EXCHANGE RATE PASS-THROUGH AND WHEAT PRICES IN RUSSIA

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Abstract

This paper investigates exchange rate pass-through from the US Dollar/Russian Ruble exchange rate to Russian wheat prices. We use Johansen test for cointegration and error-correction model before and after abolishment of the managed exchange rate regime and the transformation to the free floating exchange rate regime in Russia. We find influence of the exchange rate on the Russian wheat market after transition to the free floating exchange rate regime. However, our empirical results do not confirm cointegration between exchange rate and wheat prices in Russia before abolishment of managed exchange rate regime. The empirical results show that influence of exchange rate is stronger on Russian wheat market in comparison with the influence of world wheat prices. Additionally, we estimate influence of exchange rate on French and German wheat prices for comparison with Russian wheat prices.

Keywords: exchange rate pass-through, wheat prices, food security, Russia

1 Introduction

Russia has become the primary wheat exporting country in 2017/18 accounting for around 20% of world wheat exports, while wheat exports by the USA have decreased (USDA, 2018). It is expected that the importance of Russia for future global wheat supply will further increase if additional grain production potential will be mobilized (Schierhorn *et. al*., 2014).

However, the advancement of Russia to the largest wheat exporter in the world is in parallel to the strong devaluation of the Russian Ruble. Especially, in the course of the plummeting world oil prices, the Russian government abolished the managed exchange rate regime in November 2014. Concurrently with political changes such as Western sanctions against Russia and the Russian food import ban, the Ruble devaluated by around 70% from 2014 to 2015. This has strongly increased the competitiveness of Russian wheat exports to the world market compared to the USA and the EU, and has spurred the advancement of Russia to the primary wheat exporter in the world. In March 2019, Russia has sent a trial shipment of 21.88 tons of wheat to Algeria, which is one of the main buyers of wheat exported by France, the largest wheat exporter of the EU (Reuters, 2019).

German grain traders have confirmed that Russian traders have become primary competitors in the majority of their export markets. In August 2019, the Saudi Arabia State Grain Organization, SAGO, one of the traditional German wheat importers, officially approved Russian wheat delivery (Reuters, 2019).

Before this background we investigate the influence of the US Dollar/Russian Ruble exchange rate on price developments in domestic wheat markets in Russia. In particular, we estimate pass-through effects from the exchange rate to wheat prices within a price transmission framework.

The relationship between exchange rate and domestic wheat prices in Russia has been addressed before by Burakov (2016) within a VAR approach for the time period 1999-2015.

However, our study is unique in several respects. First, we explicitly take into account that the relationship between wheat prices and the exchange rate might have changed due to the abolishment of the managed exchange rate regime and the transformation into a floating exchange rate regime. We therefore distinguish the time period before and after the change in the exchange rate regime and allow all parameters of the error correction model to change.

Furthermore, our analysis covers 3 types of wheat which differ in the degree to which they are traded: while wheat of class 3 is the type of wheat most widely traded within Russia, wheat of class 4 is primarily exported to the international market, and wheat of class 5 is used for feed grain. We assume that the relationship between wheat prices and the exchange rate might be influenced by the degree to which the wheat is traded. Further, the transmission between the exchange rate and the domestic wheat prices may be influenced by the degree to which production inputs are imported or nominated in foreign currency, as for example seeds or fertilizers.

Third, we compare influence of exchange rate with comparison to influence of world wheat prices on Russian wheat market. And fourth, we contrast the case of Russia with German and French wheat markets.

The investigation of pass-through effects from the exchange rate to Russian wheat prices is of global relevance due to the large role of Russia for world wheat supply, which might be further strengthened in the future. Price developments in the wheat market in Russia may be transmitted to world wheat markets (Heigermoser and Götz, 2019). Thus, changes in the US Dollar/Russian Ruble exchange rate have implications not only for wheat price developments in the Russian market, but also for wheat importing countries via price developments in international wheat markets, with respective consequences for global food security. More than 50% of Russia's wheat exports are delivered to the countries in Africa and the Near East. Especially countries of North Africa are highly import depending for wheat. For example, the share of Russia's wheat exports in Egypt's wheat imports amounts to almost 75% in 2018 (Comtrade, 2020). Thus, Russia plays a large role for food security in those countries and world-wide. Also, the knowledge of the exchange rate's influence on Russian wheat prices is particularly important to correctly assess the future role of Russia in global wheat markets, which is often analyzed within economic modelling approaches (for an overview see Le Mouel and Forslund, 2017).

