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Factor analysis of the competitiveness of agricultural products in the Eurasian Economic Union (EAEU)

Т*his article discusses the outcomes of a quantitative analysis of the competitiveness of grain and its recycling in the countries-members of the Eurasian Economic Union (EEU) through econometric panel data models. The analysis is based on the data of public authorities' statistics of the countries-members of the* EEU, *as well as the United Nations Comtrade Database which is a repository of official international trade statistics. The results of the analysis allow to assess the level of competitiveness of produced agro-food products in the countries-members of the* EEU *and determine the extent to which various factors affect it. The research conclusions can be used to develop and adjust the agreed with the agro-food policy in the* EEU.

Key words: agriculture, grain and products of its processing, competitiveness, prices, production volumes, export, import, price competitiveness factor, integral indicator of competitiveness, Eurasian Economic Union (EAE), factor analysis, panel data models.

JEL classification: R1; C21; C23.

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Introduction

The Eurasian Economic Union (EAEU) was established in 2015 and now consists of five member states: the Republic of Armenia, the Republic of Belarus, the Republic of Kazakhstan, the Kyrgyz Republic and the Russian Federation. One of the primarily goals of the EAEU is the development of a coordinated

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agricultural policy-making and implementation mechanism between the member states, including measures to ensure the competitiveness of produced agricultural products.

One of the main challenge for the economy of the countries-members of the EEU is to increase the competitiveness of products. This is the most important thing in recent years due to the growing up globalization and cross-country competition. The main subject of this research focus on identify and assess the main factors affecting the competitiveness of agricultural products and food in the countries-members of the EEU. The subject of the study is a factor analysis of the competitiveness of agri-food products.

As a tool for the study of factor analysis of the competitiveness of agri-food products, the methodology for determining the integral index of competitiveness for various types of agro-food products for all the countries of the EEU was used, as well as methods of correlation regression analysis using the package of applied econometric programs Eviews 9.5.

The most important segment of the agro-food market of the EEU is the grain market. The share of the countries-members of the EEU in the world production of cereals and leguminous crops in 2016 was 5.8%. At the same time, in the world wheat production, the share of the EEU countries in 2016 reached 12%. In the world wheat trade, the share of the countries-members of the EEU is even higher - 17%. Therefore, as the object of factor analysis of competitiveness, the grain market is chosen, as a priori competitive. In this research will be examine the following types of agri-food products - wheat, barley, corn for grain, wheat flour and pasta.

Theoretical aspects of quantitative assessment of competitiveness

Competitiveness is a complex concept, which includes a large number of significantly different objects and factors.

The development of the theory of competitiveness is associated with the names of such foreign scientists as M. Porter, M. Enright, B. Ballas, K. Freeman, J. Proudman, S. Redding, J. Lafaye and others. Among domestic scientists studying the problems of competitiveness, G.L. Azoeva, I.A. Dubrovina, T.P. Rozanov, R.A. Fatkhutdinova, etc. Depending on the aspects of the study of competitiveness, there are different approaches to its essential content.

Methical approaches to the assessment of competitiveness largely depend on the levels (micro, meso, macro) on which the study is conducted. These levels include a study of the competitiveness of the country, the economy, the industry, the firm and the product. For example, domestic and domestic products, individual enterprises, regions can compete on the domestic market; on the external market - the state, their blocks, large companies.

Accordingly, a set of tools depends on the research object, which will allow for a quantitative assessment of competitiveness. In the economic literature, the following are the main different methods for assessing the competitiveness of goods:

- methods for assessing competitiveness based on indices of comparative advantage (the index of B. Balassa, Proudman-Redding, G. Bowen, D. Greenway and K. Milner, J. Lafay, etc.);

- a technique based on the evaluation of goods from the position of their conformity for satisfying consumer qualities (the Rosenberg model);

- method of comparison with the ideal value characterizing the property of the goods (model with an ideal point);

- an estimation of competitiveness of the goods on the basis of calculation of an integrated indicator.

These methods can be used to some extent to assess the competitiveness of agri-food products. However, in our opinion, in the case when the analysis of product competitiveness at the macrolevel is carried out, the most expedient is the use of the methodology for calculating the integral index.

The competitiveness of agri-food products is determined from the economic point of view as the ability to compete in terms of price conditions and qualitative parameters while ensuring sustainable growth.

To evaluate the competitiveness of the EEU countries for various types of agri-food products, we propose a methodology for assessing the competitiveness of products based on the calculation of an integrated indicator that includes five factors: average producer price (AVP_{ij}), export price (EX_P_i), output (Q_{ij}), share export in production volume (EX_Q_{ij}), price competitiveness factor (Com_C_{ij}), defined as the ratio of average prices of agricultural producers and import prices (IM_P), taking into account imports s duties, customs duties, VAT and excise duties.

To ensure the comparability of the calculations, it is necessary to normalize each i – kind of product for each j - country-member EEU using the following maximising equation:

$$AVP_{ij} = \frac{AVP_{ij}}{\max\left\{AVP_{ij}\right\}} \tag{1}$$

$$EX\_P_{ij} = \frac{EX\_P_{ij}}{\max\left\{EX\_P_{ij}\right\}} \tag{2}$$

$$Q_{ij} = \frac{Q_{ij}}{\max\left\{Q_{ij}\right\}} \tag{3}$$

$$EX\_Q_{ij} = \frac{EX\_Q_{ij}}{\max\left\{EX\_Q_{ij}\right\}} \tag{4}$$

$$Com\_C_{ij} = \frac{Com\_C_{ij}}{\max\left\{Com\_C_{ij}\right\}} \tag{5}$$

To calculate the integral indicator of competitiveness, these indicators are divided into two groups:

the first group of indicators determines the competitiveness of products based on price factors(AVP_{ij}, EX_P_{ij}, Com_C_{ij}): products become more competitive with a decrease in these indicators;

the second group of indicators characterizes the competitiveness of products based on the production volumes and the share of exports (Qij, EX_Qij): the products become more competitive with an increase of these indicators.

