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TO THE ISSUE OF RUSSIAN ECONOMIC LOSSES DUE TO FOOD SANCTIONS

Lately Russian economy has been greatly affected by economic and political sanctions against the country and its response in the form of grocery embargo. The aim of this article is to examine changes in Russian economy after the above-stated events with the use of historical and statistical methods, the method of comparison and mathematical modelling. As a result we created the model which can be used for analysis of Russian economy and its flexibility to changing factors of the environment. The model revealed not declared but real effects from economic restrictions.

Keywords: embargo; gravity model; least squares method; regression analysis; sanctions against Russia.

Валентина Р. Бокач, Світлана О. Новикова, Наталія Г. Сидорова ДО ПИТАННЯ ПРО ВТРАТИ РОСІЙСЬКОЇ ЕКОНОМІКИ ЧЕРЕЗ ПРОДУКТОВІ САНКЦІЇ

У статті доведено, що останнім часом російська економіка зазнала великих втрат в результаті економічних і політичних санкцій проти РФ і продуктового ембарго з боку Росії у відповідь. Вивчено зміни в економіці Росії за допомогою історичного, статистичного методів, методу порівняння та математичного моделювання. Побудовано модель, яка може бути використана для аналізу російської економіки та її гнучкості до чинників зовнішнього середовища, що постійно змінюються. Модель виявила не проголошуваний, а реальний ефект від економічних обмежень.

Ключові слова: ембарго; гравітаційна модель; метод найменших квадратів; регресійний аналіз; санкції проти Росії.

Форм. 3. Рис. 2. Табл. 1. Літ. 15.

Валентина Р. Бокач, Светлана А. Новикова, Наталья Г. Сидорова К ВОПРОСУ О ПОТЕРЯХ РОССИЙСКОЙ ЭКОНОМИКИ ИЗ-ЗА ПРОДУКТОВЫХ САНКЦИЙ

В статье доказано, что в последнее время российская экономика претерпела большие потери в результате экономических и политических санкций против РФ и ответного продуктового эмбарго со стороны России. Изучены изменения в экономике России при помощи исторического, статистического методов, метода сравнения и математического моделирования. Построена модель, которая может быть использована для анализа российской экономики и ее гибкости к постоянно изменяющимся факторам внешней среды. Модель выявила не провозглашаемый, а реальный эффект от экономических ограничений.

Ключевые слова: эмбарго; гравитационная модель; метод наименьших квадратов; регрессионный анализ; санкции против России.

Problem setting. It is well-known that in March 2014 restrictive political and economic measures were introduced against Russia because of its intrusion into Crimea and further military conflict in the South-East of Ukraine.

Russian government responded with sanctions on entry of some foreign citizens, as well as the Presidential Decree on food embargo (6.08.2014, # 560). The embargo banned import of certain agricultural products, raw materials and food from the

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countries which agreed on economic sanctions against Russia. Among such food products were meat, sausages, dairy products, fish and fish products, vegetables, fruits, nuts ect. In June 2015, in response to further extension of sanctions Russia prolonged food embargo for a year – until August 5, 2016 (7.08.2014, # 778; 24.06.2015, # 320).

Taking into account long-term import dependence of Russia on foreign foods, the embargo affected the country's economy. Over the past year the national economy lost 120 bln USD because of sanctions. According to the calculations of the Gaidar Institute for Economic Policy, Russia lost about 30 bln USD because of its response to sanctions (www.crbc.pro).

Recent research and publication analysis. There is no theoretical basis for sanctions evaluation in Russia so far. It can be explained by the fact that there was no such experience before. Some scientists make attempts to describe the effects from sanctions but a model for its calculation has not been created yet. Such model can be found in the works of foreign scientists though: J.E. Anderson (2010), G.K. Hufbauer et al. (1997), G.K. Hufbauer and B. Oegg (2003), W. Keller and S.R. Yeaple (2009). There have been a lot of sanctions effects calculations for other countries, especially in the USA.

The research objective. This is an attempt to give an assessment for economic sanctions impact on foreign trade and domestic production of meat and meat products.