Since the 1970s, Schuh (1974) and others investigated the linkage between exchange rate and agricultural price development. However, results of the existing literature on this issue are diverse and do not come to a uniform conclusion regarding the influence of the exchange rate on agricultural prices. While Gervais and Khraief (2007), Baek and Koo (2009), and Hatzenbuehler *et al*, (2016) identify the existence of a relationship, results by Nazlioglu and Soytas (2011) do not confirm this. To our best knowledge none of the existing studies covers the impact of exchange rate on wheat prices taking into account the transition from one exchange rate regime to another. Based on our unique research design we aim to shed further light on this under-researched question.

2 Methodological framework and model estimation

We estimate historical exchange rate volatility in every trade year. Exchange rate historical volatility is estimated non-parametrically as the returns standard deviation (σ_i) in every trade year:

$$\sigma_i = 100\sqrt{\frac{1}{T}\sum_{t=1}^{T}(p_t - \overline{p}_t)} \qquad (1)$$

where p_t denotes exchange rate return in time *t* calculated as $p_t = ln\left(\frac{P_t}{P_{t-1}}\right)$ with p_t being the USD/RUB exchange rate and $\overline{p}_t$ denoting the mean of exchange rate: $\overline{p}_t = \frac{1}{T}\sum_{t=1}^{T} p_t$.

Estimated historical volatility parameters show that exchange rate volatility is highest in the 2014-2015 trade year (4.1). Exchange rate volatility is also high in 2015-2016 (3.1). We assume that change of exchange rate regime was one of the most important factors which led to substantial devaluation and high volatility of Russian Ruble in 2014-2015. Therefore, we consider transformation to the free floating exchange rate regime as structural break which has an importance for Russian wheat market.

To investigate the relationship between exchange rate with Russian wheat prices we follow a price transmission framework.

We use Johansen test (1991, 1995) to test on cointegration between prices. We apply the error correction model (ECM) to estimate the long-run price transmission elasticity and short-run speed of adjustment between price series.

We choose a model approach in which the wheat price in one of the wheat production regions of Russia (endogenous variable) is depicted as a function of the US$/RUB exchange rate and world wheat price (exogenous variables).

The two-stage error correction model (ECM) is applied as follows:

$$P_t^{ij} = \alpha + \beta_1 ER_t + \beta_2 P_t^w + \varepsilon_t \text{ (2)}$$

$$\Delta P_t^{ij} = \delta_1 ECT_{t-1} + \sum_{k=1}^{K} \left\{ \delta_{2k-1} \Delta P_{t-1}^{ij} + \delta_{3k} \Delta ER_{t-1} + \delta_{4k} \Delta P_{t-1}^{w} \right\} + v_t \text{ (3)}$$

where P_t^{ij} is the Russian wheat price in the corresponding region i and wheat class j, ER_t is the USD/RUB exchange rate, and P_t^w is world wheat price in week *t* and ε_t and v_t are statistical error terms (Engle and Granger 1987).The long-run price transmission elasticities beta1 and beta2 indicates the % change in the regional Russian wheat price, if the exchange rate or world wheat prices changes by 1% respectively. The short-run speed of adjustment parameter δ_1 indicates the speed at which temporary deviations from the long run equilibrium are corrected.

Lastly, we test on autocorrelation to determine the suitable lag structure of our model.

This model specification reflects the assumption that the exchange rate is exogenous to wheat prices in Russia. This assumption is motivated by the rather low share (around 1.8%) of wheat exports in total Russian exports which is significantly lower compared to oil amounting about 50%

3 Data

Wheat production in Russia is spread over the six primary grain production regions: North Caucasus, Black Earth, Central, Volga, Urals and West Siberia. North Caucasus is the main exporting region accounting for 71% of total wheat exports by Russia with optimal access to the close Black Sea ports. West Siberia is the most distant wheat producing region from the world market (more than 4000 km) which almost exclusively supplies wheat to the internal wheat market, especially Central region. Other grain producing regions rather distant to the Black Sea are Volga and Urals with distance amounting to 1900 km and 2600 km, respectively (ROSSTAT).

