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Russian Agrarian Foreign Trade Development – the Impact of Selected Factors

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Anotace

Ruský agrární zahraniční obchod se mění. Jeho hodnota, objem a zejména komoditní a teritoriální struktura se neustále formují. Období transformace společně s několika krizemi kompletně změnily charakter ruského agrárního sektoru a potravinářského průmyslu. Aby vůbec Rusko bylo schopné formovat rozvojovou strategii pro příští desetiletí, je nutno identifikovat klíčové trendy a faktory ovlivňující ruský agrární zahraniční obchod. Hlavním cílem tohoto článku je analýza vlivu vybraných proměnných (zemědělská produkce, směnný kurz, světová cena potravin a vládní podpory) na ruský agrární obchod a identifikovat zda-li existuje významný vztah, či nikoliv mezi uvedenými proměnnými. Sekundárním cílem článku je analýza vztahu existujícího mezi cenami potravin na ruském trhu a vývojem cen potravin na trhu světovém. Na základě výsledků vyplývajících z jednotlivých analýz následující závěry mohou být formulovány. Hodnota importů roste mnohem rychleji v porovnání s hodnotou exportů. Výsledkem je neustále se zvyšující záporné saldo ruského agrárního obchodu. Komoditní struktura ruského agrárního exportu je velmi koncentrovaná, na druhou stranu komoditní struktura agrárního importu se stává více heterogenní. Hovoříme-li o jednotlivých hypotézách analyzujících vztah mezi jednotlivými proměnnými, lze konstatovat následující. Lze potvrdit existenci vztahu mezi ruským agrárním obchodem a vývojem hodnoty zemědělské produkce, vládních podpor a vývojem světových cen agrárních a potravinářských produktů. Na druhou stranu existence vztahu mezi směnným kurzem a hodnotou ruského agrárního exportu a importu nebyla prokázána.

Klíčová slova

Rusko, agrární zahraniční obchod, hodnota, vztah, zemědělská produkce, podpora, směnný kurz, cena potravin, vývoj, charakter.

Abstract

Russian agricultural foreign trade is changing. Its value, volume and especially commodity and territorial structures are under the permanent development. The period of transformation together with several crises completely changed the character of Russian agricultural sector and foodstuff industry. To be able to develop the country‘s strategy for the upcoming decades it is necessary to identify the key trends and drivers affecting the Russian agricultural trade performance and development. The main objective of this paper is to analyze the influence of selected key variables (agricultural production, exchange rate, and world food price and government subsidies) on Russian agricultural trade and to identify if there is existing the significant relationship or not. The secondary objective of the paper is the analysis of relationship existence between Russian food price development and World food price development. On the basis of the results coming from the analyses the following can be highlighted. The value of imports was growing much faster comparing to value of exports. The result is constantly increasing negative trade balance. Russian agrarian export commodity structure became more concentrated, on the other hand the commodity structure of agrarian imports became more heterogeneous. Talking about individual hypotheses analyzing the relations between individual variables the following can summarized. There do exist the relationships between Russian foreign trade and agricultural production development, government subsidies development and world food price development. On the other hand the existence of relationship between exchange rate and Russian agrarian export and import performance was not proved.

Key words

Russia, agrarian foreign trade, value, relation, agricultural production, support, exchange rate, food price, development, character.

Introduction

Russia has the largest area in the world, with considerable diversity in natural, economic, and social conditions across regions and a combination of federal and regional policies (Gusev, 2007; OECD, 2011). The process of Russian agri-food sector's integration in the world economy in recent years is accelerating and the country is becoming an active player in a number of food markets (OECD, 2008).

Considering the dynamics of Russia's foreign trade (Table 1) in agricultural products and foodstuffs, the following trends can be revealed. There is the significant growth of foreign trade turnover due to the expansion of both imports and exports (Liefert and Liefert, 2012).

During the 2000s, Russian agricultural import was growing considerably. This import growth has made Russia the second largest agricultural importer among emerging markets, after China (Liefert, 2009).

Russia's agri-food export was growing alongside the increase in imports. Currently, Russia has a significant share in the world markets of certain products, such as wheat and sunflower oil (Liefert, 2009; Nosov and Ivanova, 2009).

There does exist the huge disproportion between Russian agrarian export and import, while the share of agricultural products in Russian total merchandise export is only and import is 2.4%, the share of agrarian and foodstuff products import in total value of merchandise imports is about 14%.

Russian agricultural foreign trade is changing. Its value, volume and especially commodity and territorial structures are under the permanent development (Cooper, 2006). The period of transformation together with several crises completely changed the character of Russian agricultural sector and foodstuff industry. Russian agricultural and foodstuff market also changed significantly (Ellman and Scharrenborg 1998; Robinson, 1999; Feridun, 2004; Stupak, 2012; Ahrend, 2006; Hanson, 2007; Sapir, 2001; Rutland, 2013). All the changes reduced production performance and increased Russian dependency on imports from other countries (Pustovalov, 2004; Gudoshnikov, 2008; Russian presidential administration, 2009) . Changes in production structure significantly affected especially the commodity structure of Russian agrarian export (Graph 1). The reduction of domestic production capacities also affected the commodity structure and value of imports (Graph 2).