Key research findings. Despite assurances from the officials that there would be no rise in prices at the national food market, the statistics suggests the opposite. According to the Federal State Statistics Service, the index of food prices in September 2014 increased by just 1.3% immediately after the sanctions in August 2014 and continued to grow until the end of the year. As a result, in late 2014, it was 8.1% higher than at the end of 2013. Such large growth has not been observed since 1998. In the first quarter of 2015 the prices rose further by 4.3%, and in the second quarter they began to decline (www.gks.ru). However, the decline in prices was not for all products. Liver, butter, milk, cheese, eggs, sugar, cereals, some vegetables, pears became cheaper. But there is another situation with meat and fish products (Table 1). "Today's prices for meat will decline. This will happen in the third quarter due to lower consumer demand and rising import. But I am afraid that domestic manufacturers will be on the verge of bankruptcy again", – said M.L. Mamikonyan, the chairman of Russian Meat Union (Romanova and Falyahov, 2015). Since July 2014 to July 2015 the cost of the minimum food basket went up by 585.65 RUB (18.4%) (Federal State Statistics Service, www.gks.ru). Even prices for domestic food products increased. It happened first of all together with the general rise in prices, and then because imported components are used in production of domestic foods. A. Danilenko, the chairman of the Board of Soyuzmoloko explained that imported components are used in packaging for milk and dairy products, as well as in vitamin feed additives and fertilizers for cows (Romanova and Falyahov, 2015). Meat becomes more expensive for the same reason. Feed as a foreign exchange component is purchased mainly abroad. It occupies about 30–40% in the value of poultry meat, and 40–50% in pork (Romanova and Falyahov, 2015). To find a substitute for imported goods in Russia is very problematic, and sometimes impossible. Rates on loans and the refinancing rate set by the Central Bank in December 2015 also affected price the increase.

Table 1. Consumer prices indices (tariffs) for selected groups of services, RUB (www.gks.ru)

	2009		2010		2011		2012		2013		2014		2015	
	January	July	January	July	January	July	January	July	January	July	January	July	January	July
Minced meat, kg	176.97	185.91	187.82	189.95	203.66	215.3	228	234.13	239.26	238.97	243.94	262.11	294.11	312.05
Beef (except boneless meat), kg	176.8	184.27	186.26	187.65	202.28	219.5	237.83	244.32	248.61	245.33	245.1	254.05	290.47	309.47
Boneless beef, kg	243.56	256.21	258.14	262.1	297.36	316.5	339.87	352.61	357.05	357.09	362.48	376.37	420.48	450.19
Pork (except boneless meat), kg	190.12	194.36	193.82	194.51	197.96	203.02	212.22	219.18	217.98	210.3	214.05	297.83	278.32	278.76
Boneless pork, kg	254.98	262.05	259.76	261.57	275.68	282.5	289.35	296.22	295.47	289.09	295.72	338.69	362.86	366.55
Lamb (except boneless meat), kg	201.5	213.63	221.23	231.56	222.69	237.05	261.71	300.34	303.45	299.93	291.68	297.83	323.2	340.38
Chicken cooled and frozen, kg	101.28	102.09	101.46	101.93	104.51	103.76	102.32	107.57	115.88	108.49	106.61	122.58	140.15	134.73
Chicken legs, kg	100.03	104.38	103.76	117.14	116.57	114.76	117.17	122.47	131.16	127.19	127.34	135.92	157.06	155.51
Sausages, small sausages, kg	170.38	180.86	182.73	185.38	203.07	210.51	222.89	229.58	237.07	240.12	249.53	272.72	299.19	318.57
Smoked and cooked, boiled and smoked sausage, kg	224.78	238.77	240.68	243.38	258.62	268.97	283.39	291.58	299.37	303.88	312.9	343.92	382	406.71
Summer sausage, kg	486.29	512.49	518.22	523.02	593.2	609.44	634.45	652.43	664.74	677.15	693.64	744.64	825.27	879.51
Boiled sausage, kg	-	-	-	-	-	-	-	-	-	-	264.75	289.34	317.09	338.09
Canned stew beef, pork, 350 g	55.09	59.51	60.97	61.31	65.32	68.13	70.79	72.58	75.62	77.15	80.12	84.96	99.73	113.1

However, Russian counter sanctions have also a positive effect. For many years we only discussed high dependence on Russian imports of foreign products. The embargo stimulated the development of Russian own production. The agricultural sector was the first where decisions on import substitution were made: special plan was approved, state program of industry development was adjusted. In 2015, about 240 bln RUB were assigned to support the industry. And in 2016, according to D. Medvedev, the level is not going to be decreased (www.rusplt.ru). These measures were introduced to create the conditions for domestic production in the sectors experiencing the most heavy dependence on imports. According to Russia's obligations under WTO agreements, this level should not exceed 7.2 bln USD in 2015 and 6.3 bln USD in 2016 (www.council.gov.ru).

