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THE RISE OF THE 'EMERGING ECONOMIES': TOWARDS FUNCTIONING AGRICULTURAL MARKETS AND TRADE RELATIONS? WORLD WHEAT MARKET INSTABILITY INSPIRED BY EMERGING MARKETS

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Abstract. After the USSR decayed into independent countries, wheat production of Ukraine, Kazakhstan and Russia got impulse to tremendous development. The Former Soviet Republics (FSR) from net importers of wheat turned into the net exporters. However, instead of only increasing of global wheat trade, these countries induced enormous volatility to the global market. Regarding that, some institutional changes aimed to decrease variation of wheat production are still not introduced in the FSR. Thus, identifying of key problem in countries policy remains a discussion issue. This article presents production variation decomposition based on input/output data of wheat production in the FSR. Methodology, provided in the articles allows to understand and measure influences of production component on overall production variation.

Key words: Decomposition of production variation, emerging wheat market, wheat yields and harvested area variation

INTRODUCTION

Recent decades are characterized by the world agricultural market expanding due to the emergent markets development. By taking advantage of the soils quality and availability, the Former Soviet Republics (FSR) made a tremendous transformation from the extensive non-profitable agriculture to the intensive, market oriented production. Russian Federation, Ukraine and Kazakhstan are among the top ten of wheat net exporters and producers in the world (FAO 2014). Thus, after the shortage in agriculture commodities production during post Soviet Union crisis, Russia, Ukraine and Kazakhstan considerably increased global cereals production, encouraged international competition, and met growing demand of the African, European and Asian developing countries. There are many studies investigating contribution of FSR in the world cereals production. Most of them emphasize opportunity for growing cereals production level due to both: (1) utilizing reserved areas for harvesting, and (2) increasing level of yields (productivity per one hectare), which now on average is considerably lower than in the EU or the USA. Since the contribution of the FSR in the world production and trade of cereals will grow it is important to investigate their effect on the international trade, in particular, considering all possible influences including prices risk and supply stability.

In past, Soviet Union's volatility of cereals production had strong impact on the world grain market. However, the high volatility, as main feature of cereals production, is currently typical for the FSR. Moreover, if in 70th–90th destabilization influence of the Soviet Union on world cereals market was caused by demand instability, nowadays, destabilization is caused rather due to supply fluctuations. Supply volatility is mainly caused by traditionally inherent instability of grain production, or by over-regulation in foreign trade policy of the FSR. The unstable trade policy condition of the FSR (often changes in import/export restrictions and measures in Russian Federation and Ukraine within the last decade) has numerous negative consequences on both: internal and external agricultural markets [Goychuk 2013]. The main internal consequences of grain market regulation instability are substantial price volatility on the domestic level [Skrypnyk 2012], and negative impact on incentives of the entire grain industry [Goychuk 2013].

Mechanisms of prices formation and volatility on the world cereals market attracts attention of many researchers. Studies of [Anderson 2009, Nelgen 2012] shows the impact of the adverse weather conditions in main grain producing areas on the change of export-regulation measures in number of countries. Export measures are especially preferred by the wheat exporters from the FSR . Main producers of grain from the FSR in 2009 decided to contribute policy coherence on the world market by forming Black See joint grain "pool" of Russian Federation, Ukraine and Kazakhstan (World Bank 2009). However, due to contradictions

in competition this project has not been implemented. In some cases, as it will be shown later, these tree countries are complementary suppliers on the grain market.

As a consequence of wheat production volatility in each of the Former Soviet Republics (FSR), the world wheat market (as well as cereals market) is facing instability of supply. Thus, it is important to understand and measure the level of simultaneous effect of the FSR production shortages on the global market and understand the reasons hidden behind production shortfalls.

BASIC CONCEPTS OF THE WORLD GRAIN MARKET STABILIZATION

Supply and demand instability are inherent to the world wheat market and its' players in particular. Thus, for bringing stability into the world grain trade, several concepts were developed. The globally targeted concept of commodities provisioning was developed in 80th–90th. It is based on the influence of global grain stocks on fluctuation of the world wheat production and consumption (Blandford 1983). However, the volume of grain stocks is determined by individual country's policy and is called to compensate own production shortages. As a measure of variability, author considered the standard deviation from price, production and consumption trend values. With continues growth of world grain production (entering of new producers and growing yields) expected production level and its' variance increase (Sharples et al. 1994). Thus, world grain production standard deviation, which was around 17.9 million tonnes in 1960–1977, became more than two times higher 40.6 million tonnes in 1985–1993. In the paper of (Sharples et al. 1994) it is discussed the possible mechanisms of the production instability transformation from the country level to the global. The authors distinguish several locally targeted strategies of the overcoming of domestic grains production instability. They are: (1) households consumption management (by regulating if internal prices); (2) guaranteeing the stability of production supply through trade (and interventional buying of scarcity products); (3) grain reserves (stocks) using.

