	28,292***	28,292***	1.780***	1.780***	1.791**	1.798***	omitted
lnGDPru	0.0142***	0.0142***	-1.389*	-1.389*	0.488***	0.491***	0.376
lnGDPeu	0.0653***	0.0653***	0.880***	0.880***	0.927***	0.919***	1.172**
Constant	-54,327***	-54,327***	-3,063**	-3,063***	-9.713*	-9.677**	-10.24***
R-squared	0.692	0.692	0.614	0.614	0.706	-	0.196
Test	Not BLUE	Not BLUE	Not BLUE	Not BLUE	Hausman comparison test		

Source: Comtrade database, author's own calculation

To confirm the suggestion, the model 5th Gravity Panel Random GLS with panel data proved to be better than the previous model 4th OLS ln Robust. A comparison of both models was made by the Breusch-Pagan test. The 5th model showed more accurate results. The LM method is suitable for verification of the random effect model. The evaluation result is also shown in the model 6th Gravity Panel Random effects ML. To determine a better method, the GLS or LM, the Houseman test was implemented for a comparison of the models. The results for export and import gravity models are shown in Table 1 and Table 2.

Table 2 Regression models for exports from the EU to Russia

Variables	1st OLS	2nd OLS Robust	3rd OLS ln	4th OLS	5th Gravity Panel Random effects GLS	6th Gravity Panel Random effects ML	7th Gravity Panel Fixed
lnDist	-74.46***	-74.46***	-1.005***	-1.005***	-1.128*	-1.128	omitted
Border	138,330*	138,330**	1.821***	1.821***	1.812	1.799	omitted
Language	-253,295***	-253,295***	0.745***	0.745***	0.959	0.943	omitted
History	307,069***	307,069***	-0.883***	-0.883***	-1.056	-1.036	omitted
Sea Port	177,072***	177,072***	-0.0988	-0.0988	-0.245	-0.235	omitted
lnGDPru	0.127***	0.127***	0.229	0.229	0.556***	0.561***	0.635***
lnGDPeu	0.279***	0.279***	1.412***	1.412***	1.515***	1.504***	1.345***
Constant	-133,261*	-133,261**	-592.9	-592.9	-7.244	-7.192	-14.35***
R-squared	0.517	0.517	0.626	0.626	0.675	-	0.452
Test	Not BLUE	Not BLUE	Not BLUE	Not BLUE	Hausman comparison test		

Source: Comtrade database, author's own calculation

3.4 Gravity model application (per commodity)

In this section, the hypothesis stating that the gravity model is feasible for grouping by product is tested. The previous data set is taken for the research, but the regression for each type of 24 agricultural products is checked. Exports and imports are investigated separately. As in the previous section, each product is checked with different types of regressions, and the Gravity Panel Random effects GLS is utilized.

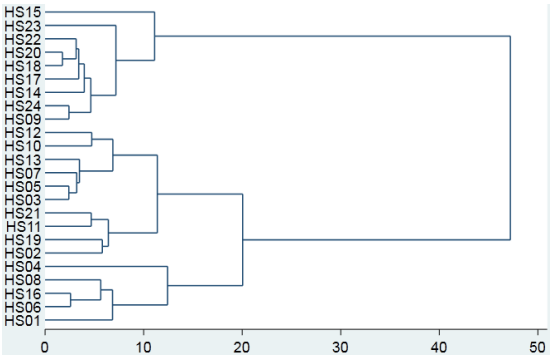
For each of 24 agricultural products, the procedure was carried out for exports and imports separately, similarly to the country gravity model section. The White, Breusch-Pagan, Hausman, and Wald tests were conducted. The methodology was similar to the "country" gravity model (Kontsevaya and Metlyahin, 2020). The GML model with random effect was recognized as the best solution. The appendix contains GLS regression for all 24 goods for export and import.

Obviously, the gravity model in the classic version is suitable for rare cases of product groups. For some groups of goods (meat, fruits, vegetables) there is classical gravity dependence, as presented by Timbergen, J. (1962). Other products have no dependence on the variable distance, but there is dependence on the variable language. Surprisingly, the variable sanction is significant even among those products that were not sanctioned. Thus, it can be

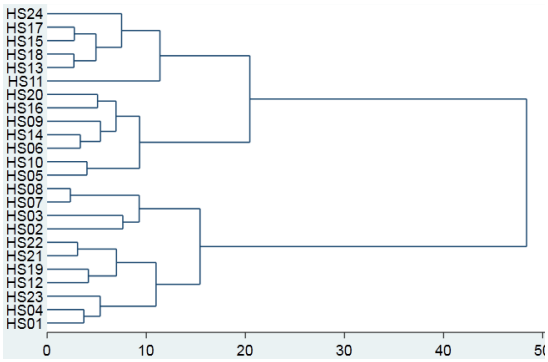
concluded that the effect of sanctions is much deeper than was once stated. Dendrograms for grouping products by significant variables are represented in Figure 6.