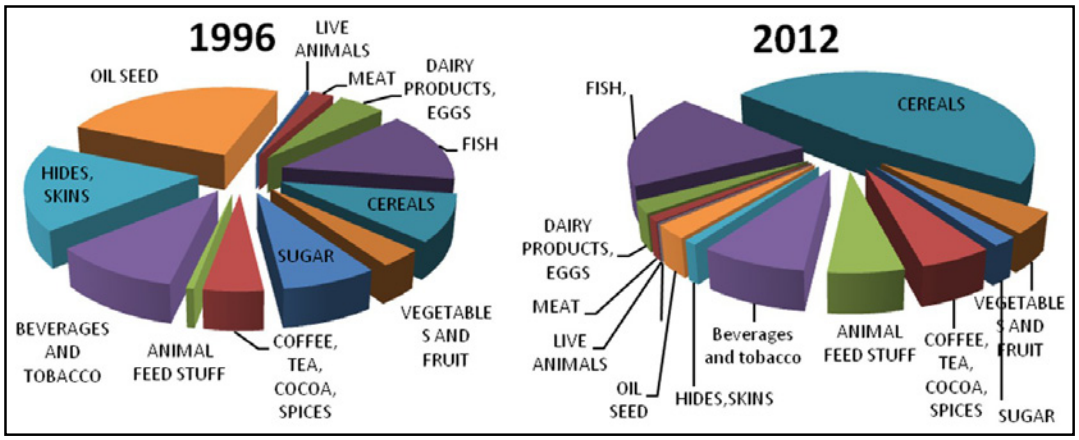
Last two decades development changed also territorial structure of Russian agricultural trade. For details see – Tables 2 and 3. While in 1996 Russian territorial structure of agrarian export was the following CIS (Commonwealth of Independent States) (28.73%), EU (European Union) (25.65%), Asia (25.41%), America 4.8% and Africa 0.41%, in 2012 the situation was the following: Asia 41.32%, CIS 26.96%, Africa 15.21%, EU (10.33%) and America (0.71%).

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	GM
Export	1.2	0.8	1.3	1.5	2.2	2.7	2.5	3.9	4.8	8.3	8.4	9.3	7.6	11.3	16.7	X
Import	10.3	7.7	7.0	8.7	9.8	11.3	12.8	16.3	20.4	26.2	25.2	32.7	22.5	28.9	41.2	X
Balance	-9.1	-6.9	-5.7	-7.3	-7.7	-8.6	-10.3	-12.4	-15.5	-17.9	-25.0	-19.1	-26.1	-27.9	-23.8	X
Normalized trade balance	-79.3	-81.9	-68.6	-71.4	-63.7	-61.6	-67.6	-61.5	-61.6	-52.0	-59.8	-50.7	-63.3	-55.1	-41.6	X
Foreign trade coverage ratio	11.6	10.0	18.6	16.7	22.1	23.8	19.3	23.8	23.8	31.6	25.2	32.7	22.5	28.9	41.2	X
Chain index of export flows	X	64	170	112	149	124	92	157	125	170	102	111	81	150	147	121
Chain index of import flows	X	75	91	125	113	115	113	127	125	128	127	85	119	117	103	110

Source: UN Commodity Trade Statistics Database. author's calculations (2013)

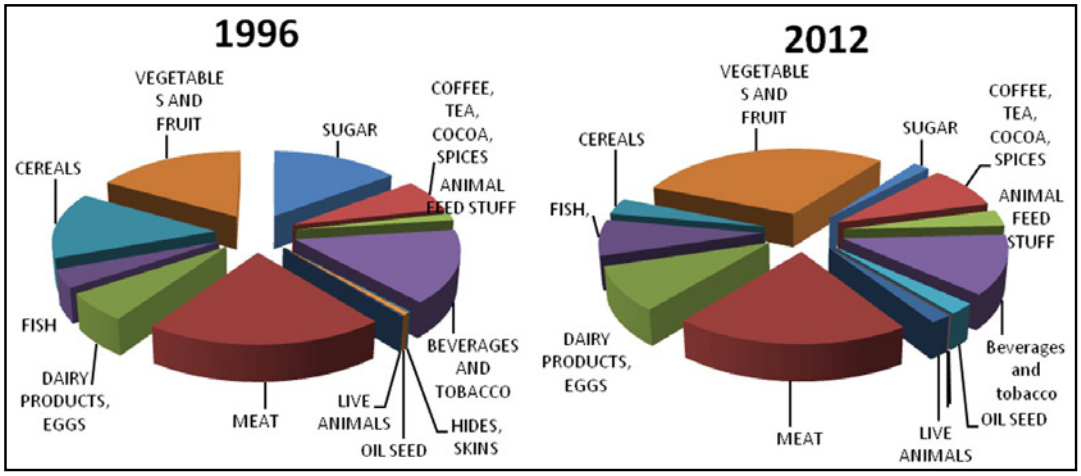
Table 1: Russian foreign trade in agrarian and foodstuff products (billions USD).