Each of these three strategies has different effect on social welfare of developed and developing countries. For instance, applying measures of the first strategy can induce social instability risks in developing countries more, then in developed. The third strategy is associated with significant reserve costs what is unacceptable for underdeveloped economy. Trade-focused measures are related to the transferring of domestic production shocks on the world. It happens by the unexpected and unregulated intervention of a country into the world mar-

ket in the cases of production shortages as well as in the cases of harvest excess of planed volumes. If consider poor countries with relatively high level of wheat consumption, fulfilling national reserves create heavy burden on the state budget. Thus, they prefer to transform the internal shocks on the external market. Applying of only one out of tree strategies in the pure form is almost impossible, and in most of cases a combination of it is utilized. An econometrics model published in reports of (Blandford 1983, Sharples et al. 1994) allows us to estimate the share of each domestic strategy in overcoming of the local instability of grain production. Gradually, this study shows the role of stocks in overcoming of the world wheat prices fluctuations.

As it was mentioned before, volatility of prices on the global grain market in 1960th–1980th was mainly caused by the USSR. Moreover, the volumes of export/import was highly dependent on production volatility. Role of the USSR in global grain market was emphasized in 1972–1973, when significant shift in prices was caused by unexpected entrance of the USSR into the world wheat market as a net importer, due to very low harvest (Blandford 1983). However, additional global market volatility is also connected with significant production variability in some leading grains producers (Argentina, Australia, Canada and the EU).

Main stabilizers of the global grain market are national reserves, which aimed to decrease the variability of production and consumption. The highest responsiveness to the global price fluctuation has stocks of the USA (Sharples et al. 1994). If analyse production, consumption and prices on the world grain market using the coefficient of variation as the measure of volatility, the most variable indicator is the price. This follows from the 'Blake' law discovered in 1760 – 'minor changes in the inelastic goods supply and demand cause significant price fluctuations' (Koester et al. 2010). Consumption of grains has substantially lower volatility than output, which is achieved through effective grain stocks management and trade. Due to the increased efficiency of stock management and yields, the dependency of price and production on the weather was substantially reduced towards the end of millennium. During the last decade FSR increased their contribution into the world grain market. However, they are still experiencing problems in choosing proper strategy of building powerful export capacities for insuring stable consumption.

WHEAT INDUSTRY OF FORMER SOVIET REPUBLICS (FSR)

To investigate the impact of FSR wheat production on global trade, the data of FAO stat was used. Production was analysed on the time interval 2000–2012, trade was analysed on the time interval 2000–2011. Regarding the production there is no significant at the 5% level of significance tendencies in each of the FSR (Figure 1).

The production dynamics of the FSR (Ukraine, Kazakhstan and Russia) can be characterized as highly volatile. The lowest standard deviation was observed in Kazakhstan (3.6 million tonnes), the lowest coefficient of variation – in Russia (19%). The coefficient of variation of joint production of the FSR (Ukraine, Kazakhstan and Russia together) is higher than in Russian Federation (Table 1). That is indicating presence of the production dynamics correlation between Ukraine and Russia (correlation coefficient is 0.79, correlation matrix is shown in appendix 1). The volatility of wheat production in the FSR (Kazakhstan, Russian Federation, and Ukraine) together and separately is shown on Figure 1. Descriptive statistic of the production dynamics is given in Table 1.