Our empirical analysis is based on weekly prices of Russian wheat (Ruble/ton) of classes 3, 4 and 5 provided by the Russian Grain Union for each of the six wheat producing regions, lasting from September 12, 2008 to May 25, 2018. Wheat of class 3 is the most widely traded type of wheat for human consumption within Russia, whereas wheat of class 4 is primarily exported to the international market, and wheat of class 5 is mainly used as a feed grain in Russia.

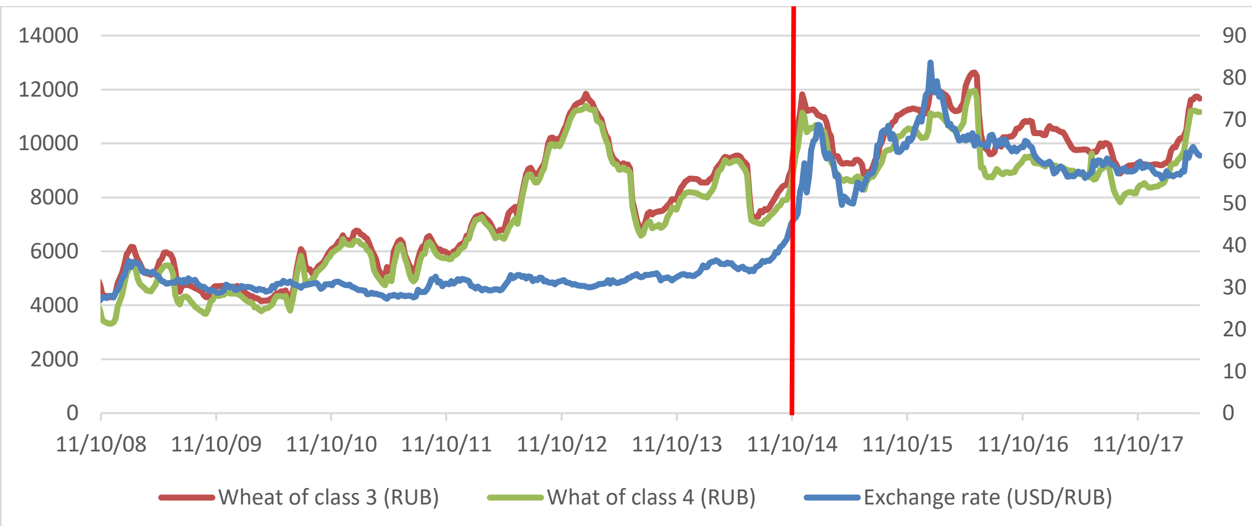
The full sample contains 507 observations for each of the 18 individual regional wheat price series (6 regions and 3 wheat classes considered). However, to explicitly take into account the possible influence of the change to the floating exchange rate regime and the large devaluation of the Ruble in 2014/15, we conduct the econometric analysis for two sub-periods separately: the first subset comprises 322 observations from September 12, 2008 to November 7, 2014 and the second subset lasts from November 14, 2014 to May 25, 2018 (185 observations) when the managed exchange rate regime was abolished by the Central Bank of Russia and turned into a freely floating exchange rate regime (Figure 2). On November 10, 2014, the Central Bank changed the managed exchange rate regime to the floating exchange rate regime which means that the Ruble exchange rate against foreign currencies is set by the market. However, this regime still allows for some limited interventions of the Central Bank on the currency market, e.g. if financial instability in the Russian economy is particularly high (Central Bank of the Russian Federation).

We use milling wheat prices (Euro/ton) from France (La Pallice) and Germany (Hamburg), lasting from November 14, 2014 to March 9, 2018 and May 25, 2018, respectively, provided by AHDB.

The French Rouen spot wheat price (FOB US Dollars/ton) serves as a world wheat price. The US Dollar/Russian Ruble exchange rate is obtained from the Central Bank of the Russian Federation. Euro/US dollar exchange rate provided by Federal Reserve System. All variables are transformed into natural logarithms. We proxy missing values with the average values of preceding and subsequent values.[1]

We plot domestic wheat prices of class 3, 4 and 5 in North Caucasus, main wheat exporting region in Russia, with exchange rate in Figure 1.