Accordingly, the calculations are based on these multidirectional factors. To ensure their comparability, an additive model of deterministic factor analysis is used.

On the basis of normalized factors, an integral indicator of competitiveness is determined for each type of agro-food products of the EAEU states (INT_Cij).

$$INT\_C_{ij} = \left\{ 1 - \left(AVP_{ij} + EX\_P_{ij} + (1 - Q_{ij}) + (1 - EX\_Q_{ij}) + Com\_C_{ij} \right) / 5 \right\} \tag{6}$$

The higher the integrated indicator of competitiveness, the more competitive the products are, both on the domestic and foreign markets. The proposed methodology includes not only the calculation of the integral index of the competitiveness of products of the EEU countries, but also the use of the correlation-regression analysis methodology in order to determine the degree of influence of each of these factors on the weighted average integral indicator of competitiveness.

Data and methods

During the research, a set of methods was used, including a monographic study of the subject of research, expert assessments, statistical methods, econometric modeling. Through the econometric model, the main quantitative relationships between the analyzed economic phenomena and processes will be described.

The annual data of the state statistical offices of the EEU countries and the international trade database UN Comtrade on the volume of production, export-import operations and prices for wheat, barley, corn, wheat flour and pasta by the EEU countries for the period 2010-2016.

The main factor affecting competitiveness is the price factor, therefore when constructing the econometric model, we will use spatial and temporal statistics, including the various types of prices that have been formed in the five states of the EEU during the period 2014-2016:

- average producer prices (AVP_{ij});

- average export prices (EX_P_{ij});

- coefficients of product price competitiveness (Com_C_{ij}), representing the ratio AVP_{ij} and IM_P_{ij}.

In addition to the price parameters, the competitiveness of agri-food products is affected by two more factors: the volume of its production (Q_{ij}) and exports, which directly correlate with prices.

To determine the dependence of the integral index of the competitiveness of agri-food products on factors affecting the formation of product competitiveness, a multifactorial analysis of the listed variables is carried out.

The first factor investigated is the average producer prices for grain and products of its processing.

In 2016, the minimum level of producer prices for each of the types of products considered was formed in the Republic of Kazakhstan: for wheat - 105 US dollars per ton, for barley - 77 US dollars per ton,

for corn for grain - 114 US dollars per ton, for wheat flour - USD 211 per ton, for pasta - USD 386 per ton. The highest prices for wheat, barley and wheat flour were registered in the Republic of Armenia (USD 231 per ton, USD 212 for t, and 341 US dollars per ton, respectively).

The second factor is export prices.

In addition to the cost of the goods, the export price includes transportation, insurance, indirect taxes, etc. In 2016, the most competitive export prices on the domestic market of the EAE for wheat and wheat flour were in the Republic of Belarus - $ 131 per ton and $ 177 US per tonne, respectively. For barley and pasta - in the Republic of Kazakhstan ($ 95 per ton and $ 618 per tonne). By corn for grain - in the Russian Federation ($ 929 per ton).

The third factor is the coefficient of price competitiveness.

The analysis of the coefficient of price competitiveness made it possible to determine that the Republic of Belarus, the Republic of Kazakhstan and the Russian Federation possess the greatest competitive advantages among the EEU states.

However, examining only the price factor, the second problem is the problem of production and export volumes, which can be minimal at a sufficiently competitive price, which does not increase the overall index of product competitiveness.

The next investigated factor is the volume of grain production and its processing products. In 2016 gross grain harvest in the EEU reached a record value of 151 million tons. This high figure was mainly due to the increase in grain production in the Russian Federation and the Republic of Kazakhstan in recent years, both due to the increase in grain yields, and due to growth of acreage.

The main grain producers in the EEU are Russia and Kazakhstan, their combined share in total wheat production in 2016 was 96.4%, barley and maize for grain - 92%.