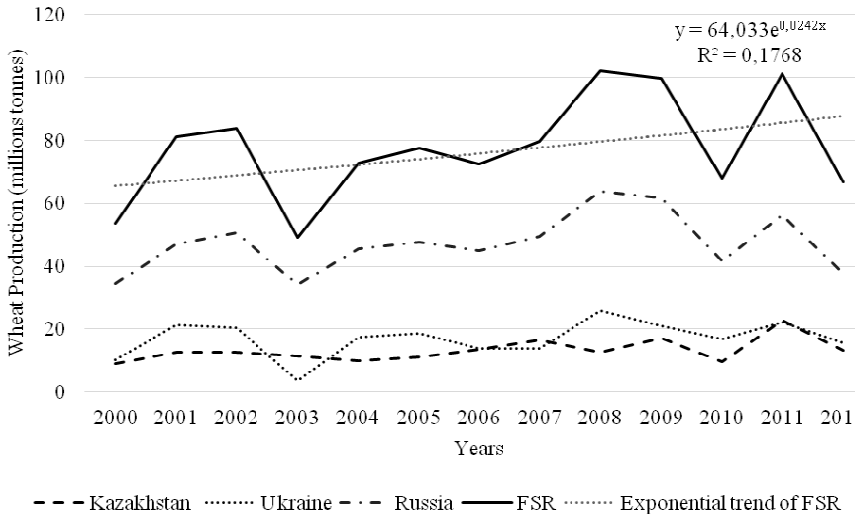

FIGURE 1. Total emerging markets wheat production dynamics (Kazakhstan, Russia, Ukraine)

Source: Own calculations based on data from FAO (2014).

TABLE 1. Descriptive statistics of wheat production during 2000–2012 (million tonnes)

Characteristics	Kazakhstan	Ukraine	Russia	FSR	World	World without FSR
Average	13.26	17.04	47.27	77.57	629.42	551.87
Variance	12.65	31.01	80.66	257.13	2016.52	1318.41
Standard deviation	3.56	5.57	8.98	16.04	44.91	36.31
Coeff. of variation	26.83%	32.68%	19 %	20.67%	7.1%	6.58%
Limiting consumption risk[1]	0.06%	14.14%	5.55%	–	–	–

Source: Own calculations based on data from FAO (2014).

[1]The risk that internal consumption exceeds the level of production in the country.

The Former Soviet Republics' (FSR) share in the world wheat production during 2000–2012 was around 12.27% with a standard deviation of share 2.1%. Each of the countries had shown large volatility of production on the given period. The most unstable is wheat production in Ukraine. As it was mentioned before, due to the significant variability, it is difficult to detect significant trends in production for any of the FSR. However, joint wheat production of the FSR (sum of Kazakhstan, Russia, and Ukraine) shows insignificant at the 5% sign. level (with model's *p – value* = 0.153) exponential grow with annual production increase 2.4% (Figure 1). The instability of wheat production in each of the FSR countries leaves the non-zero probability of limiting consumption, when produced volume of wheat would be not enough to cover internal consumption (Table 1). Probability estimates of the limited consumption for Russia and Ukraine is considerably higher than for Kazakhstan.

Probability of limiting consumption can be identified as:

$$P\left\{\overline{PR} - \overline{C} < 0\right\}$$

where $\overline{PR}$ – is mean produced amount of wheat during the investigated period, and $\overline{C}$ – is mean consumed amount of wheat. However, mean consumed amount of wheat besides produced wheat, accounts also the foreign trade:

$$\overline{C} = \overline{PR} + \overline{IMP} - \overline{EXP}$$

where $\overline{IMP}$, $\overline{EXP}$ are mean imported and exported amount of wheat respectively. As follows, probability of limiting consumption become:

$$P\left\{\overline{EXP} - \overline{IMP} < 0\right\} \text{ or } P\left\{\overline{TS} < 0\right\}$$

where $\overline{TS} = E\left\{TS(t)\right\} = E\left\{EXP(t) - IMP(t)\right\}$ is a mean trade balance or expected difference of export and import in time *t*. Trade balance is assumed to be asymptotically normally distributed $(t \to \infty)$, $\overline{TS}, N(\mu_{TS}, \sigma_{TS})$, with μ_{TS}, σ_{TS} – mean and standard deviation of trade balance respectively.

Low probability of limited consumption of Kazakhstan compare to the other FSR explains lower volatility of wheat export in Kazakhstan compare to the same countries. In Ukraine and Russia production volatility is normally compensated by the restricted export regulation. To satisfy stable internal supply of wheat at the level of demand in the FSR, variety of policy measures in wheat export are applied. For instance, wheat export restrictions introduced in Russia in summer 2010 was a consequence of harvest shortage. Moreover, it was copied by the other FSR and especially Ukraine (Goychuk et al. 2013). It caused appreciable impact on the world market price. However, not only world market price is influenced

by the mentioned factor. The domestic price volatility in 2010 was also a consequence of overregulated foreign trade and difficulties in producers' access to the world market. It has to be highlighted, that the difference in prices on the world and domestic (Ukrainian) markets is positive, despite the high levels of volatility (Skrypnyk et al. 2012).