Figure 1. Wheat prices in North Caucasus region and USD/RUB exchange rate.



*Vertical line corresponds to change of exchange rate regime in Russia.

Russian wheat market is characterized by oscillating behavior of prices resulting from large variations in the regional grain harvest due to weather conditions and policy interventions. In particular, the government introduced a tax on wheat exports during the 2007/8 for several months. Later, wheat exports were completely banned from August, 2010 to July, 2011. Also, in February 2015, a wheat export tax was introduced again and removed in May, 2015 to reduce amount of wheat for export. The goal of export restrictions is decreasing of domestic prices and providing food security (Götz *et al.*, 2016).

[1] Before November 10, 2014, 14 (4.3%) and 32 (9.9%) price observations are missing for all regional Russian wheat prices of class 3 and the world wheat prices, respectively. After November 10, 2014, 6 (3.2%) price observations of wheat prices of class 3 are missing for North Caucasus, Volga, Urals and West Siberia and 5 (2.7%) observations for Black Earth and Central, whereas 15 (8.1%) price observations are absent for the world wheat prices. The dataset of exchange rate is complete.

4 Empirical results

4.1 Data properties

Results of the GLS Dickey-Fuller test do not allow rejecting the hypothesis of a unit root at a 5% critical value for all price series in levels before and after the abolishment of the managed exchange rate regime in Russia. Therefore, all variables are I(1).

We proceed with cointegration analysis in the next step. In general, non-stationary price series are identified as cointegrated if their linear combination is of a stationary nature. We apply the multivariate Johansen cointegration test (1995) with the null hypothesis of at most 1 cointegrating vector for wheat prices in Russia, exchange rate, and world wheat prices for the time period before and after the removal of the managed exchange rate regime (November 10, 2014) separately. The existence of one and only one integrating factor for all price series implies that prices must be cointegrated, and there must be n-1 cointegrating vectors which is 2 in our case.

Empirical results of the cointegration test show absence of 2 cointegrating vectors between the USD/RUB exchange rate, world wheat prices and Russian wheat prices for all regions and classes during the managed exchange rate regime. After the removal of the managed exchange rate regime and the transition to the floating exchange rate regime, cointegration between exchange rate, world wheat prices and Russian wheat prices is confirmed in 10 out of 18 cases. Exceptions are price series for wheat of class 3 and 4 in Volga, Urals and West Siberia, wheat prices of class 4 in Black Earth and wheat prices of class 5 in Volga.

4.2 Exchange rate pass-through under the free floating exchange rate regime

Table 1 shows the estimated parameters of the relationship between the RUB/US$ exchange rate and wheat prices as the exogenous variables and the regional wheat price of Russia as endogenous variable for the time period with a free floating exchange rate regime after the managed exchange rate was abandoned. We include results of bivariate ECM model between exchange rate and Russian wheat prices in Table 1 in cases where we do not find n-1 cointegrating vectors for multivariate approach. Parameter estimates of the ECM indicate that wheat prices of class 3 in North Caucasus, Black Earth and Central are the strongest integrated with the exchange rate in comparison with other regions. The same pattern is observed for wheat of class 4 in Center, North Caucasus and Black Earth regions with long-run price transmission elasticities amounting to 0.92, 0.80 and 0.60 respectively, while cointegration in other regions was not observed neither with multivariate nor with bivariate approach. This can be explained by the fact that North Caucasus is the most important exporting region in Russia and closest to the Black Sea port and the exchange rate a primary determinant of price formation. Central and Black Earth are also relatively close to the Black Sea port but substantially more distant compared to the North Caucasus region. Thus, if the exchange rate changes by 10%, wheat prices of class 3 and 4 in North Caucasus change by 7,2% and 8% respectively.

Table 1. Long-run price transmission elasticities (β_1) and (β_2) and short-run speed of adjustment (δ_1), Russian wheat prices, the exchange rate, and world wheat prices (November 14, 2014 – May 25, 2018).