In recent years, the gross wheat harvest in the EEU has fluctuated significantly: from 51 million tons (in 2012, which was due to a catastrophic drought in Russia) to almost 92 million tons in 2016, i.e. growth in 2012-2016. amounted to almost 80% (Figure 1). As a result, the EEU took the third place in the world for wheat production (after the EU - 145 million tons and China - 129 million tons). The maximum growth in production was recorded in Russia - in 2016 it was 37% more than the average for the previous five years (from 2011-2015), in Armenia the increase was almost 17%, in Kazakhstan - 2%. In Belarus and Kyrgyzstan, gross wheat harvest was slightly lower than the average annual figures for 2011-2015.
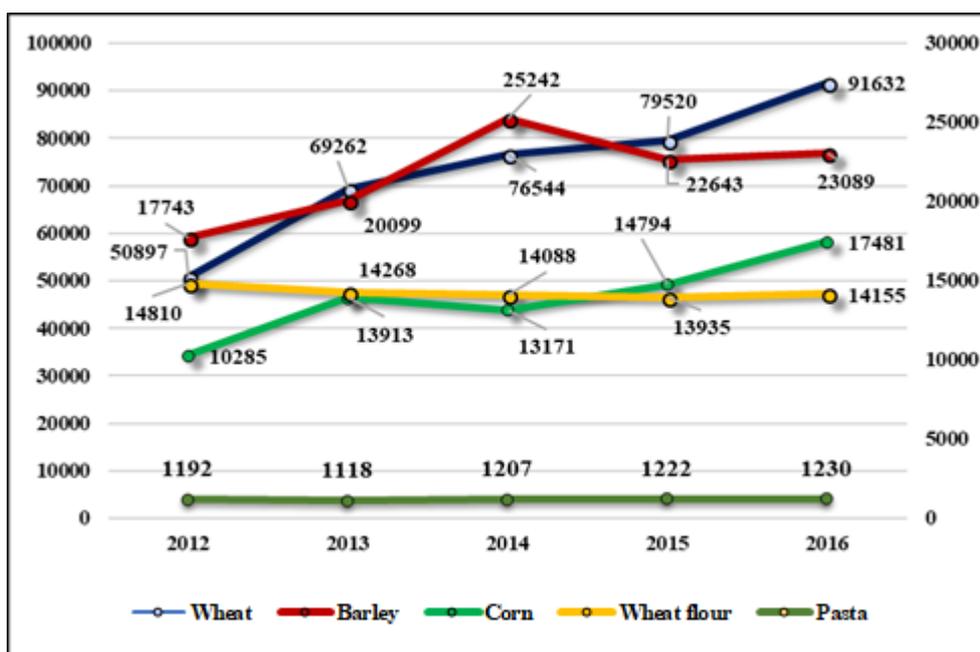
Source: compiled from the statistical services of the member states of the EEU

Figure. 1. Gross collections of wheat, barley, maize for grain and volumes production of flour and pasta in the EAE in 2012-2016, thousand tons

Gross collections of barley in 2012-2016. as a whole, the EEU increased by 30% and amounted to 23 million tons in 2016. The largest increase in production was registered in Armenia, Kazakhstan, Kyrgyzstan. In Belarus, on the contrary, gross barley harvests in the period under review decreased by 25%.

High growth rates of gross revenues were observed for maize for grain (an increase of 70%), the volume of its production in the EEU in 2016 reached 17.5 million tons.

The flour production in the EEU during the period under review decreased by 4.5% and amounted to 14.2 million tons in 2016. The decline in production was mainly due to a reduction in its production in the Russian Federation.

Volumes of production of macaroni products in the EEU rose by 3% and reached 1.2 million tons.

The leader in terms of the volume of grain production and its processing products among the states of the EEU is the Russian Federation.

The fifth factor affecting the competitiveness of products is the volume of exports, or more precisely, the share of exports in production volumes, which is the export concentration index.

If to compare the share of exports in production, then in 2016 the highest share of exports in the volume of production for wheat was formed in the Russian Federation (35%), barley in the Republic of Kazakhstan (24%), maize for grain - in the Russian Federation (35%), flour - in the Republic of Kazakhstan (60%), for pasta - in the Republic of Kazakhstan and the Russian Federation (11% and 10% respectively) (Figure 2).
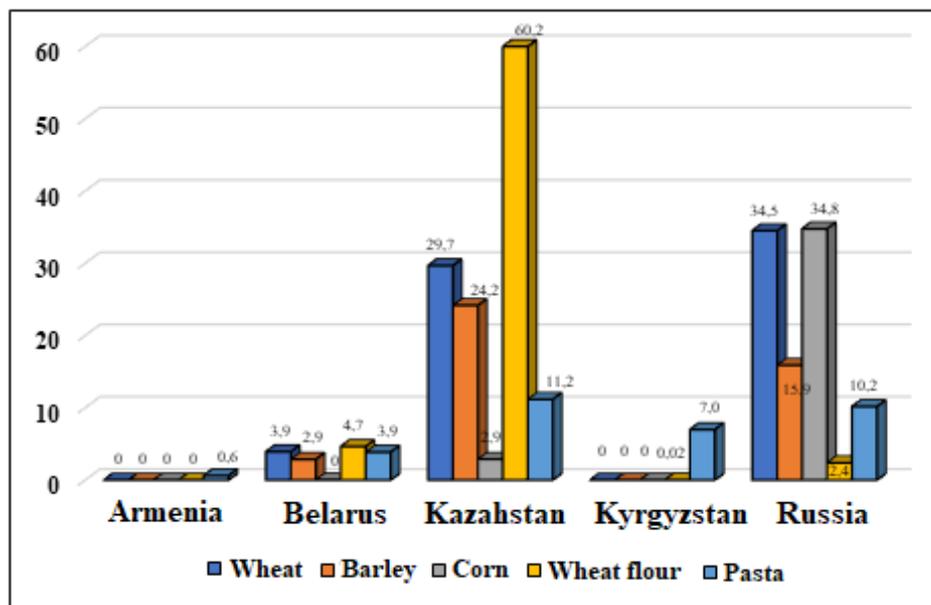
Source: compiled from UNComtrade and ECE data

Figure 2. Share of exports in the volume of production of wheat, barley, maize for grain flour and pasta in the Member States of the EEA 2016, %

Integral indicators of the competitiveness of grain and products of its processing on the domestic market of the EEU, determined on the basis of average producer prices, export prices, production volumes and share of export of products, price competitiveness coefficients are presented in table 1. For wheat, barley, maize for corn and pasta the most a high index was established in the Russian Federation, and wheat flour in the Republic of Kazakhstan. The Republic of Armenia and the Kyrgyz Republic in the market of grain and products of its processing are not competitive.