The analysis of global wheat production without the FSR compare to that including the FRS on interval 2000–2012 shows, that the FRS contribute 12.3% into the global production. Variance created by the FRS accounts 34.6% from the world value. Consequently, coeff. of variation, which typically tends to decrease with increasing number of market participants (as follows from diversification), after including the FSR to world production, increased from 6.58 to 7.13%. At the same time, growth rate of wheat production in the FSR is bigger than in world, where wheat production annually increasing in 1.63%. However, world wheat production trend compare to that of the FSR, is significant at the 5% level of significance with model's *p – value* = 0.003.

During the 2000–2011 mean amount of wheat export from the emerging markets of the FSR (Kazakhstan, Russia, Ukraine) was around 14% of the total world export with standard deviation 5.02 million tonnes (Table 2). This volume is enough large to influence on the world wheat market. Moreover, total joint wheat export from the FSR has a significant at the 5% level of significance growing tendency, with the annual growth rate 11.32 % (Figure 2). That is higher than total production growth rate in the FSR (2.4%), and higher then world export growth rate (which is 2.5% at the 5% level of significance. That means that most probably in future the FSR could become drivers of the world wheat export growth.

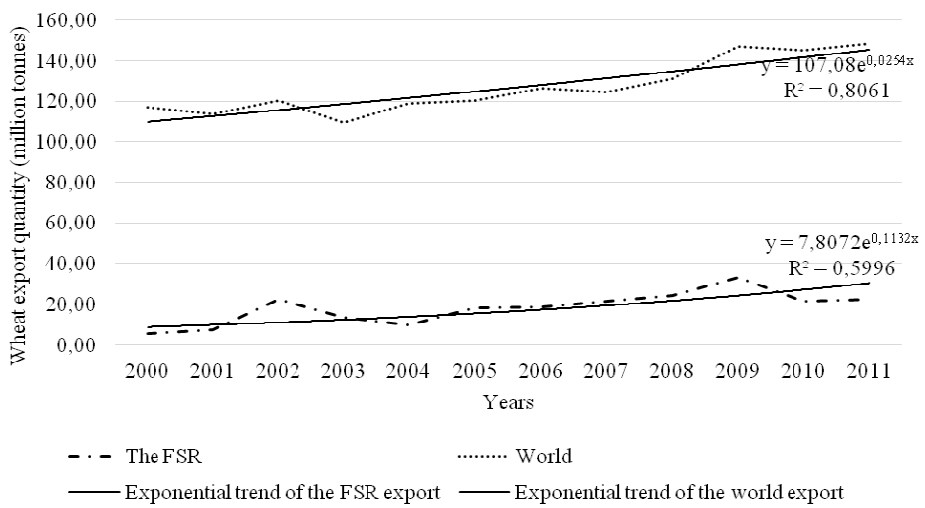

FIGURE 2. Wheat export dynamics during 2000–2011

TABLE 2. Descriptive statistics of wheat export during 2000–2012 (million tonnes)

Characteristics	Kazakhstan	Russia	Ukraine	FSR	World
Average	4.01	9.55	4.61	18.18	126.92
Variance	1.53	24.45	12.16	56.00	160.84
Standard deviation	1.24	4.94	3.49	7.48	12.68
Coeff. of variation	30.88%	51.76%	75.62%	41.17%	9.99%

Source: Own calculations based on data from FAO (2014).

ANALYSIS OF VARIANCE IN WHEAT SUPPLY FROM EMERGING MARKETS

There are two possible, related to production causes of high wheat supply variability: (1) utilized land areas fluctuation, and (2) yields variability. Descriptive statistics on areas and yields fluctuations in the FSRs' markets is presented in (Tables 3 and 4). The mean share of joint land area in the FSR dedicated for wheat in the structure of total world areas was 19.1% (during 2000–2012) with standard deviation only 1.35 %. The most variable are lands utilized for wheat in Ukraine (coeff. of variation is 19.63%), relatively more stable – in Kazakhstan (9.7%) and Russia (8.1%) (Table 3). Only in Kazakhstan there is a significant (on the 5% level of significance) growing linear tendency of areas used for wheat. Variation of area utilized for wheat in the world is less than in each country from the FSR separately. The effect of decreasing variation with increasing of independent components is taking place due to absence of correlation effect between the components (Table 3). Considerable variability of lands dedicated to wheat in Ukraine could be determined by many factors. However, most probable explanation is prices instability, caused by over-intervention of government, which leads to the most variability of land areas dedicated to wheat.