Price series	Exchange rate (β_1)	World wheat prices (β_2)	Intercept (α)	Speed of adjustment (δ_1)
Wheat class 3				
North Caucasus	0.72	0.31	4.63	-0.05 (0.01)*
Black Earth	0.56	0.30	5.25	-0.03 (0.01)*
Central	0.57	0.34	4.99	-0.04 (0.01)*
Volga (bivariate model)	0.49	-	7.12	-0.02 (0.01)**
Urals (bivariate model)	0.51	-	7.05	-0.02 (0.01)**
West Siberia (bivariate model)	0.48	-	7.13	-0.01 (0.00)**
Wheat class 4				
North Caucasus	0.80	0.51	3.10	-0.05 (0.02)**
Black Earth (bivariate model)	0.66	-	6.31	-0.03 (0.01)**
Central	0.92	0.58	2.19	-0.04 (0.01)**
Volga	N/C	-	N/C	N/C
Urals	N/C	-	N/C	N/C
West Siberia	N/C	-	N/C	N/C
Wheat class 5				
North Caucasus	0.96	0.51	2.40	-0.04 (0.01)**
Black Earth	1.19	0.73	0.18	-0.02 (0.00)**
Central	1.18	0.76	0.06	-0.02 (0.01)**
Volga (bivariate model)	0.83	-	5.50	-0.01 (0.00)**
Urals	1.05	0.52	1.85	-0.01 (0.00)**
West Siberia	0.79	0.56	2.68	-0.01 (0.00)**

Note:“-“ absence of 2 cointegrating vectors with multivariate Johansen test, N/C – no cointegration with bivariate Johansen test, standard errors in parentheses, significance at 1%* and 5%** level.

The higher importance of the exchange rate for wheat of class 5 (feed wheat) compared to wheat of class 3 and 4 can be explained by the substitutability of feed wheat by soy bean meal for livestock feeding. Price transmission elasticity parameters for wheat of class 5 in North Caucasus, Black Earth, Central and Urals are close to unity, indicating conformity with the Law of One Price. Russia imports around 43% of soya for livestock needs and soy bean meal consumption is around 5 million tons per year (Agroinvestor, 2017). Therefore, livestock producers may substitute soy bean meal by feed wheat or vice versa depending on the Ruble price influenced by the exchange rate.

The price transmission elasticity results suggest a substantial role of the exchange rate for Russian wheat market, except Volga, Urals and West Siberia for wheat of class 4 which are most distant regions of Russian wheat market to the Black Sea port.

The size of the intercept parameter, which we interpret as a proxy for trade and production costs, is highest for wheat of class 3 in West Siberia and lowest for wheat of class 5 in Central.

In the second stage ECM results, the size of speed of adjustment parameter is highest for wheat of class 3, 4 and 5 in North Caucasus, amounting to -0.05, -0.05 and -0.04, respectively. This corresponds with the fact that North Caucasus is the main wheat exporting region of Russia and thus changes in the exchange rate are transmitted faster to North Caucasus in the short run compared to other regions. Our findings make evident that corrections of deviations from the long-run equilibrium are not instantaneous with weekly adjustment rates ranging from 1% for wheat of class 5 in Volga, Urals and West Siberia to 5% for wheat of class 3 and 4 in North Caucasus. The speed of adjustment parameters for wheat of class 5 is similar for all regions amounting from -0.01 to -0.02 with the exception of North Caucasus (-0.04). All parameters for short run speed of adjustment have a correct negative sign and statistically significant at 5% level.

Russia is an open economy and the wheat prices on the internal market are directly connected with international prices. Wheat is traded in US Dollars on the world market and the export price is given/or denominated in US Dollar. We therefore assume that the exchange rate, world wheat prices in Dollars and differences between world price and internal price have an impact on wheat prices in Russia.

We suppose that the Russian Ruble depreciation against the US Dollar leads to increasing regional wheat prices which can be explained by the increase in export demand on the domestic market and possibly wheat producer's incentives to increase their profits by raising the price which requires some degree of market power. Prime costs of wheat are supposed to increase since Russian farmers buy inputs (seeds, fertilizers, tractors) which are either imported or nominated in foreign currency.[2] Eventually, higher production cost could raise internal prices for wheat with timely delay.