Table 1. Integral indicator of the competitiveness of grain and products of its processing in the member states of the EAEC in 2016, %

Product	Armenia	Belarus	Kazakhstan	Kyrgyzstan	Russian Federation
Wheat	0	62,0	73,0	0	100
Barley	0	55,2	88,3	0	100
Corn	0	4,2	17,1	0	100
Wheat flour	0	52,4	100	0	35,2
Pasta	0	25,3	70,6	0	100

Regression analysis of factors of competitiveness of grain and products of its processing

The main producers of grain and products of its processing in the EEU are Russia, Kazakhstan and Belarus. Therefore, the object of correlation-regression analysis of competitiveness factors will be the products in these three countries.

In order to compare the above mentioned EEU countries on the criterion of the competitiveness of grain and products of its processing, and also to determine the degree of influence of this or that factor on the integral indicator of competitiveness, we will construct econometric models. These models for each product type in the whole of the EEU will take the following form:

$$INT\_w = b_0 + b_1 RF_{jt} + b_2 RB_{jt} + b_3 KZ_{jt} + \varepsilon \tag{7}$$

b_0 – the conditional start of the regression model (constant);

b_i – coefficient of pure regression;

INT_w – the weighted average integral indicator of competitiveness;

$RF_{ij}, RB_{ij}, KZ_{ij}$ – integral indicators of competitiveness of i products in Russia, Belarus, Kazakhstan, respectively;

ε — random error of the regression model.

As a dependent variable in the presented model is the weighted average indicator of the competitiveness of grain and products of its processing in general for the EEU - INT_w. To determine this indicator, it is necessary to calculate the integral indicators of competitiveness (RFij, RBij, KZij) for i type of product j of the country, using the formula 6. Then we calculate the weighted average indicator - INT_w, as weights used the share j of the state in the total volume of gross grain production in the EEU.

The degree of influence of price determinants, factors of the volume of production and export of grain on the integral indicator of its competitiveness, will be estimated on the basis of the coefficients of pure regression (bi) for j state and i type of output of the grain market using the models of multiple regression of the species:

$$INT\_C = b_0 + b_1 AVP_{ij} + b_2 EX\_P_{ij} + b_3 Com\_C_{ij} + b_4 Q_{ij} + b_5 EX\_Q_{ij} + \varepsilon \tag{8}$$

INT_C — integral indicator of competitiveness;

AVP (Average price) — average producer prices of grain products in the EEA member states, in US dollars;

EX_P (Export prices) — export prices for grains and products of its processing in the Member States of the EEA, in US dollars;

Com_C (Coefficient of competition) — coefficient of price competitiveness;

Q — volumes of cereal production from the member states of the EAEC, thousand tons;

EX_Q — the share of grain exports from the EEA member states in total production.

The construction of models of competitiveness and evaluation of their parameters were carried out in the package of applied econometric programs Eviews 9.5.

At the initial stage, consider the level of competitiveness of grain and its processing products in Russia, Kazakhstan and Belarus, to compare the competitive advantages of each country. To this end, we calculate the average integral competitiveness index (INT_w) for the whole of the three countries of the EEA, using as a weight the share of each state in the total volume of the GNPP's gross output.

Next, consider the degree of influence of various factors on product competitiveness in the EEA states.

Wheat

The model of multiple linear regression, reflecting the dependence of the integrated indicator of wheat competitiveness in the EEU on the parameters of the competitive advantages of individual EAEC countries, will take the following form:

$$INT\_w = 0,062 + 0,65\,RF - 0,033\,RB + 0,21\,KZ$$
$$\;\;\;\;\;\;\;\;(0,019)\;\;\;\;(0,038)\;\;\;\;\;\;\;\;(0,019)\;\;\;\;\;\;\;\;(0,019)$$

Source. The values of standard errors are indicated in parentheses at a 5% level of statistical significance.

Parameters of the obtained econometric model show that the most competitive in the period of 2010-2016. is wheat produced in the Russian Federation (the largest coefficient of pure regression with variable RF), the Republic of Kazakhstan ranks second in terms of competitiveness, and the Republic of Belarus on the third. The existing ranking of the countries in question is determined by the high level of wheat production and exports in the Russian Federation.

Further, using the methods of correlation-regression analysis, we estimate the strength and direction of the influence of price and non-price factors on the competitiveness of wheat in each individual country of the EEU. The results of the analysis are presented in Table 2.

Table 2. Results of regression analysis of competition factors of wheat in Russia, Kazakhstan and Belarus in 2010–2016 years

Factors	Coefficient	Standard error	t-Statistic	Prob
Russian Federation				
Const	-0,51	0,084	-1,80	0,032
Average prices (APV)	-0,81	0,021	0,92	0,041
Объём производства (Q)	1,14	0,023	-0,48	0,006
Export prices (EX_P)	-0,41	0,018	1,92	0,011
Share of export (EX_Q)	-0,39	0,027	-0,24	0,008
Coefficient of competition (Com_C)	-0,54	0,0103	-1,154	0,030
R^2=98%, F =32,32, Prob (F) = 0,016				
Republic of Belarus				
Const	0,26	0,026	0,08	0,033
Average prices (APV)	-0,16	0,014	-1,18	0,029
Объём производства (Q)	0,09	0,019	-0,50	0,064
Export prices (EX_P)	-0,07	0,007	-1,12	0,031
Share of export (EX_Q)	0,14	0,005	2,87	0,041
Coefficient of competition (Com_C)	-0,17	0,007	-2,60	0,049