As for yields of wheat, the best performance is shown by Ukraine, where this indicator is almost on the world average level (Table 4). The lowest variability was found in Russian. It can be explained that in Russia production areas are widely dispersed and geographically diversified. Consequently, level of whether influence of the output is lower in Russia then in Ukraine. In all FSR the yields variation indexes are larger than that for areas. It means that joint FSR yields variability is higher than variability in areas dedicated to wheat. The total FSR wheat yield remain significantly lower than in world and does not show significant tendency of growth (Table 4 and Figure 3).

In general, the tendency of the world wheat yields (tonnes/ha) growth is stable and significant at the 5% level of significance during last 12 years with the quite stable rate of growth 1.4% annually, whereas productivity growth in the FSR is extremely unstable and does not exceed 1.2% (Figure 3).

TABLE 3. Descriptive statistics of area utilized for growing wheat in 2000–2012 (million hectares)

Characteristics	Kazakhstan	Russia	Ukraine	FSR	World	Share of FSR in the world
Average	12.26	23.33	5.94	41.53	216.69	19.14%
Variance	1.40	3.57	1.36	12.90	18.63	2.00%
Standard deviation	1.18	1.89	1.17	3.59	4.32	1.35%
Coeff. of variation	9.66%	8.10%	19.63%	8.65%	1.99%	7.05%

Source: Own calculations based on data from FAO (2014).

TABLE 4. Descriptive statistics of yields of wheat in 2000–2012 (tonnes per hectare)

Characteristics	Kazakhstan	Russia	Ukraine	FSR	World
Average	1,07	2,01	2,77	1,85	2,90
Variance	0,05	0,05	0,32	0,06	0,03
Standard deviation	0,22	0,23	0,57	0,24	0,16
Coeff. of variation	20,93%	11,45%	20,45%	13,10%	5,57%

Source: Own calculations based on data from FAO (2014).

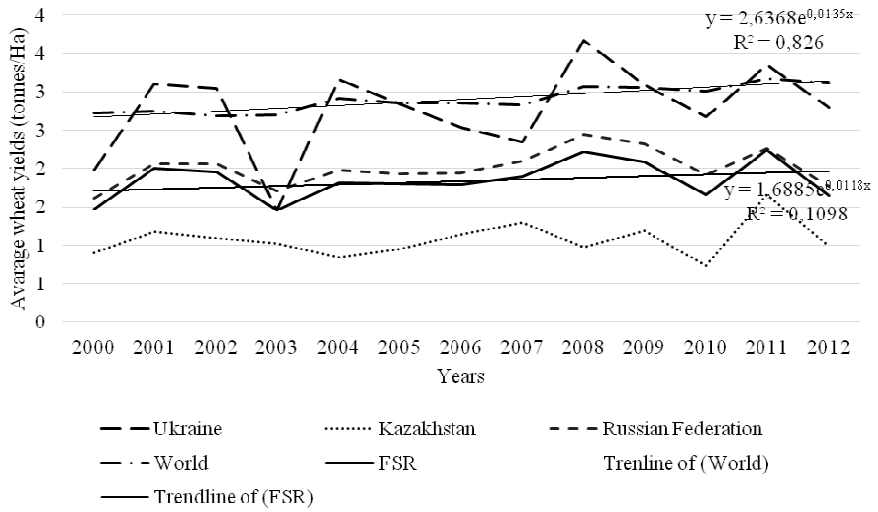

FIGURE 3. Wheat yield dynamics in world and FSR (2000–2012)

Source: Own calculations based on data from FAO (2014).

DECOMPOSITION OF WHEAT PRODUCTION VARIANCE

Available data allow us to analyse contribution of each input component (harvested area of wheat –*S*, and yields – *Y*) into volatility of output expectation (production volume *Pv*) and its variance – *Var*(*Pv*).

We assumed that expected production volume of wheat is *E*(*Pv*). It is a function of input means $\overline{S}, \overline{Y}$ and its covariance cov(*Y*, *S*) (Babcock et al. 2003):

$$E\left(\hat{P}v_i\right) = \overline{S_i} \cdot \overline{Y_i} + \operatorname{cov}\left(Y_i, S_i\right) \tag{1}$$

where *i* = 1... 5 are index of Kazakhstan, Russia, Ukraine, the FSR and World.

$$\operatorname{cov}\left(Y_i, S_i\right) = \rho\left(Y_i, S_i\right)\sqrt{Var\left(Y_i\right)}\sqrt{Var\left(S_i\right)}$$