Additionally, Table 1 shows parameters of price transmission elasticity for world wheat price as exogenous variable to Russian wheat prices. Estimated parameters for exchange rate pass-through is higher with comparison to transmission elasticity parameters of world wheat prices for all classes and regions. Estimation results for Russian wheat of class 3 in North Caucasus region show that the price transmission elasticity parameter for exchange rate is more than two times higher than for world wheat prices (0.72 and 0.51, respectively). The difference between parameters for wheat of class 4 is also high: 0.80 and 0.51 for North Caucasus and 0.92 and 0.58 in Central. Consequently, we assume that Russian wheat prices more influenced by fluctuations on exchange rate market than on world wheat market when they trade with exporters.

In summary, we find that the exchange rate plays important role for Russian wheat market. The role of exchange rate increased for Russian wheat market after transition to the free floating exchange rate regime. Empirical results show that Russian wheat market driven more by changes in exchange rate in comparison with the changes in world wheat prices in the long run period.

4.3 Exchange rate pass-through in Russia with comparison to France and Germany

In this section, we discuss exchange rate pass-through to wheat prices in France (La Pallice) and Germany (Hamburg) with comparison to empirical results for Russian wheat prices of classes 3 and 4 in the closest to the Black Sea port region North Caucasus (Table 2). La Pallice is a deep water port of France and Hamburg is the third largest European port located in Germany. Consequently, wheat prices from La Pallice and Hamburg are suitable for comparison with North Caucasus. Results of the GLS Dickey-Fuller test do not allow rejecting the hypothesis of a unit root at a 5% critical value for milling wheat prices in La Pallice and Hamburg as well as for EUR/USD exchange rate. Johansen test confirms presence of n-1 cointegrating vectors for French and German wheat prices with exchange rate and world wheat prices. We apply the same ECM model for milling wheat prices in France and Germany as for Russian wheat prices (equations 2 and 3).

[2] Ruble's depreciation since late 2014 and subsequent price inflation have complicated decision-making process about purchasing of farm inputs (Kingwell *et al*., 2016)

Results indicate that long-run price transmission elasticity parameter is the highest for La Pallice with respect to exchange rate (-0.89). However, estimated parameter for France is not substantially higher than for Germany (-0.80) and Russia (0.72 and 0.80). Price transmission elasticity parameters for France and Germany have a negative sign which can be due to the different representation of exchange rate in comparison to Russia.[3] Wheat of class 3 is the most widely traded type of wheat for human consumption within Russia and has the lowest price transmission elasticity with respect to exchange rate (0.72) and world wheat prices (0.31) in comparison with wheat of class 4 from North Caucasus as well as with wheat prices from La Pallice and Hamburg.

In contrast to Russian wheat prices, long run price transmission elasticity is higher for French and German wheat prices with respect to world wheat prices than for the exchange rate. The Law of one price is hold for La Pallice. This can be explained by the use of French Rouen wheat prices as corresponding world wheat prices.

Empirical findings of second stage ECM indicate that the speed of adjustment parameters are higher for wheat prices in La Pallice (-0.25) and Hamburg (-0.15) in comparison with wheat prices from North Caucasus (-0.05).

Table 2. Long-run price transmission elasticities ($\boldsymbol{\beta_1}$) and ($\boldsymbol{\beta_2}$) and short-run speed of adjustment ($\boldsymbol{\delta_1}$), Russian, German (November 14, 2014 – May 25, 2018) and French wheat prices (November 14, 2014 – March 9, 2018).

Price series	Exchange rate (β_1)	World wheat prices (β_2)	Intercept (α)	Speed of adjustment (δ_1)
		Russia		
North Caucasus, wheat of class 3	0.72	0.31	4.63	-0.05 (0.01)*
North Caucasus, wheat of class 4	0.80	0.51	3.10	-0.05 (0.02)**
		France		
La Pallice, milling wheat	-0.89	1.10	-0.61	-0.25 (0.07)*
		Germany		
Hamburg, milling wheat	-0.80	0.90	0.48	-0.15 (0.05)*

Note: standard errors in parentheses, significance at 1%* and 5%** level.