$R^2=90,5\%$, Prob F = 0,017				
Republic of Kazahstan				
Const	-0,66	0,044	-1,50	0,037
Average prices (APV)	0,48	0,022	2,18	0,008
Объём производства (Q)	0,83	0,027	0,16	0,009
Export prices (EX_P)	-0,32	0,16	5,16	0,00
Share of export (EX_Q)	0,08	0,019	0,48	0,0065
Coefficient of competition (Com_C)	-0,09	0,022	-0,37	0,0073
$R^2=84,7\%$, F (s) =5,55, Prob F = 0,1				

The data of Table 2 show that the level of wheat competitiveness in the Russian Federation is most influenced by such factors as production volumes and average producer prices. Gross harvest of wheat in farms of all categories in the period 2010-2016. increased by almost 80% - from 41.5 million tons to 73.3 million tons. Along with the growth in production, volumes of wheat supply to foreign markets also increased - in relative terms, this figure more than doubled. However, the outstripping growth in wheat production (supply), compared with the dynamics of demand in domestic and foreign markets, exerts pressure on both domestic and export prices of agricultural producers. In particular, average domestic wheat prices reached peak values in 2013 - $ 244 per ton, in subsequent periods the price steadily decreased and in 2016 it was $ 132. The same trend is observed in the formation of export prices for Russian wheat. This strengthens Russia's competitive position in foreign markets. The current level of prices for Russian wheat is much lower than in the leading countries by the volume of exports of this crop in the world. For example, the average export price for wheat produced in Russia in 2016 was 166.5 dollars, and in the USA - 224.9 dollars, in Canada - 228.5 dollars.

In the Republic of Belarus the greatest influence on the competitiveness of wheat is exerted by such factors as domestic producer prices and the share of exports in the total volume of gross production. In particular, the prices of Belarusian agricultural producers of wheat reached the highest values in 2013 - USD 233 per ton and in subsequent years fell steadily, reaching USD 127 in 2016. In this case, gross collections of wheat are increasing. Thus, in 2016, the increase compared to 2010 was 34.5%. Also, the volumes of export deliveries and export share grew: almost 19 times - from 5 to 91.6 thousand tons, and the share of exports increased from 0.28% to 3.9%.

In Kazakhstan, the most important factors of wheat competitiveness are the average producer prices, export prices and production volumes. From 2013, the negative dynamics of average producer prices remains, the level of which has almost halved by 2016, as well as export prices - a decrease of about 36%. According to the price criteria, Kazakhstan has the greatest competitive advantages among all the countries of the EAEC. In the period 2010-2016. Kazakh agricultural producers have increased the volume of wheat production from 9.6 to 15 million tons. However, against the background of growth in production volumes, the share of exports is declining. In particular, if in 2010 the volume of wheat deliveries from Kazakhstan to foreign markets amounted to 5 million tons - more than half of the total production of this crop, in 2012

exports amounted to 7.5 million tons - about 76% of gross harvest, then by 2016 this indicator decreased to 4.4 million tons - 30% of the total volume of production.

Barley

The model of multiple linear regression, reflecting the dependence of the integral indicator of barley competitiveness in the EEU on the parameters of the competitive advantages of the countries studied, will take the form:

$$INT\_w = -0,024 + \underset{(0,007)}{0,81}RF + \underset{(0,08)}{0,07}RB + \underset{(0,0013)}{0,15}KZ$$
$$_{(0,063)}$$

Source. The values of standard errors are indicated in parentheses at a 5% level of statistical significance.

The parameters of the obtained econometric model show that the most competitive in the period of 2010 – 2016. is the barley produced in the Russian Federation (the largest coefficient of pure regression with variable RF), the second place is occupied by the Republic of Kazakhstan, the third is the Republic of Belarus (table 3). The ranking of the countries under consideration is also due to the high level of wheat production and exports in the Russian Federation.

Table 3. Results of regression analysis of competition factors of barley in Russia, Kazakhstan and Belarus in 2010–2016 years

Factors	Coefficient	Standard error	t-Statistic	Prob
Russian Federation				
Const	0,16	0,043	0,38	0,008
Average prices (APV)	-0,28	0,01	3,46	0,02
Объём производства (Q)	0,32	0,02	1,43	0,021
Export prices (EX_P)	-0,11	0,007	2,00	0,01
Share of export (EX_Q)	0,07	0,009	-0,80	0,046
Coefficient of competition (Com_C)	-0,21	0,008	-2,75	0,04
R^2=91%, F =20,99, Prob (F) = 0,016				
Republic of Belarus				
Const	0,13			
Average prices (APV)	-0,26	0,011	-1,98	0,011
Объём производства (Q)	0,07	0,014	-1,84	0,013
Export prices (EX_P)	-0,09	0,006	-1,57	0,018
Share of export (EX_Q)	0,077	0,006	1,21	0,028
Coefficient of competition (Com_C)	-0,16	0,006	-2,57	0,005
R^2=90,5%, Prob F = 0,017				
Republic of Kazakhstan				
Const	0,21			