The situation in the case of Russian agrarian imports territorial structure also changed very much. While in 1996 the territorial structure was the following one: CIS (30.34%), EU (26.24%), Asia (11.34%), (America 14.1%) and Africa (1.45%), in 2012 the territorial structure reached the following changes: EU (28.81%), America (24.4%), Asia (16.66%), CIS (12.58%) and Africa (3.96%).



Source: UN Commodity Trade Statistics Database, author's calculations (2013)

Graph 1: Product structure of the Russian agricultural export (%).



Source: UN Commodity Trade Statistics Database, author's calculations (2013)

Graph 2: Product structure of the Russian agricultural import (%).

	1996	1998	2000	2002	2004	2006	2007	2008	2009	2010	2011	2012
World	1688	1187	1301	2177	2479	4849	8257	8390	9281	7562	11337	16705
North America	76	54	24	28	33	44	74	64	60	75	67	66
CIS	485	317	418	546	1065	2006	2899	3496	2895	1765	2335	4504
EU	433	223	243	467	304	601	831	910	714	781	1328	1725
Asia	429	448	462	680	633	1384	2351	2498	3986	3448	4701	6902
South America	5	1	0	3	0	1	3	22	32	9	47	51
Africa	7	10	42	298	254	492	1662	1007	1232	1122	2099	2541
Others	253	135	112	156	189	321	438	393	362	363	760	916

Source: Comtrade database, author's calculations (2013)

Table 2: Russian agricultural exports by geographic regions, million USD.

	1996	1998	2000	2002	2004	2006	2007	2008	2009	2010	2011	2012
World	11139	10266	6982	9832	12820	20387	26156	33348	28355	33620	39210	40516
CIS	3380	1620	1669	1221	2463	2309	2855	3587	2844	3407	3281	5097
EU	2923	2919	1841	2919	3480	5692	7511	9264	7622	10040	12013	11674
Asia	1263	1280	855	1389	1714	3124	4129	5494	4811	5868	7137	6751
South America	379	882	683	1729	2142	4763	6029	7179	6233	6803	7505	6928
North America	1193	1289	771	800	803	1326	1693	2686	2124	1770	2296	2950
Africa	162	205	209	388	476	742	1024	1240	1197	1383	1739	1603
Others	1840	2072	955	1386	1742	2430	2913	3897	3523	4349	5238	5511

Source: Comtrade database, author's calculations (2013)

Table 3: Russian agricultural imports by geographic regions, million USD.

To prevent the growth of imports, negative trade balance and food dependency the Russian Federation has employed import-substitution policy in relation to agriculture. In 2010, Russian President approved the Food Security Doctrine of the Russian Federation. The Doctrine sets the following goals regarding the minimum share of domestic production in the total supply of basic food products: grain – 95%, sugar – 80 %, vegetable oil – 80%, meat and meat products – 85 %, milk and dairy products – 90 %, fish products – 80 %, potatoes – 95%, edible salt – 85 %. These goals should be achieved by 2020. (Doctrine of Food Security of RF, 2009)

Furthermore, Russia is seeking not only to achieve a high level of self-sufficiency in basic agricultural products, but also claims to be a major exporter of agricultural products and foodstuffs. To achieve all these goals Russian agricultural products must be competitive both in the domestic and global market (Competitiveness is one of the most serious problems of Russian agrarian trade (Liefert, 2002; Savin and Winker, 2009).). Russian government in nowadays is looking for the most suitable policies to encourage the Russian agricultural trade performance and to improve the position of Russian agricultural and foodstuff sector. There are four key determinants influencing Russian agricultural market (those determinants were identified by the "Food Security Doctrine") – agricultural sector performance, world food price, exchange rate and government subsidies.

To be able to develop the country's strategy for the upcoming decades it is necessary to identify the key trends and drivers affecting the Russian agricultural trade performance and development. The main objective of this paper is to analyze the influence of selected key variables (above mentioned) on Russian agricultural trade and to identify if there is existing the significant relationship or not. The secondary objective of the paper is the analysis of relationship existence between Russian food price development and World food price development (Russian food market is quite isolated from the World market through the Russian government policy and the significant share of all export transactions is realized through the bilateral agreements. It is the reason why one of the objectives is to find out if Russian food prices are influenced by world food prices development or if they are influenced by only regional prices.). The results coming from the analyses are very important especially for the future formation of Russian agricultural trade policy. On the base of hypotheses analyses the paper is identifying the existence of relationship between Russian agricultural trade value (especially export value) on one side and the set of above mentioned variables on the other side.