4.4 Long-run price transmission elasticity and distance to the Black Sea port

We assess the significance of the distance and the spatial change with the respect to price transmission elasticities for period after transition to the free floating exchange rate regime for better comparison of exchange rate influence on wheat prices in various regions. Dillon and Barrett (2015) consider the importance of remoteness for local maize prices in East Africa taking into account difference between price transmission elasticities with respect to world oil and world maize prices. We consider parameters of bivariate model (exchange rate and Russian wheat prices) because of higher number cases of cointegration in comparison to application of multivariate Johansen test (exchange rate, world wheat prices and Russian wheat prices).

Figure 5 plots the estimated parameters of price transmission elasticity for Russian wheat prices of class 3, 4 and 5 with respect to exchange rate against the distance in kilometers from the largest cities of corresponding wheat regions to the Black Sea port in Novorossiysk. The exchange rate

[3] In case of France and Germany, we use EUR/USD exchange rate which shows cost of 1 EUR in US dollars. Reverse representation of exchange rate (USD/EUR) gives values below one and logs with negative signs. In case of Russia, we use USD/RUB exchange rate (cost of 1 USD in Russian Rubles).

insulating effect is markedly heterogeneous among the regions. The clear pattern is that wheat of class 5 in most regions have the highest price transmission elasticities with regard to the exchange rate which we explain by the substitution effect of imported soya. We do not observe significance of distance between wheat prices of class 5 in different regions. This type of wheat is mostly used for feed consumption inside of the country. North Caucasus (3 and 4 class), Central (4 class), and Black Earth (4 class) have highest price transmission elasticity parameters among wheat prices of classes 3 and 4. This can be explained by the facts that North Caucasus and Black Earth are closest wheat producing regions to the Black Sea port and Central has strong connection with North Caucasus in terms of trade relations. Wheat of class 4 has the biggest share in total Russian grain export. Estimated parameters for wheat of class 4 in Black Earth and Central are higher than parameters for wheat of class 3. There is no clear pattern for wheat of class 3 in all regions except North Caucasus between the distance to the port and price transmission elasticity with respect to the exchange rate (Figure 2 and Table 3). We assume that for wheat prices in Volga, Urals and West Siberia influence of the exchange rate through production costs can be stronger than through market power of wheat producers in some periods. The most remote from the Black Sea port is West Siberia and Urals regions. Beside this, both regions mostly supply wheat to internal wheat market of Russia.

Figure 2. The elasticity of Russian wheat prices and exchange rate against distance from the Black Sea port to the largest cities of main wheat production regions.