In addition, due to foreign products absence at the Russian market free niches appeared and competition became much lower, which allows domestic producers promote their products. However, sanctions are not the driving force for Russia's economy, and the country needs structural reforms in all the sectors of economy. The current situation has pushed the government to launch economy restructuring.

Physical volume of output of goods and services in basic economic activities has been increasing gradually. Since 2014, agricultural production has been rising, except the reduction in the 4th quarter of 2014 (Figure 1). However, GDP in money terms in 2015 decreased, due to ruble weakening and oil prices drop.

As for foreign trade, trade surplus remains positive over the last time. During the 1st half of 2015 it amounted to 88.556 bln USD (Figure 2). Commodity structure of exports after the sanctions imposition did not change in general: petroleum and petroleum products, gas, fuel are still dominating. Export volumes of goods increased, but the cost volumes calculated in USD decreased. It should be noted that in January-June 2015 as compared to the same period in 2013 exports volume of wheat and rye mixture increased by 4.5 times. The share of exports of foodstuffs and raw materials for its production amounted 3.2% in the commodity composition of exports in January-June 2015 (in January-June 2014 – 2.7%). The value of goods shipments fell by 15.4% in comparison with January-June 2014. The volume of shipments of barley increased by 2.8 times, milk and cream – by 5.7%. This indicates an increase in agricultural production inside the country. Machines and equipment, vehicles, clothing, footwear, medicines, meat, fish, citrus among food products continue to dominate in the structure of imports. Import volume and value of meat reduced almost 2 times, poultry – by more than 2 times, fish – by 1.8 times, wheat – 5 times, barley – 31 times, the volume of citrus and other foods reduced a little too. This proves certain implementing success in the strategy of import substitution.

In geographical structure of Russia's foreign trade the European Union is the leader, although because of the sanctions its share in the turnover decreased from 50.2% in January 2014 to 45.9% in January 2015 (17.8 bln USD). Turnover decreased by 39.4% in January 2015 as compared to January 2014, while exports fell by 38.1%, imports – by 43.9% (www.customs.ru). The share of APEC and CIS countries in turnover declined. In 2013 44% of the imported products came from the EU and the US, in 2014 these became under the embargo. As a result, Russia will have to change radically the geographical structure of import in favor of Latin America, Belarus, Serbia, Azerbaijan, Uzbekistan. In general, we can conclude that Russia is not much

affected by the embargo the products prohibited for import from some countries are imported from the other, mainly from Latin America. However, resolution for logistical problems and certification are needed.

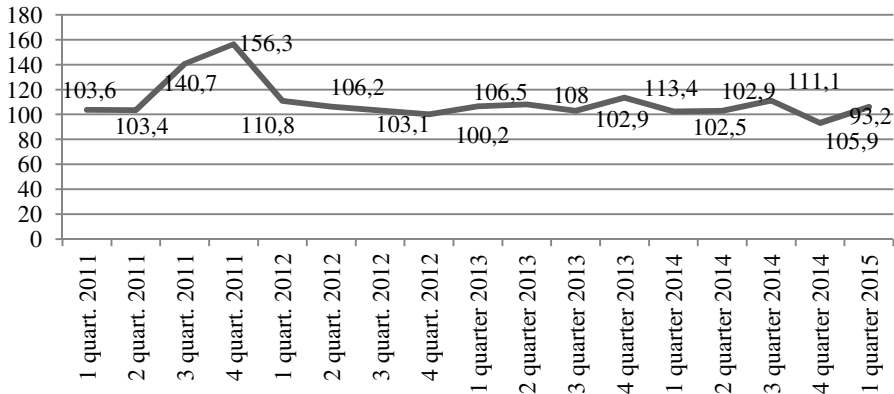


Figure 1. Index of agricultural production, %
(Federal State Statistics Service, www.gks.ru)