Materials and methods

In order to achieve the objectives, a number of methods and analytical tools have been used in this paper (time series analysis, trend functions, fixed-base index, chain base index and geometric mean of chain indices – Hindls, 2007).

Regression analysis

In this paper, the Russian foreign trade in agricultural products and foodstuffs is considered to be a dependent variable and other parameters (gross value of agricultural production, government subsidies, exchange rate and world food price) are considered to be independent variables. The regression analysis is conducted as logarithmic regression. The results coming from the analyses can be interpreted also as elasticity existing between endogenous and exogenous variable.

The several hypotheses about the relationship between the value of Russian foreign trade in agricultural products and foodstuffs (as a dependent variable) and studied independent variables are formulated and then the separate simple regression equations for each independent variable in relation to dependent variable is calculated and tested.

Every regression model is tested to see if it is „significant" or not.

Methods of hypothesis testing

Hypothesis testing is the use of statistics to determine the probability that a given hypothesis is true. There is a wide range of statistical tests available, depending on the nature of the investigation.

The P-value Method of Hypothesis Testing

A P-value (or probability value) is the probability of getting a value of the sample test statistic that is at least as extreme as the one found from the sample data, assuming that the null hypothesis is true.

In other words, a small P-value indicates that observation of the test statistic would be unlikely if the null hypothesis is true. Being a probability, P can take any value between 0 and 1. Values close to 0 indicate that the observed difference is unlikely to be due to chance, whereas a P value close to 1 suggests there is no difference between groups other than that due to random variation. The lower the P-value, the more evidence there is in favor of rejecting the null hypothesis. Alpha (α) is a probability threshold for a decision. If $P \leq \alpha$, we will reject the null hypothesis.

The aim of hypothesis testing is not to ‚accept' or ‚reject' the null hypothesis. Rather, it is simply to gauge how likely it is that the observed difference is genuine if the null hypothesis is true (Statistics, 2007).

The F-test in Regression

A significant result for the F statistic means that a relationship exists as described by the straight line model. This test is very important in the regression analysis, and essentially it is a special case of constraint checking.

Accordingly, if the value of this statistic is more than the critical value at a given level of significance, the null hypothesis is rejected, which means the statistical significance of regression. Otherwise, the model was deemed significant. If F-calculated is larger than F-critical thus we have to reject the hypothesis (Statistics, 2007).

The T- test in Regression

The t-statistic is the regression coefficient (of a given independent variable) divided by its standard error. The standard error is essentially one estimated standard deviation of the data set for the relevant variable. To have a very large t-statistic implies that the coefficient was able to be estimated with a fair amount of accuracy.

If the t-stat is more than critical value, it can be concluded that the variable in question has a significant impact on the dependent variable. High t-statistics (over critical value) mean the variable is significant.

The t-tests are used to conduct hypothesis tests on the regression coefficients obtained in simple linear regression. A statistic based on the t distribution is used to test the two-sided hypothesis that the true slope, β1 equals some constant value, $\beta_{1,0}$.

If the value of $\beta_{1,0}$ used is zero, then the hypothesis tests for the significance of regression. In other words, the test indicates if the fitted regression model is of value in explaining variations in the observations or if you are trying to impose a regression model when no true relationship exists between X and Y. Failure to reject H_0: $\beta_1 = 0$ implies that no linear relationship exists between X and Y (Statistics, 2007).

The Coefficient of Determination - r-sqrd (Goodness of Fit)

The coefficient of determination (R^2) indicates how well data points fit a line or curve.

The R^2 value is equal to the square of the simple correlation of x and y in simple regression. R^2 can be interpreted as the fraction (or percent if multiplied by 100) of the total variation in the outcome that is "accounted for" by regressing the outcome on the explanatory variable. R^2 -value varies from 0 to 1 (Statistics, 2007).

Results and discussion

We'll start with the formulation of hypotheses and their feasibility study, which will give us a basis for the further construction of the regression model. While many connections among these variable could be hypothesized, in this regression models we considered five hypotheses.

Gross agricultural and food production and foreign trade

The relationship between foreign trade and production of agricultural products is the most logical and the most probable. It is obvious that if country is able to increase its production, it is also able to increase its export performance.

Hypothesis I: Gross agricultural and food production affects country's agricultural export.

The null hypothesis is the gross agricultural and food production does not affect Russian foreign trade in agricultural products.

Value of gross production has been compiled by multiplying gross production in physical terms by output prices at farm gate. Thus, value of production measures production in monetary terms at the farm gate level. Since intermediate uses within the agricultural sector (seed and feed) have not been subtracted from production data, this value of production aggregate refers to the notion of „gross production".