$\rho = (Y_i, S_i)$ – liner correlation between Y_i, S_i. Variance of output $Var(Pv_i)$, can be approximated by the simultaneous effect of variances of inputs $Var(S_i)$, $Var(Y_i)$ with inputs means $\overline{S_i}, \overline{Y_i}$ and covariance of inputs $\operatorname{cov}(Y_i, S_i)$:

$$Var\left(Pv_i\right) = \overline{S_i}^2 Var\left(Y_i\right) + \overline{Y_i}^2 Var\left(S_i\right) + 2\overline{S_i}\,\overline{Y_i}\operatorname{cov}\left(Y_i, S_i\right) + O\left[Var\left(Y_i\right), Var\left(S_i\right)\right] \tag{2}$$

where $O\left(Var\left(Y_i\right), Var\left(S_i\right)\right)-$ is random value with magnitude, which is asymptotically tends to zero simultaneously with decreasing of its arguments (has the same order of smallness as arguments).

If we neglect the last term in equation (2), we obtain an approximation that can be used to assess the contribution of individual components of the variability on the final result (wheat production level in the investigated countries):

$$Var\left(\hat{P}v_i\right) \approx \overline{S_i}^2 Var\left(Y_i\right) + \overline{Y_i}^2 Var\left(S_i\right) + 2\overline{S_i}\,\overline{Y_i}\operatorname{cov}\left(Y_i, S_i\right) \tag{3}$$

By using the approximation (3) it is possible to evaluate the influence of areas and yields volatility, and their mutual effect for FSR on total contribution to the world production (Table 5). The accuracy of approximation (1 and 3) can be assessed by comparing estimates (1) and (3) with the real data. All statistical characteristics are evaluated on the time interval 2000–2012.

The errors of estimation (%) from (3) is:

$$\xi\left\{Var\left(\hat{P}v_i\right)\right\} = \left|Var\left(Pv_i\right) - Var\left(\hat{P}v_i\right)\right| \Big/ Var\left(Pv_i\right) \tag{4}$$

where: $Var(Pv_i)$ – is actual variance of production obtained from observed data, $Var\left(\hat{P}v_i\right)$ – is the model estimates of the variance.

As follows from the calculations (Table 4) the lower error of estimation of wheat variance was observed at the world level (estimation error is 0.1%). In all other cases for the FSR the estimation error of variance is significantly higher than that in the world. The error of variance estimation for Kazakhstan is 10.02%, for Russia is 20.56%, and for Ukraine is 31.11%, and for the FSR is 3.43% (Table 5). High level of errors of variance estimation in the FSR could be explained by significant variation in production factors in the FSR compare to the world. The highest level of coeff. of variation is in the world 5.6% (yields variability), at the same time, the lowest level of the coeff. of variation in the FSR is observed in wheat harvested areas variability of Russia (coeff. of variation is 8.1%). If apply the same techniques of error calculation (4) for mean production level of wheat small deviation of estimates from observed values can be found in most cases. That is the consequence of data errors.

TABLE 5. Model's data calculation

Indicators		Kazakhstan	Russia	Ukraine	FSR	EU	World
1	2	3	4	5	6	7	8
Yields (tonnes/ ha)	$\overline{Y}_i$	1.07	2.01	2.77	1.85	5.14	2.9
	$Var\left(\overline{Y}_i\right)$	0.05	0.05	0.32	0.06	0.09	0.03
	$\overline{S}_i^{\,2} Var\left(Y_i\right)$	7.6	28.8	11.35	101.29	64.04	1229.3
	d_1(%)	66.3%	36.3%	28.1%	38.6%	60.2%	61.0%
$\rho(Y_i, S_i)$		0.32	0.89	0.85	0.87	0.38	0.72
$\mathrm{cov}(Y_i, S_i)$		0.09	0.39	0.56	0.76	0.09	0.50
Areas (million ha)	$\overline{S}_i$	12.26	23.33	5.94	41.53	26.12	216.69
	$Var\left(\overline{S}_i\right)$	1.40	3.57	1.36	12.90	0.65	18.63
	$\overline{Y}_i^{\,2} Var\left(S_i\right)$	1.62	14.42	10.46	44.14	17.03	156.95
	d_2(%)	14.1%	18.1%	25.9%	16.8%	16.0%	7.8%
Mutual variation	$2\overline{S}_i \overline{Y}_i \mathrm{cov}\left(Y_i, S_i\right)$	2.25	36.21	18.57	116.77	25.33	628.64
	d_3(%)	19.6%	45.6%	46.0%	44.5%	23.8%	31.2%
Model estimates	$E\left(\hat{P}v_i\right)$	13.26	47.27	17.04	77.57	134.29	629.42
	$Var\left(\hat{P}v_i\right)$	11.46	79.46	40.38	262.20	106.40	2014.90

TABLE 5, cont.