Figure 6. Cluster analysis Dendrogram.

Export



Import



Where: 1-Live animals; 2-Meat and edible meat offal; 3-Fish, crustaceans, molluscs, aquatic invertebrates, etc.; 4-Dairy products, eggs, honey, edible animal products, etc.; 5-Products of animal origin; 6-Live trees, plants, bulbs, roots, cut flowers, etc.; 7-Edible vegetables and certain roots and tubers; 8-Edible fruits, nuts, peel of citrus fruits, melons; 9-Coffee, tea, mate and spices; 10-Cereals; 11-Milling products, malt, starches, inulin, wheat gluten; 12-Oil seed, oleaginous fruits, grain, seed, fruits, etc.; 13-Lac, gums, resins, vegetable saps and extracts; 14-Vegetable plaiting materials, vegetable products; 15-Animal, vegetable fats and oils, cleavage products, etc.; 16-Meat, fish and seafood and food preparations; 17-Sugars and sugar confectionery; 18-Cocoa and cocoa preparations; 19-Cereal, flour, starch, milk preparations and products; 20-Vegetable, fruits, nuts, other food preparations; 21-Miscellaneous edible preparations; 22-Beverages, spirits and vinegar

Source: Comtrade database, author's own calculation

As with imports, four clusters of goods were identified with a significant variable: Distance, Border, History, and Language. As for imports, three clusters of goods were identified with a significant variable: Distance, Border, Language. As for export trade flow, the variables language and border work together. While for import trade flow the same variables work separately, the variable language is significant for certain groups of goods, and the variable border for others. As for imports, the variable sanction is always significant for all groups of goods (even for commodities that were not subject to sanctions), and for export, the variable sanction is almost never significant. The GDP of Russia and the EU countries is significant in most cases for both exports and imports, which confirms Timbergen's conclusions about the gravity model.

It is logically understandable why the export of agricultural commodities that were not officially under the ban also decreased. If a company supplies a large list of agricultural products to Russia and most of these products are subject to sanctions, then it is easier for a company to change the market than to work with small volumes. In addition, Smutka (2016) suggests that Russia gains an advantage in the domestic market from the imposition of the import ban, and thus supports its agriculture.

The choice of types of products that are under the sanctions was determined by the volume of exports. The products that had the largest export volume to Russia were selected as sanctioned products.

Discussion

The choice of the model is a matter of discussion. The classical gravity model was utilized in this research to estimate international agricultural trade. The research involves the influence of a nontariff regulating barrier, namely the Russian ban. However, to reasonably estimate the influence of nontariff barriers on specific agricultural products, Babula (2005) studied the influence of quotas on wheat imports to the USA and offered the vector autoregression model, as it provides more robust estimation. Authors such as Deardorff and Stern (1998), Ferrantino (2006), Solodkovska and Olefirenko (2014) consider the gravity model to be reasonable and suitable in this case, and they believe that the estimation made with the help of this model is robust.

The method of choosing the distance between countries is also a subject for discussion. In our research, the distance between the capitals of states was used. However, Kaukin (2013) argues in his work that the gravity model should be built while taking into account the routes of trade flow and the characteristics of border-crossing points (customs). Sometimes, the customs office is conveniently located and the passage through it is logistically optimal. However, at the same time, it has a low throughput and goods must wait there for a long time. Therefore, the supplier prefers a more distant but faster checkpoint. This idea could be used in our future research to improve the gravity model.

4 Conclusion

An estimation of the current conditions for agricultural trade in Russia and the European Union shows that in Russia, imports of agricultural products are greater than exports by several fold, and that the European Union is the main supplier of agricultural products to Russia. In 2014, an import ban on some imported agricultural products was introduced to increase self-sufficiency. It greatly impacted the trade flow between European countries and Russia. Latvia and Poland suffered most of all because Russia was their main trading partner. The quality of Russian agricultural products declined due to the absence of European competitors in the market. The regression model analysis for the researched period 2000-2017 identified two factors impacting trade flow between Russia and the European Union, namely distance between countries and the economic size of the countries, or in other words, the shorter the distance between countries and the larger the economic size, the more intensive the trade between countries. The regression analysis of each of the 24 imported and exported products in Russia revealed the impact of a common border and a common language for office work, together with the factors of distance and economic size. A common border and common language increase trade activity between countries. The cluster analysis revealed the impact of sanctions on absolutely all groups of agricultural products imported into Russia, and even non-sanctioned products suffered from this impact. It should be said that sanctions had a greater influence than expected. Thus, the import of agricultural products into Russia from the European Union is significant and greatly impacted by the import ban. Moreover, in the future this impact will be as great as it is now.