	Gross Production Value	Export Value
1996	41252000	1697976
1997	39689000	1423363
1998	25781000	1034278
1999	22278000	610533
2000	24226000	1076535
2001	29147000	1117711
2002	28388000	1839763
2003	32885000	2339450
2004	41179000	2197106
2005	45741000	3451314
2006	53489000	4367401
2007	67699000	7734804
2008	88709000	7900781
2009	69204000	7530653
2010	69455000	5832416
2011	96202000	9215159

Source: FAOSTAT (2013)

Table 4: Gross Value of Agricultural Production and foreign trade in agricultural products in Russian Federation (1000 USD).

Value of gross production (Table 4) is provided in current term and is expressed in US dollars. The **current** value of production measures value in the prices relating to the period being measured. Thus, it represents the market value of food and agricultural products at the time they were produced.

US dollar figures for value of gross production are converted from local currencies using official exchange rates as prevailing in the respective years. Expressing data series in one uniform currency is useful because it avoids the influence of revaluation in local currency, if any, on value of production.

Government support for agriculture and agricultural exports

In the days of the Soviet Union, the government was inclined to consider the high levels of production as something desired, regardless of cost, and referred to the self-sufficiency as the ultimate goal. Therefore, subsidizing of agricultural enterprises was carried out in large volume, even in relation to the economically inefficient entities.

Large share of industry support was provided by the cheap material and technical resources for agriculture, particularly fertilizer and fuel, leading to inefficient use (overspending and wastage), which did not give a proportional increase in production volume.

These subsidies were sharply reduced after the 1991. Agricultural enterprises were not ready for such changes. The result was a sharp decline in agricultural production, the effects of which we can observe to this day.

In the recent years, funds allocated from the federal budget of the Russian Federation to support agriculture (Table 5), currently do not comply with its contribution to the formation of the gross domestic product (GDP) of the country. The support of agricultural production is a small fraction of the total expenditure budget (about 1-2% of total government expenditures).

Increased government support for agriculture stimulates the development of agricultural production, and therefore potentially has a positive impact on the volume of agricultural exports.

Hypothesis II: Government support for agriculture affects the agricultural exports.

The null hypothesis is the government support for agriculture does not affect Russian foreign trade in agricultural products (Table 5).

Russian government expenditures on agriculture consist of Federal Budget and the budgets

of subjects of the Russian Federation. For the purposes of this analysis only total consolidated budget expenditures are used.

	Consolidated budget	Federal Budget
1996	4921074	1659886
1997	5376127.2	1711372
1998	2503842.5	484282.3
1999	1441923	357434.4
2000	1955265.9	476373.9
2001	2310709.9	812519.7
2002	1907588.3	886805.3
2003	2218817.4	1032842
2004	2727865.1	1207757
2005	2778912.9	669064.4
2006	4074884	960955
2007	5723032.1	1058505
2008	9588427.9	2335407
2009	8793221.5	2619121
2010	8637405.5	1163215
2011	9145594.8	4814087

Sources: Rosstat, World Bank database (2013)

Table 5: Government expenditures on agriculture and rural development in Russian Federation (1000 USD).

Exchange rate and foreign trade

Next hypothesis is addressing the influence of the exchange rate of the ruble on changes in the value of country's foreign trade in agricultural products and foodstuffs.

According to the economic theory, increasing in the real exchange rate is leading to depreciation of domestic currency; thus, it is encouraging exports.

The exchange rate plays an important role in a country's trade performance. The fact that the Russian economy began to grow after the plunge of the ruble in 1998 proves that the strong ruble had been hampering the country's economic growth and made Russian products less competitive.

There is huge number of studies that investigate the impact of exchange rate on foreign trade, including agricultural exports and imports. The most of them investigates the impact of the exchange rate volatility. However, there will be examined only direct relationship between the official ruble/USD exchange rate (Table 6) and the Russian foreign trade (exports and imports separately).

Hypothesis III:

a) There is a relationship between the ruble exchange rate and Russian agricultural exports.

b) There is a relationship between the ruble exchange rate and Russian agricultural imports.

The null hypotheses are the exchange rate does not affect Russian foreign trade in agricultural products.

	Official exchange rate	Import Value	Export Value
1996	5.120833	10934964	1697976
1997	5.784833	12448930	1423363
1998	9.705083	10496568	1034278
1999	24.6199	7913562	610533
2000	28.12917	7233760	1076535
2001	29.16853	8709335	1117711
2002	31.34848	9360263	1839763
2003	30.69203	10993983	2339450
2004	28.81374	12363270	2197106
2005	28.28444	15460680	3451314
2006	27.19096	19304657	4367401
2007	25.58085	24535164	7734804
2008	24.85288	31390865	7900781
2009	31.74036	26682992	7530653
2010	30.36792	31843086	5832416
2011	29.38234	37233201	9215159

Sources: World Bank database, FAOSTAT (2013)

Table 6: Official exchange rate of Russian ruble and country's foreign trade in agricultural products (LCU per US$, period average, 1000 USD).

Official exchange rate refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market. It is calculated as an annual average based on monthly averages (ruble units relative to the U.S. dollar).