1	2	3	4	5	6	7	8
Actual data	$E(Pv_i)$	13.26	47.27	17.04	77.57	134.29	629.42
	$Var(Pv_i)$	12.65	80.66	31.01	257.13	104.24	2016.52
Error of estimation	$\xi\left[Var\left(\hat{Pv}_i\right)\right]$	9.4%	1.5%	30.2%	2.0%	2.1%	0.1%

Notes: d_1, d_2, d_3[2] are share of the wheat production variance explained by the variation of yields, harvested areas, and interaction of both factors.

Source: Own calculations based on data from FAO (2014).

If we consider the world wheat production as the model (ideal), we can conclude, that major contribution to the variance is made by yield variability d_1(*World*) = = 61.1%, whereby joint effect of area and yield variability accounts d_2(*World*) = = 31.1%, and only d_3(*World*) = 7.8% of variance explained by variability of areas. Relatively the same role of components in production variance is in the EU. From the FSR closes to the model is situation in Kazakhstan, where wheat production variation is also largely determined by yield d1(Kazakhstan) = 66.9% with significantly lower expected yields value.

As for Ukraine and Russian Federation, substantial distortion into wheat production variance appears due to changes in areas as well as in yields. Moreover, the positive interdependence of yields and areas is observed. That means that in years of good harvest, areas of harvested wheat are higher than in the years with bad harvest. Consequently, low yields caused by inappropriate weather conditions are amplified by less areas harvested and the other way around in good harvest years. Estimates of the linear relationship between the area and yield variability for Russia and Ukraine are significant on 0.001 level of significance (Table 5). The tight linear relationship between wheat yields and harvested areas variability could unlikely be explained by favourable weather foresight. This relationship could be reasoned by existing methodology for the wheat area harvested calculation. If in the lean year instead area harvested use area sown, the results of production may be different.

In general, preservation of high variability of wheat production mainly caused by mutual effect of yields and harvested areas is typical and for the FSR. Moreover, it was the main feature of wheat production in the USSR. There are several

[2] $d_1 = \overline{S}_i^{\,2} Var(Y_i) \Big/ Var\left(\hat{Pv}_i\right)$, $d_2 = \overline{Y}_i^{\,2} Var(S_i) \Big/ Var\left(\hat{Pv}_i\right)$, $d_3 = 2\overline{S}_i \overline{Y}_i \operatorname{cov}(Y_i, S_i) \Big/ Var\left(\hat{Pv}_i\right)$, $d_1 + d_2 + d_3 = 1$

reasons explaining insignificance of changes in wheat production of the FSR. They are: (1) in unfinished institutional reforms of agricultural marked and state governance, (2) in state overregulation of export/import operations, (3) in corrupted structure of supply chain and high transaction costs of small producers during access to market, (4) in "rooted traditions" of solving production problems using extensive methods of expansion. The most resilient agricultural entrepreneurship in current environmental conditions are large-scale enterprises – "agroholdings", who are using scale effect in bearing with institutional difficulties. In the Ukrainian case, when all listed above reasons are complicated by absence of the land market, large scale producers has an advantage on the markets of land rent and capital (Skrypnyk et al. 2013). However, even agricultural holdings are highly affected by overregulation of the global external market access. It has negative affect on the investment attractiveness and, consequently determines high variation of production.

CONCLUSION

Entrance of the new wheat producers from the former USSR (Ukraine, Russian Federation, and Kazakhstan) to the global wheat market not only increased the volume of global export and trade. As it was shown, it tremendously influenced on volatility of global wheat supply by increasing the level of its volatility, instead of expected decreasing of it. However, despite of the expected uniting of former USSR countries into one joint wheat 'pool', no formal and/or informal unifications happened. Behaviour of three analysed countries is currently independent from each other and their role on the world market is complement. Therefore, after decay from the USSR significant structural changes in the FSR production occurred. If the main distortion of the global market in 1970-1990 was made by fluctuations of demand, now the problem of distortion caused by export supply instability.

Amount of three strategies of production shocks overcoming, the FSR chose the least expensive and least risky in terms of internal instability. That is strategy of volatility compensation due to reserves utilization. It transfer internal volatility on the external level by applying restrictions on export of wheat to the global market. However, despite considerable volatility in individual export of the each FSR, their joint export shows relatively stable growing tendency on the rate much higher than the world average.