Acknowledgments:

This research was supported by the grant of Internal Grant Agency (IGA) of Faculty of Economics and Management, Czech University of Life Sciences, project 2020A0015 entitled "Price changes on agrifood markets in post-Soviet countries under Russian import ban and sanctions".

References

1. Assem Abu Hatab (2005) Determinants of Egyptian Agricultural Exports: A Gravity Model Approach. *Modern Economy,* Volume 5, 134-143.
2. Babula, R. (2005) Using Directed Acyclic Graphs And VAR Econometrics To Simulate The Upstream And Downstream Effects Of Imposition Of An Import Quota: An Application To U.S. Wheat-Related Markets. *Quantitative Methods for Assessing the Effects of Non-Tariff Measures and Trade Facilitation,* Volume 1, 193-214, doi.org/10.1142/5663
3. Dascal, D. (2002) An analysis of EU wine trade: A gravity model approach. *International Advances in Economic Research*, Volume 8(2), 135-147.
4. Deardorff, A. and Stern, R. (1998). Measurement of Nontariff Barriers *Journal of International Economics*, Volume 55(1), 239-242
5. Distanse (2020) Distance calculation [Online]. Available at: http://www.distancefromto.net/ Accessed: 2020, September 1.
6. FAO Official website of the Faostat. [Online]. Available at: http://faostat3.fao.org/home/E. [Accessed: 2020, September 1].
7. Ferrantino, M. (2004). The Effects of Non-Tariff Measures on Prices, Trade, and Welfare: CGE Implementation of Policy-Based Price Comparisons. *SSRN Electronic Journal*, Volume 2, 4-69, DOI: 10.2139/ssrn.539705
8. Keith Walsh (2006) Trade in Services: Does Gravity Hold? A Gravity Model Approach to Estimating Barriers to Services Trade. *The institute for International Integration studies*, Discussion Paper No. 183, 183-204.
9. Kaukin A. (2013) Features of Empirical Estimates of the Gravity Model of Russian Foreign Trade. *Russian foreign economic journal*, Volume 4, 74-84.
10. Kontsevaya, S. (2020) *Agricultural trade between Russia and European Union: Gravity model approach* (Master's thesis). Czech University of Life Sciences, Prague, Czech Republic.
11. Kontsevaya, S., Metlyahin A. (2020) Trade flow estimation between Russia and European Union countries per agricultural commodity group. *Proceedings of the International Scientific Conference «Hradec Economic Days 2020»* Volume 10(1), Hradec Kralove: University of Hradec Kralove, pp. 343–350.
12. Koo, Won W (1994) A Gravity Model Analysis of Meat Trade Policies. *Agricultural Economics*, Volume 10, 1994, 81-88.
13. Mehmet Erigyt, Erdogan Kotil (2010) Factors affecting international tourism flows to Turkey: a gravity model approach. *Tourism Economics.* Volume 16 (3), 585–595.

14. Mirzobobo, Y. (2018) Food quality vs food patriotism Russian consumers' preferences for cheese after the food import ban. *British Food Journal*, Volume 1, Issue 11, 371-385.
15. Smutka, L. (2016) Agrarian import ban and its impact on the Russian and European Union agrarian trade performance, *Agricultural Economics*, volume 62 (11), 493-506.
16. Solodkovska, G., Olefirenko, V. (2014) Ways of improvement of non-tariff measures of international trade regulation Management. *Theory and Studies for Rural Business and Infrastructure Development*. Volume 36 (4), 966–976, DOI: 10.15544/mts.2014.091
17. Svatoš, M. Smutka, L. Ishchukova, N. (2014). The position of agriculture in the Russian Federation – the last two decades development overview. *Agricultural Economics*, 60 (11), 489-502.
18. Timbergen, J. (1962) *Shaping the World Economy: Suggestions for an International Economic Policy*, New York: The Twentieth Century Fund.
19. Troekurova, I., Pelevina, K. (2014) Gravity Models of Foreign Trade of Brics Countries. *Bulleten Saratov University*, Volume 5(100), 133-142.
20. UNcomtrade (2020) Comtrade database Official website [Online]. Available at: http://comtrade.un.org/ Accessed: 2020, September 1.
21. Wooldridge, J (2004) *Introductory Econometrics: A Modern Approach*. South-Western ISBN-13: 978-0324660548.
22. Worldbank (2020) Official website of the Worldbank. [Online]. Available at: https://data.worldbank.org/. [Accessed: 2020, September 1].
23. Zuravleva, T. (2016) Competitiveness of Russian exports. *Actual problems and development trends of the modern economy*. Volume 6, 361-366.