World Food Prices and Russian agricultural exports

In order to discuss the relationship between world prices and country's foreign trade it is necessary to explain their relations from an economic point of view.

As the world price level rises, foreign made goods become relatively more expensive so that

the demand for imports decreases. In the same situation, the country‘s exports will grow.

Therefore, we expect the positive correlation between international food prices and country’s agricultural exports.

Hypothesis IV: There is a relationship between World Food Prices and Russian agricultural exports

The null hypothesis is there is no relationship between World Food Prices and Russian agricultural exports.

In this analysis, World Food Price Index was used as an indicator of price changes. World Food Price Index consists of the average of 5 commodity group price indices (Meat, Dairy, Cereals, Oil and Fat and Sugar Price Indices) weighted with the average export shares of each of the groups for 2002-2004: in total 55 commodity quotations considered by FAO commodity specialists as representing the international prices of the food commodities noted are included in the overall index.

World Food Prices and Russia’s export prices

In addition to the analysis of factors affecting the volume of Russian trade in agricultural products and foodstuffs, this paper is examining the relationship between the prices of Russian agricultural exports and World prices of agricultural products (Table 7). It is possible to test to what extent the Russian export prices follow the worldwide prices.

Hypothesis V: there is a relationship between World Food Prices and Russia’s export prices

Data for the analysis are presented in the Table 7 below.

	World Food Price Index	Russia’s export price index
1996	129.1	72.2
1997	118.5	91.6
1998	107.1	67.6
1999	92.4	85.7
2000	90.4	86.6
2001	93.4	68.7
2002	89.9	73.2
2003	97.7	96.1
2004	112.4	76.7
2005	117.3	102.5
2006	126.7	120.9
2007	158.7	110.4
2008	199.8	179.7
2009	156.9	118.5
2010	185.3	119.3
2011	227.6	131.6

Sources: FAO, author’s calculation (2013)

Table 7: World Food Price Index and Russia’s food export price index.

Russia’s Export Price Index is calculated as Laspeyres index for country’s trade in agricultural products according to export unit values of 400 items (4-digit code in Harmonized System) weighted with the average export shares of each of the groups for 2002-2004.

Results of the regression analysis

The following tables (Tables 8, 9, 10, 11, 12 and 13) provides an overview of results coming from individual regressions.

N=16	b*	Std.Err. (of b*)	b	Std.Err. (of b)	t(14)	p-value
Intercept			-2209189	480880.9	-4.59405	0.000417
Var1	0.964083	0.070985	0	0.0	13.58157	0.000000

Regression Summary for Dependent Variable: Var2 (Spreadsheet1), R = .96408322 R^2 = .92945646 Adjusted R^2 = .92441763, F(1.14) =184.46 p<.00000 Std.Error of estimate: 8126E2

Source: author’s calculation (2014)

Table 8: Hypothesis I - Gross Production Value and export value.

N=16	b*	Std.Err. (of b*)	b	Std.Err. (of b)	t(14)	p-value
Intercept			-348242	733442.0	0.000000	0.642247
Var1	0.86614243	0.13357643	0.876342846	0.135149539	6.000000	0.000010

Regression Summary for Dependent Variable: Var2 (Spreadsheet1), R = .86614243 R^2 = .75020271 Adjusted R^2 = .73236005, F(1.14) = 42.045 p<.00001 Std.Error of estimate: 1529E3

Source: author’s calculation (2014)

Table 9: Hypothesis II - Government expenditure for agriculture and export value.

N=16	b*	Std.Err. (of b*)	b	Std.Err. (of b)	t(14)	p-value
Intercept			797819.0	2118820	0.376539	0.712161
Var1	0.36344802	0.24898444	119258.0	81699	1.000000	0.166440

Regression Summary for Dependent Variable: Var2 (Spreadsheet1), R = .36344803 R^2 = .13209447 Adjusted R^2 = .07010122, F(1.14) = 2.1308 p<,16644 Std.Error of estimate: 2850E3

Source: author's calculation (2014)

Table 10: Hypothesis IIIa - Official exchange rate (LCU per US$, period average) and export value.

N=16	b*	Std.Err. (of b*)	b	Std.Err. (of b)	t(14)	p-value
Intercept			9597186	7258617	1.000000	0.2073045
Var1	0.288588838	0.25589011	315649	279884	1.000000	0.2783687

Regression Summary for Dependent Variable: Var2 (Spreadsheet1), R = .28858884 R^2 = .08328352 Adjusted R^2 = .01780377, F(1.14) = 1.2719 p<.27837 Std.Error of estimate: 9764E3

Source: author's calculation (2014)

Table 11: Hypothesis IIIb - Official exchange rate (LCU per US$, period average) and import value.