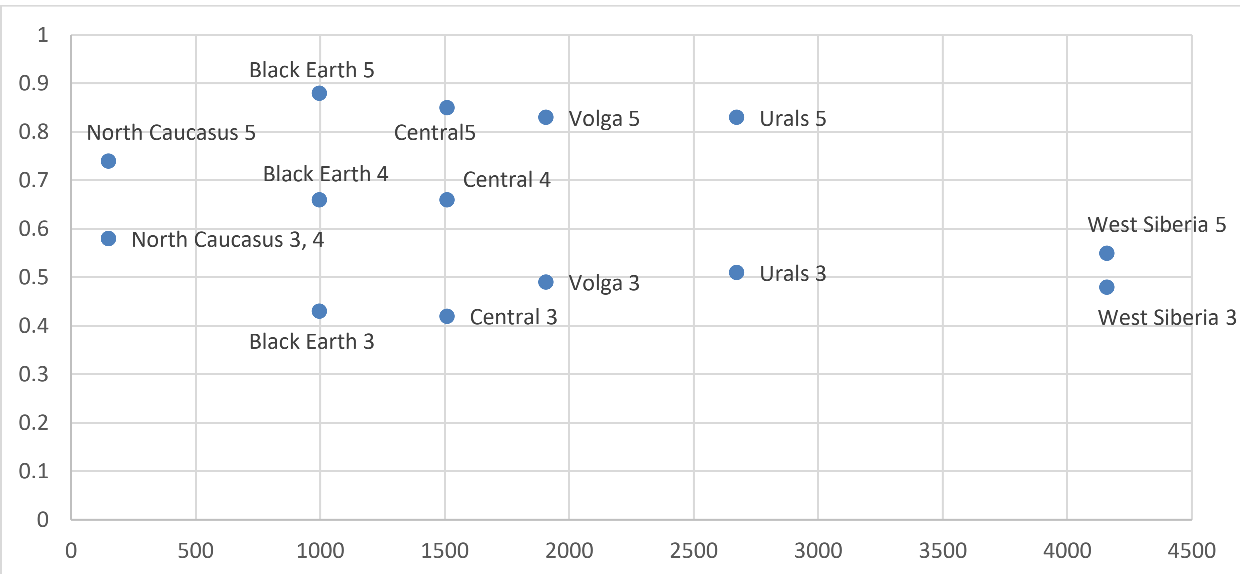


Table 3. ECM long-run price transmission elasticity between Russian wheat prices and exchange rate and distance between largest cities of wheat regions to the Black Sea port (November 14, 2014 – May 25, 2018).

Region	Distance from port of Novorossiysk, Black Sea (km)	Wheat of class 3	Wheat of class 4	Wheat of class 5
North Caucasus (Krasnodar)	150	0.58	0.58	0.74
Black Earth (Voronezh)	997	0.43	0.66	0.88
Central (Moscow)	1509	0.42	0.66	0.85
Volga (Kazan)	1906	0.49	-	0.83
Urals (Yekaterinburg)	2672	0.51	-	0.83
West Siberia (Novosibirsk)	4159	0.48	-	0.55

Note: “- “ no cointegration, distance from Google Maps.

5 Conclusions and policy implications

We estimate exchange rate pass-through to Russian wheat prices and have four main results. First, we find substantial importance of exchange rate for wheat prices in Russia. Second, cointegration of the exchange rate and domestic wheat prices is identified in the period within the free floating exchange rate regime, while cointegration was not confirmed in times of the managed exchange rate regime. Exchange rate pass-through to Russian wheat prices might be explained by imported input products in prime costs of wheat prices as well as the market power of Russian wheat producers who consider fluctuations on the exchange rate market. Third, we find empirical evidence that Russian wheat market influenced more by the changes in the exchange rate than in world wheat prices after the removal of the managed exchange rate regime which we explain by the strong increase of wheat exports which was induced by the heavy devaluation of the Russian Ruble in 2014/15. In contrast to Russia, we find that influence of world wheat prices is stronger on French and German wheat prices with comparison to the exchange rate. Exchange rate pass-through to wheat prices in France and Germany is not substantially higher than in Russia. Fourth, empirical results show that long run price transmission elasticity parameters in North Caucasus (wheat of class 3 and 4 class), Central (4 class), and Black Earth (4 class) have highest price transmission elasticity parameters among wheat prices of classes 3 and 4 which may indicate to market power of Russian wheat producers.

Our findings are important for policymakers, as they explain the role of exchange rate in determining wheat prices in Russia before and after the removal of the managed exchange rate regime and during periods of strong Ruble’s devaluation. Farmers and investors can use this information in determining the extent to which they are exposed to the exchange rate risk. This also implies that policy for stabilizing wheat prices in Russia requires considering dynamic of the exchange rate.

Oil dependence for Russia is the so-called resource curse or paradox of plenty and especially in case of low oil prices. Although, it is negative for an economy as a whole, it is beneficial for wheat producers and traders who gain from low world oil prices - Ruble’s depreciation connection. Our results suggest that the importance of the exchange rate on domestic wheat prices in Russia has strongly increased with the abandonment of the managed exchange rate regime and significant devaluation of the Ruble. We suppose that it was one of the main factors which contributed to Russia’s competitive advantage on the world grain market.

The issue of wheat price volatility in Russia is a topic of global concern due to its importance for global wheat supply. Due to the free floating exchange rate regime, wheat price volatility in Russia may increase with respective consequences for price volatility on world wheat markets. Beside this, competitive advantage by the price due to influence of Ruble’s devaluation is not steady and vulnerable to a risk of external price changes which can be a reason for Russian wheat supply instability on the world markets. Consequently, export increase supported by stable long term conditions as increase of yield and improvement of infrastructure for wheat storage and transportation can be more beneficial for Russian producers and wheat importers. In order to mitigate the influence of sharp exchange rate fluctuations from the production side, a government should pay more attention to the production of domestic input products.

Reducing of price volatility on Russian wheat market requires further efforts to curb the heightened wheat price risk by e.g. the implementation of wheat storage systems and functioning wheat futures markets.

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