Average prices (APV)	-0,22	0,019	-0,62	0,056
Объём производства (Q)	0,11	0,016	0,35	0,074
Export prices (EX_P)	-0,11	0,014	-0,07	0,095
Share of export (EX_Q)	0,095	0,014	1,20	0,028
Coefficient of competition (Com_C)	-0,009	0,012	-0,02	0,099
$R^2=84,7\%$, F (s) =5,55, Prob F = 0,01				

On the basis of the data in Table 3, it can be concluded that in the Russian Federation the most significant factors of barley competitiveness are the volumes of production, the average producer prices and the coefficient of price competitiveness. In particular, during the period 2010-2016. the volume of barley production in Russia has more than doubled - from 8.35 to 18 million tons, which is about 80% of the production of this crop as a whole for the countries of the EEU in question. The dynamics of producer prices of barley is characterized by a negative trend, as in the case of wheat. The average prices for Russian barley reached the maximum values in 2013 - 216 US dollars per ton, by the end of 2016 prices fell almost twofold - to $ 116. At the same time, it should be noted that the prices for barley of Russian agricultural producers are the largest among all the countries of the EEU. The current level of export prices allows Russia to confidently compete with the leading countries in terms of barley exports in the world - France, Australia and Germany. Export prices for barley in these countries in 2016 were 182, 195, 173 US dollars, respectively, which is much higher than export prices for Russian barley, the level of which in 2016 was $ 148.

In the Republic of Belarus, the average producer prices and the price competitiveness factor have the greatest impact on the competitiveness of barley. The least significant factor is the volume of production. For the period 2010-2016. The gross harvest of barley in farms of all categories declined by almost 38%, from 1.97 million tons to 1.23 million tons.

In Kazakhstan, the competitiveness of barley is also influenced mainly by price factors. The current level of domestic and export prices for barley in Kazakhstan is the lowest in the grain market of the Unified Energy System ($ 77 per tonne and $ 95 per tonne, respectively). The coefficient of price competitiveness does not significantly affect the level of competitive advantages of barley in the internal market of the EAEC.

Corn

The model of multiple linear regression, reflecting the dependence of the integrated indicator of corn's competitiveness in the EEU on the parameters of the competitive advantages of individual countries of the Union, will take the form:

$$INT\_w = -0,033 + \underset{(0,035)}{0,92\,RF} + \underset{(0,05)}{0,05\,RB} + \underset{(0,009)}{0,15\,KZ}$$
$$\underset{(0,0065)}{}$$

Source. The values of standard errors are indicated in parentheses at a 5% level of statistical significance.

Parameters of the obtained econometric model show that the most competitive in the period of 2010–2016. is maize produced in the Russian Federation (the highest coefficient of pure regression with variable RF), the second place is occupied by the Republic of Kazakhstan, the third is the Republic of Belarus (table 4). The ranking of the countries under consideration is also due to the high level of maize production and exports in the Russian Federation.

Table 4. Results of regression analysis of competition factors of corn in Russia, Kazakhstan and Belarus in 2010–2016 years

Factors	Coefficient	Standard error	t-Statistic	Prob
Russian Federation				
Const	-2,09	0,135	-1,55	0,037
Average prices (APV)	-0,08	0,002	-3,18	0,019
Объём производства (Q)	0,08	0,003	3,06	0,02
Export prices (EX_P)	-0,11	0,000	3,22	0,019
Share of export (EX_Q)	0,37	0,012	-3,16	0,019
Coefficient of competition (Com_C)	-0,39	1,85	-3,22	0,019
$R^2 = 91\%$, F = 20,99, Prob (F) = 0,016				
Republic of Belarus				
Const	0,25	0,01	2,53	0,024
Average prices (APV)	-0,13	0,000	2,33	0,026
Объём производства (Q)	0,05	0,000	2,47	0,025
Export prices (EX_P)	-0,12	0,000	-2,68	0,023
Share of export (EX_Q)	0,05	0,0045	-0,84	0,056
Coefficient of competition (Com_C)	-0,33	0,010	-6,18	0,01
$R^2 = 90,5\%$, Prob F = 0,017				
Republic of Kazakhstan				
Const	1,77	0,018	7,06	0,009
Average prices (APV)	-0,80	0,00	-2,72	0,022
Объём производства (Q)	0,09	0,00	-1,09	0,047
Export prices (EX_P)	-0,26	0,00	-3,19	0,019
Share of export (EX_Q)	0,063	0,003	1,69	0,034
Coefficient of competition (Com_C)	-0,34	0,017	0,23	0,0085
$R^2 = 84,7\%$, F (s) = 5,55, Prob F = 0,1				

The data in Table 4 show that the price competitiveness ratio has the greatest impact on the level of competitiveness of maize in the Russian Federation. The level of average producer prices of corn in Russia in 2016 was about 125 US dollars per ton. The second and third place in terms of the degree of impact on the competitiveness of Russian corn in 2016 are factors: the share of exports is 35% and export prices are $ 929.

The volume of production of this crop from 3.1 million tons in 2010 to 15.3 million tons in 2016, i.e. almost 5 times, allowed not only to satisfy domestic demand for corn for grain, but also to increase the volume of supplies of this type of products to foreign markets in the period from 0.3 to 5.32 million tons. The current level of prices allows maintaining strong competitive positions corn grain, produced in Russia, both on domestic and export markets for agri-food products.