N=16	b*	Std.Err. (of b*)	B	Std.Err. (of b)	t(14)	p-value
Intercept			-4625980	1051652	-4.39877	0.000606
Var1	0.911765	0.109768	63420	7635	8.30631	0.000001

Regression Summary for Dependent Variable: Var2 (Spreadsheet1), R = .91176461 R^2 = .83131471 Adjusted R^2 = .81926576, F(1,14) = 68.995 p<.00000 Std.Error of estimate: 1257E3

Source: author's calculation (2014)

Table 12: Hypothesis IV - World Food Price Index and export value.

N=16	b*	Std.Err. (of b*)	B	Std.Err. (of b)	t(14)	p-value
Intercept			26.00000	15,00000	1.000000	0.103507
Var1	0.8000757859	0.1603297	0.557578578	0.1117349475	4.000000	0.000200

Regression Summary for Dependent Variable: Var2 (Spreadsheet1), R = .80007579 R^2 = .64012126 Adjusted R^2 = .61441564, F(1.14) = 24.902 p<.00020 Std.Error of estimate: 18.388

Source: author's calculation (2014)

Table 13: Hypothesis V - World Food Price Index and Russia's export price index.

The following text provides the summary of results coming from individual analyses. Individual results are also briefly explained and discussed. At the end of each section there is information related to the results of individual hypotheses analyses.

1) Gross agricultural and food production and exports

On the basis of regression analysis, it is possible to formulate the following conclusions related to the relationship between the value of agricultural and food production in Russia and the value of country's foreign trade in agricultural products and foodstuffs (export).

The p-value of the F-statistic for agricultural production is greater than 0.05, so this term is significant at the 5% significance level given the other terms in the model.

The p-value (p = 0.0000) is greater than the common alpha level of 0.05, which indicates that it is statistically significant. Hence, it is possible to reject the null hypothesis.

F(1.14) = 184.4590, that is more than the critical value (4.6) at a given level of significance. It means that the regression is deemed significant.

Another way to test the regression for significance is to test the b1 term (slope term which shows the effect of X on Y). This is done via a t-test. The t-value is -4.594. The t-value will be negative if the first mean is smaller than the second one. The p-value for a negative t-value is the same as that for the positive version of that t-value. Therefore t = 4.594 is more than t_{crit} = 2.1448. It means that regression is statistically significant. The two tests give the same results.

Adjusted R^2 measures the proportion of the variance in the exchange rate that was explained by variations in the independent variables. In this case, the adjusted $R^2 = 0.82441763$ shows that 82.4% of the variance was explained. The correlation coefficient is 0.864 that is close to 1.

The empirical results directly support the hypothesis I. The results of the analysis show that there exists a relationship between the gross agricultural production value development and agricultural export value development. An increase in the agricultural production value has a significant and positive impact on export trade flows. The hypothesis I can be **accepted**.

2) Government support for agriculture and agricultural exports

Testing the hypothesis about the relationship between government expenditures for agriculture and country's exports of agricultural products provided the following results.

The p-value (0.000014) is greater than the alpha level of 0.05, which indicates that the regression is statistically significant.

F statistic (F = 42.04544) is more than the critical value (F-critical = 4.60) at a given level of significance, the null hypothesis is rejected, which means that the statistical significance of regression.

Adjusted R^2 = 0.73236005 shows that 73.2% of the variance was explained by the regression. R-Square is equal 0.75020 - it means that 75.0% of the variation was explained by the regression. The correlation coefficient is 0.78 and it is close to 1.

According to t-statistic analysis, the value of t = 4.594 is more than critical (2.1448). The t value is in the area of rejection, so that b is enough different from 0 to reject the hypothesis of no relationship between X and Y. It means that regression is statistically significant.

There is evidence, that the relationship between the government's support for agriculture and agricultural exports value. The hypothesis II can be **accepted**. Null hypothesis can be rejected.

3) Exchange rate and foreign trade

The regression analysis of the impact of ruble exchange rate on the Russian foreign trade was conducted both in relation to export and import flows.

Exchange rate and agrarian export value

If we are analyzing the relationship between the exchange rate of the ruble (in relation to USD) on the value of Russian exports of agricultural products and foodstuffs, the following results are coming from the analysis.

The p-value (0.16644) is greater than the common alpha level of 0.05, which indicates that it is not statistically significant.

In regression, the t-stat, coupled with its p-value, indicates the statistical significance of the relationship between the independent and dependent variable. The value of t=0.3222 is less than critical (2.1448) and therefore regression is not statistically significant.

F(1.14) = 2.1308, that is less than the critical value (4.6) at a given level of significance. It means that the regression is deemed insignificant.

The adjusted R2=0.07010118 shows that only 7.0% of the variance was explained. The „R-Square"' provides us the information - that 13.2% of the variation was explained by the regression. The correlation coefficient is very low (less than 0.15).

On the basis of results coming from the analysis the hypothesis IIIa can be **rejected** and the regression can be considered as an insignificant.

Exchange rate and agrarian import value

The analysis of relations between the ruble/USD exchange rate and Russian agricultural import value provides the similar results as in the case of exports.