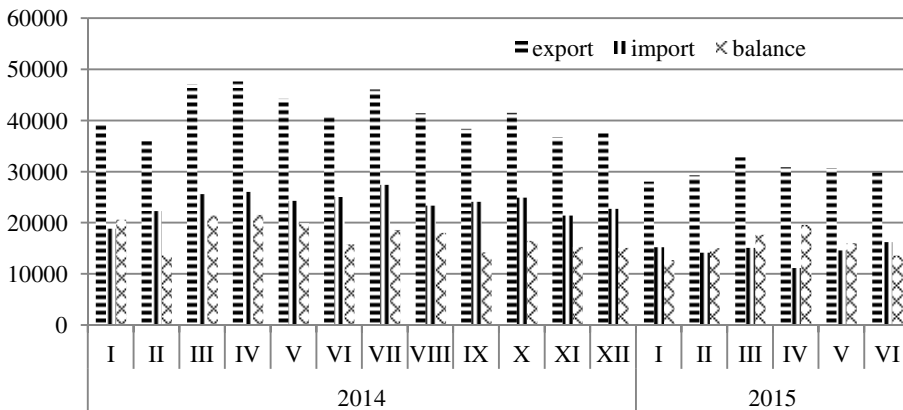


Figure 2. Dynamics of Russian trade turnover, mln USD
(Federal Customs Service, stat.customs.ru)

There are various methods of assessing the impact of sanctions on the economy. They can be divided into 2 groups: statistical evaluation methods and the theory of games. One of the statistical methods is compilation of the gravity model, which will be studied in this paper. This model attracted considerable attention and became a universally recognized model for evaluating effects from economic sanctions. Classical gravity model is based on the law of universal gravitation discovered by Newton in 1666. According to its application to economics mutual attraction between the two countries, which may be represented as their foreign trade is directly proportional to the studied countries sizes, expressed in GDP and inversely proportional to the square of distance between them. This model was being continuously modified by various scientists who added certain variables which, in their opinion, impact bilateral trade of countries. Similar models are offered in their work J.E. Anderson (2010), W. Keller

and S.R. Yeaple, 2009), G.C. Hufbauer and B. Oegg (2003). The gravity model became especially relevant when the USA introduced economic sanctions against a number of countries in 1995 and 1999. Then G.C. Hufbauer et al. (1997) added gravitational component into the previously modified model. To assess the US sanctions the following model of gravitational equations was developed and tested:

$$\begin{aligned} \ln(\text{TRADE}_{ij}) = & C + \beta_1 \times \ln(\text{GNP}_i + \text{GNP}_j) + \beta_2 \times (\text{GNPPC}_i * \text{GNPPC}_j) + \\ & + \beta_3 \times \ln(\text{DIST}) + \beta_4 \times (\text{ADJ}) + \beta_5 \times (\text{LANG}) + \beta_6 \times (\text{BLOC}) + \beta_7 \times (\text{LIM}) + \\ & + \beta_8 \times (\text{MOD}) + \beta_9 \times (\text{EXT}) + \beta_{10} \times (\text{LIM1} * 2) + \beta_{11} \times (\text{MOD1} * 2) + \\ & + \beta_{12} \times (\text{EXT1} * 2) + \beta_{13} \times (\text{LIM3} * 4) + \beta_{14} \times (\text{MOD3} * 4) + \beta_{15} \times (\text{EXT3} * 4), \end{aligned} \quad (1)$$

where TRADE_{ij} – trading volume between countries i and j ; GNP – gross national product; GNPPC – gross national product per capita; DIST – distance between two countries; ADJ – dummy for common border; LANG – dummy for common language; BLOC – dummy for regional trade agreement; LIM – these are minor trade, financial, or travel sanctions; MOD – these are broader trade or financial sanctions, with 5 or more restrictions that would otherwise be classified as limited; EXT – the extensive category is reserved for comprehensive trade and financial sanctions; C – constant; regression coefficients β , standing near the independent variables are elasticities (show the % change value of trade between countries when you change any of the factors by 1%). If this coefficient is positive, there is a direct positive relationship between the investigated factors and trade volume, if the coefficient is negative, there is an inverse ratio of the factor to the result. These factors standing around dummies show the average change in bilateral trade in the transition from one category (sanctions imposed) to another (no sanctions between countries etc.).