In the Republic of Belarus and Kazakhstan maize for grain is produced in small volumes - in 2016, 740 and 762 thousand tons, respectively. In the period from 2010-2016. there is a steady growth in the volumes of gross harvest of this crop. In particular, in Belarus for the period under review, the growth was 34.3%, in Kazakhstan - 65%. Due to the comparatively small volumes of corn production and export in Kazakhstan, its competitiveness is influenced by factors: average producer prices, whose level is the lowest among all the countries of the EEU, as well as the ratio of domestic prices to corn prices (the price competitiveness factor). The Republic of Belarus has formed the least competitive level of both domestic and export prices.

Wheat flour

The model of multiple linear regression, reflecting the dependence of the integral index of the competitiveness of wheat flour in the EEU on the parameters of competitive advantages of individual countries of the Union, will take the form:

$$INT\_w = 0,071 + 0,14\ RF + 0,27\ RB + 0,74\ KZ$$
$$\quad\quad\quad (0,0021)\quad (0,004)\quad\quad (0,0024)\quad\quad (0,0147)$$

Source. The values of standard errors are indicated in parentheses at a 5% level of statistical significance.

Parameters of the obtained econometric model show that the most competitive in the period of 2010¬¬-2016. is the wheat flour produced in the Republic of Kazakhstan (the largest coefficient of net regression with variable KZ), the second place is occupied by the Republic of Belarus, the third is the Russian Federation (table 5). The existing ranking of the countries under consideration is due to the high level of export of wheat flour in Kazakhstan, which ranks second after Turkey in terms of the volume of supplies of this type of products to foreign markets.

Table 5. Results of regression analysis of competition factors of wheat flour in Russia, Kazakhstan and Belarus in 2010–2016 years

Factors	Coefficient	Standard error	t-Statistic	Prob
Russian Federation				
Const	4,68	0,16	29,42	0,021
Average prices (APV)	-0,45	0,004	-12,52	0,034
Объём производства (Q)	0,61	0,005	13,34	0,023
Export prices (EX_P)	-0,22	0,012	-31,95	0,02
Share of export (EX_Q)	-0,05	0,003	-15,15	0,041
Coefficient of competition (Com_C)	-0,90	0,005	-19,05	0,031

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$R^2=91\%$, F $=20,99$, Prob (F) = 0,016				
Republic of Belarus				
Const	0,21	0,07	2,79	0,022
Average prices (APV)	-0,21	0,008	2,77	0,022
Объём производства (Q)	-0,08	0,008	-2,65	0,023
Export prices (EX_P)	-0,04	0,007	0,41	0,041
Share of export (EX_Q)	0,02	0,004	0,53	0,047
Coefficient of competition (Com_C)	-0,19	0,004	-4,23	0,015
$R^2=90,5\%$, Prob F = 0,017				
Republic of Kazakhstan				
Const	-3,33	0,052	-0,84	0,045
Average prices (APV)	-0,55	0,041	2,58	0,024
Объём производства (Q)	0,24	0,025	-3,48	0,018
Export prices (EX_P)	-0,43	0,046	1,22	0,044
Share of export (EX_Q)	0,91	0,024	-2,31	0,026
Coefficient of competition (Com_C)	0,21	0,056	0,02	0,019
$R^2=84,7\%$, F (s) =5,55, Prob F = 0,1				

The share of exports is the determining factor in the competitiveness of wheat flour. The republic ranks second in the world in terms of exports of this type of product, whose volume in 2016 amounted to 2.4 million tons, and the share of exports to production amounts to more than 60% of the total production. Also, Kazakhstan has the most competitive producer price level for wheat flour - USD 210 per ton, while in Turkey the price is USD 305.2 per ton, in Germany - USD 346.5 per ton. Low the level of export prices allows us to compete on this criterion not only with the EEU states, but also with world leaders in the export of this type of product.

In the Republic of Belarus, the main factors of competitiveness are the average producer prices and the coefficient of price competitiveness. On the territory of the Republic, about 5% of the volume of wheat flour produced in the EEU is produced. The share of exports is also relatively small - only about 5% of the total volume of production. At the same time, export prices are the most competitive among all the state of the EEU - US $ 176 per ton.

In the Russian Federation, the most significant factors in the competitiveness of wheat flour are the volume of production - 67.4% of the total volume in the EEU countries in question (in 2016 - 9.9 million tonnes), the price competitiveness factor, and the average producer prices. In general, during the period the volume of wheat flour production in Russia has not changed significantly and stably at the level of 10 million tons per year, while the share of flour exports is characterized by quite small values - about 3% of the total production volume (in 2016 - 237 thousand tons., m). The decrease in the cost of wheat grains put pressure on the prices of wheat flour producers, in particular, prices on the domestic market in the period 2013-2016. almost doubled from USD 433.5 to USD 229.3 per tonne. The same dynamics can be observed

at export prices, which have declined by almost 40% over the past 5 years, from USD 492 to USD 321 per ton. Russia's export prices for wheat flour are roughly on par with the prices of the largest exporters of this type of product.

Pasta

The model of multiple linear regression, reflecting the dependence of the integrated indicator of the competitiveness of pasta in the EEU on the parameters of competitive advantages of individual countries of the Union, will take the form:

$$INT\_w = -0,022 + \underset{(0,245)}{} 0,85\ \underset{(0,0031)}{RF} + 0,1\ \underset{(0,0394)}{RB} + 0,22\ \underset{(0,0147)}{KZ}$$

Source. The values of standard errors are indicated in parentheses at a 5% level of statistical significance.