The p-value (0.2784) is greater than the alpha level of 0.05. It means that it is not statistically significant. The value of t = 1.3222 is less than critical (2.1448) and therefore regression is not statistically significant.

F(1.14) = 1,271897 - that is more than the critical value (4.6) at the level of significance $\alpha = 0.05$. It means that the parameter can be deemed significant. Adjusted $R^2 = 0.01780374$ shows that only 1.7% of the variance was explained by this parameter. According to the value of R^2, 8.3% of the variation can be explained by the regression. The correlation coefficient is lower than 0.1.

The hypothesis IIIb can be also **rejected** and the regression can be considered also as an insignificant.

4) World Food Prices and Russia's agricultural export

The analysis of relationship between international food prices and Russian agricultural exports provides the following results.

The p-value ($p = 0.000001$) is less than the common alpha level of 0.05, which indicates the significance of the regression.

The F-value of the regression is significant and equals 68.99479. It is much more than critical value (4.6). In this case, the explained variation (due to regression) is 68.99479 times greater than the unexplained (residual) variation. This is why we reject the null hypothesis.

The coefficient of determination, R-Square, is 83.1%. It means that 83.1% of the variation can be explained by the regression. The adjusted $R^2 = 0.81926576$ shows that 81.9% of the variance was explained by the regression. The correlation coefficient is 0.912 that is very close to 1. It means that the relationship between both mentioned parameters is very strong.

Therefore, the results of the analysis support the hypothesis about the relationship between world food prices and Russian agricultural export value development. The hypothesis IV can be **accepted**. Null hypothesis can be rejected.

5) World Food Prices and Russia's export prices

The last hypothesis tested is the one about relationship between World Food Prices and Russia's export prices.

According to results of the regression analysis, p-value is equal 0,000198. This value is greater than the alpha level (0.05). Therefore, the regression is statistically significant.

F statistic ($F = 24.90199$) is more than the critical value at a given level of significance It means that the regression can be considered as the significant one.

However, according to t-statistic analysis, the value of $t = 1.7415$ is less than critical (2.1448). So according to this criterion – the regression is statistically insignificant.

Adjusted $R^2 = 0.61441564$ shows that 61.4% of the variance can be explained by the regression. R-Square is equal 0.64012126. It means that 64.0% of the variation can be explained by the regression. The correlation coefficient is 0.8.

Thus, p-value, f - statistic and high value of correlation coefficient can be considered as evidences of the relationship between world food prices and Russia's agricultural export prices. However, according to t-statistic the regression is statistically insignificant. Nevertheless, the hypothesis V can be **accepted**.

Conclusion

On the basis of above mentioned characteristics related to Russian agricultural foreign trade development and on the basis of results coming from individual regression analyses the following conclusions can formulated. Russian agricultural trade heavily changed during the last two decades (Gaidar et al., 2011). The value of exports and imports increased significantly. The value of imports was growing much faster comparing to value of exports. The result is constantly increasing negative trade balance. The last two decades of transformation changed not only the value of Russian agrarian trade, but also the territorial and commodity structure of Russian agrarian trade changed significantly. Russian agrarian export commodity structure became more concentrated, on the other hand the commodity structure of agrarian imports became more heterogeneous. The negative figure of Russian agrarian trade commodity structure development is the fact that while commodity structure of imports is represented by high share of semi-finalized or finalized products, the commodity structure of Russian export can be characterized by high portion of unprocessed products with very low added value. The territorial structure of Russian agrarian trade also changed significantly. In nowadays Russian exports are focused especially on Asian countries and CIS. On the other hand Russian imports are focused especially on the European Union and America.

Talking about individual hypotheses characterizing the relationships between Russian agricultural foreign trade and selected above mentioned variables the following can be summarized. The empirical results are directly supported by the hypotheses I, II, IV and V. Thus, there is existing a strong relationship between the gross agricultural production value and agricultural export value development. An increase in the agricultural production value has a significant and positive impact on export trade flows. There are also high correlation and statistical significance in relations

between government support for agriculture and agricultural exports. The results of the analysis support the hypothesis about the relationship between world food prices and agricultural exports. There is also the evidence of significant relationship between world food prices and Russia's agricultural export prices development. So it can be said with some certainty, that Russian export prices substantially follow the worldwide prices.

In addition, in the regression analysis two hypotheses were rejected. These are hypotheses about relationships between ruble/USD exchange rate and Russian agricultural export and import value development. In both cases, the regressions were deemed insignificant. From the import side it can be explained by fairly low price elasticity of demand for agricultural products compared to other products. As mentioned earlier, Russia is not self-sufficient in agricultural products. Since agricultural and foodstuff products are products of first priority, the demand for them is less exposed to fluctuations in the exchange rate.

From the export side it is possible to explain the above mentioned results through the specific commodity and territorial structure of Russian agrarian trade (especially agrarian export). It is dominated by unprocessed products. In addition, a large share of Russian agrarian export is realized in relation to CIS countries.

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