The regression equation form is logarithmic linear, or log-linear, meaning that the equation has a linear form when all the variables are expressed either in logarithmic form (for continuous variables) or as dummy variables (values of 0 or 1).

Variables LIM , MOD and EXT indicate sanctions were in place during the years in question (1995 and 1999). To evaluate whether sanctions continue to adversely affect trade even after they have been lifted (an "after-life"), the authors included dummy variables $\text{LIM1} * 2$, $\text{MOD1} * 2$, $\text{EXT1} * 2$, $\text{LIM3} * 4$, $\text{MOD3} * 4$, $\text{EXT3} * 4$ representing the cases where sanctions were not present in the year under analysis but had been in place at any time during the previous 1–2 or 3–4 years.

The study found that gravity model above is not applicable for Russian sanctions of 2014–2015 years per se for several reasons. First of all, Russian language is not an official language of any other country except Russia, thus we don't need a dummy variable of a common language. Taking into account increasingly growing integration and interdependence of countries a dummy of common trade organization for countries also becomes unnecessary, since it will always take the same value. In addition, it is not possible to estimate the sanctions for the past several years, as they were imposed recently. And all the current sanctions can be identified as moderate. So, evaluation of effect with the full-scale gravitational equation becomes impossible. Thus, we offer the following form of gravitational equation for the case of Russia:

$$\begin{aligned} \ln(\text{TRADE}_{ij}) = & C + \beta_1 \times \ln(\text{GNP}_i * \text{GNP}_j) + \\ & + \beta_2 \times \ln(\text{DIST}) + \beta_3 \times (\text{ADJ}) + \beta_4 \times (\text{MOD}). \end{aligned} \quad (2)$$

In this paper we used the least squares method, as well as Excel software package of regression analysis to calculate the coefficients. We received the following gravitational equation for appraisal of the impact of sanctions on the volume of trade between Russia and the countries from the sanctions list:

$$\ln(\text{TRADE}_{ij}) = 10109094521.6 + 855.14 \times \ln(\text{GNP}_i * \text{GNP}_j) - \\ - 81314.02 \times \ln(\text{DIST}) + 11656225099.51 \times (\text{ADJ}) - \\ - 16806596141.61 \times (\text{MOD}). \quad (3)$$

According to the obtained coefficients we can conclude there is a direct correlation between the volume of bilateral trade and GDP, the presence of common border. This is evident, because the more goods and services are produced within the country, the more of them can be sold abroad, which means trade between two countries increases in volume. Common border reduces transportation costs and also customs costs, because if countries are neighbors, there is one border between them, therefore, goods are to be registered only by one customs office.

There is an inverse relation between the volume of trade and distance, because the greater is the distance, the higher are transport costs, which is especially important for Russia because of its vast territory.

The main conclusion which can be drawn from the analysis of the factors is that sanctions negatively affect the volume of trade (negative factor). It should be noted also that the value of the coefficient is rather high, which emphasizes its importance.

Conclusion. Despite the government assurances that Russia is not affected by sanctions imposition, the statistics shows decline in foreign trade, especially imports, which can be observed in the short term. The statistics has been confirmed by constructing a gravity model of foreign trade with the sanctions component. So, the country still suffers losses from the imposed food embargo. However, the calculated model shows a decrease in bilateral trade between the two countries at the same time but it does not reveal which country incurs larger losses. According to the latest analytical article, while Russia managed to overcome the difficulties quickly by increasing production and signing contracts with new suppliers, other countries such as France, Germany, Czech Republic, Poland and others suffer heavy losses because of large volume of manufactured products, which were not realized as planned before the embargo.

Obviously, one year does not give an opportunity to assess the impact of economic and political sanctions on Russian economy, however, it is possible to obtain at least initial results using a simplified model of gravity equations.

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Стаття надійшла до редакції 10.03.2016.