Parameters of the obtained econometric model show that the most competitive in the period of 2010–2016. are the pasta produced in the Russian Federation (the largest coefficient of pure regression with variable RF), the second place is occupied by the Republic of Kazakhstan, the third - by the Republic of Belarus (table 6). The ranking of the countries under consideration is also due to the high level of production of pasta in the Russian Federation.

Table 6. Results of regression analysis of competition factors of pasta in Russia, Kazakhstan and Belarus in 2010–2016 years.

Factors	Coefficient	Standard error	t-Statistic	Prob
Russian Federation				
Const	-0,96	0,09	-0,44	0,044
Average prices (APV)	-0,47	0,007	-0,19	0,021
Объём производства (Q)	0,40	0,003	0,43	0,014
Export prices (EX_P)	-0,23	0,01	0,87	0,051
Share of export (EX_Q)	0,07	0,003	0,27	0,032
Coefficient of competition (Com_C)	-0,19	0,007	0,07	0,011
$R^2=91\%$, F =20,99, Prob (F) = 0,016				
Republic of Belarus				
Const	4,49	4,66	0,96	0,051
Average prices (APV)	-1,53	1,74	0,88	0,054
Объём производства (Q)	-0,24	1,00	-0,94	0,052
Export prices (EX_P)	-0,12	2,70	-0,97	0,051
Share of export (EX_Q)	-0,07	0,72	-0,66	0,063
Coefficient of competition (Com_C)	-0,52	3,83	-0,92	0,053
$R^2=90,5\%$, Prob F = 0,017				
Republic of Kazakhstan				
Const	1,31	0,09	14,51	0,04

Average prices (APV)	-0,75	0,09	7,02	0,03
Объём производства (Q)	0,21	0,05	-6,29	0,01
Export prices (EX_P)	-0,13	0,05	-2,32	0,03
Share of export (EX_Q)	-0,33	0,05	-4,85	0,01
Coefficient of competition (Com_C)	-0,64	0,06	-10,92	0,02
$R^2=84,7\%$, F (s) =5,55, Prob F = 0,1				

In the Russian Federation, the main influence on the competitiveness of pasta is provided by such factors as average producer prices, production volume and export prices. In the period 2010-2016. in Russia there are no high fluctuations in the volume of production of pasta by years, the value of this indicator is at the level of 1 million tons per year. At the same time there is an increase in exports of this type of product. In particular, if in 2010 the share of exports was 4% of the total volume of production of pasta, then by 2016 this figure was more than 10%. Since 2013, there has been a drop-in export prices for Russian pasta, from $ 1403 to $ 1040 per ton. The current level of prices allows Russia to compete on price criteria with world leaders in the export of pasta, except Turkey, where the price for this type of product was 2016 US $ 508 per ton.

In Belarus, due to the small volume of production of pasta - in 2016, 44 thousand tons, the price factors influence the competitiveness.

The share of the Republic of Kazakhstan is about 10% of the total volume of production of pasta in the EAE (in 2016 - 152.4 thousand tons), while the share of exports is about 11% (in 2016 - 17 thousand tons). In accordance with this, the competitiveness of pasta produced in Kazakhstan is determined mainly by price factors. At the same time, the most competitive level of prices has developed not only inside the market of the EAES, but also in the world market for pasta.

The competitiveness of products on the world market was assessed by comparing the prices of domestic producers with the prices of producers in the countries which are recognized as global leaders in exports of these products. This analysis was conducted for three countries: Belarus, Kazakhstan and Russia (table 7).

Table 7. Average producer prices for agricultural products in the EAEU and in the leading export countries in the world in 2016, USD/t

Products	Belarus	Kazakhstan	Russia	leading export countries in the world				
Wheat	214	105	132	Russia	USA	Australia	Canada	Ukraine
				132	143	206	174	129
Barley	174	77	115	Australia	France	Ukraine	Russia	Germany
				188	138	118	115	139
Maize (corn)	560	114	124	USA	France	Hungary	Ukraine	Russia
				132	176	148	138	124

Source: authors calculations based on FAOStat data

Average prices of domestic producers for wheat, barley and maize (corn) in 2016 in Kazakhstan and Russia were lower than in the countries which are recognized as global leaders in exports of these products. At the same time, prices of domestic producers for these crops in Belarus were higher than in the countries which are recognized as global leaders in exports of these products.

General conclusions and proposals

Thus, in general, the production of grain and its processing in the three EEU countries (Russia, Kazakhstan, Belarus) is competitive. In Russia - wheat, barley, maize for grain and pasta; in Kazakhstan - wheat flour. The main factors for increasing competitiveness over the past three years were the decrease in domestic producer prices, as well as the growth in production volumes. That allows in general the countries of the EEU in the future to take a significant share in the international market of grain and its processing products.

It is forecasted that the export of Russian grain can reach 38.8 million tons by 2020, up to 48.3 million tons by 2030. In Kazakhstan, in 2020, grain exports will be 5.3 million tons and wheat flour - 2.5 million tons. The share of Belarus in world grain exports is insignificant, but by 2020 it can increase grain production up to 10 million tons, which will also increase its export opportunities.

In order to further increase the level of production and competitiveness for grain and products of grain processing in the EEU member states, it is necessary to develop and introduce quality seed, more intensive use of new low-cost technologies, improvement of price relations in the grain market and state support for the grain subcomplex, harmonization of domestic requirements for quality grain with foreign, expansion of flour exports and products of deep grain processing, development of internal and external infrastructure and the transport and logistics system of the grain market in the long run. To conclude, a sustainable strategy for the development of grain exports needs to be established in the Eurasian Economic Union.

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