Additional characteristics of wheat production in the FSR is variation of yields and areas, where yields' variation is essentially higher than areas'. However, variation of areas is exceptionally higher in Ukraine. It could be caused by the overregulation foreign trade. The growing tendencies in crops productivity of the FSC was insignificant at the 5% level of significance and was far from the world level.

Only Kazakhstan (out of three FSR) shows insignificant growing trend in wheat harvested areas growth. It has been shown previously, that significant share of output variation is explained by simultaneous effect of harvested area and yields of the crops. This mutual interdependence (more harvested areas in good harvest years and opposite situation in bad harvest years) significantly enhance the impact of weather on output fluctuation.

Based on the model there were found three main components (yields, harvested areas, and interaction of both) influencing on level of variation of wheat production on the national level. The estimates, obtained from analysis of production time series in the FSR, shows different influence of each components on final production variation. The influence also vary between each country. For developed or diversified producers of wheat (who has relatively low variation of output – EU, USA, World) the highest influence on total production variation has yields instability component (around 60% of production variation explained). The harvested area and mutual effect of harvested areas and yields has much lower effect. However, the absolute opposite picture was observed in the FSR. The mutual effect of harvested areas and yields as well as only harvested areas contribute most to variation of output. Regarding that agricultural area variance has high influence on production variation in Ukraine we can conclude, that there is no efficient policy of land management. That opens a field of improving for policymakers. High role of mutual influence of areas and yields on output variation in Ukraine and Russia is showing incentive problem in agriculture of Ukraine and Russia. It can be resolved by institutional reforming: agricultural land market creation, liberalizing of foreign trade operations, creation of equal conditions on resource market, regardless the scale of producer. Thus, in order to decrease variance explained by interaction of areas and yields, the producers' encouraging measures has to be developed. Proposed methodology of variance composition analysis is useful instrument in the long-term agricultural policy evaluation. It allows to identify aspects of agricultural policy that need immediate improvement.

Institutional reforming can significantly increase the flows of investment into the agricultural sector, increase the level of capitalization of grain producers and, consequently, reduce productivity dependence on the environmental conditions. Moreover, the strategy of producers has to be changed from cyclical (relativity to the expected weather conditions) to the countercyclical, that accounts features of price formation. Complex of this measures will leads to growth of producers income.

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Appendix

Correlation of wheat yields in FSR in 2000–2012

Characteristics	Kazakhstan	Russia	Ukraine	Joint FSR	World
Kazakhstan	–	0.4661	0.2066	0.6005**	0.2378
Russia	0.4661	–	0.7918**	0.9573***	0.5122*
Ukraine	0.2066	0.7918**	–	0.8485***	0.5964**
Joint FSR	0.6005**	0.9573***	0.8485***	–	0.4942*
World	0.2378	0.5122*	0.5964**	0.4942*	–

Notes: *** – 0.01, ** – 0.05, * – 0.1 level of significance.

Source: Own calculations based on data from FAO (2014).

WZROST GOSPODAREK WCHODZĄCYCH: W KIERUNKU RYNKÓW ROLNYCH I STOSUNKÓW HANDLOWYCH. NIESTABILNOŚĆ ŚWIATOWEGO RYNKU PSZENICY NA RYNKACH WSCHODZĄCYCH

Abstrakt. Po rozpadzie ZSRR produkcja pszenicy na Ukrainie, w Kazachstanie i Rosji dostała impuls do ogromnego rozwoju. Byłe radzieckie republiki (FSR) z importerów netto pszenicy zamieniły się w eksporterów netto. Kraje te przyczyniły się do zwiększenia światowego handlu pszenicy, ale wywołały również ogromną zmienność na rynku globalnym. Wciąż nie wprowadzono zmian instytucjonalnych w FSR, które miałyby na celu zmniejszenie zmienności produkcji pszenicy. Wciąż identyfikacja kluczowych problemów w polityce tych państw pozostaje kwestią dyskusji. W artykule przedstawiono rozkład zmienności produkcji pszenicy na podstawie danych wejściowych/wyjściowych produkcji tych plonów w FSR. Metodologia przedstawiona w artykule pozwala zrozumieć i zmierzyć wpływ wybranych składników produkcji na ogół jej zmienności.

Słowa kluczowe: Dekompozycja zmienności produkcji, rynki wschodzące, zmienność plonów pszenicy zebranej z obszarów uprawy.