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The relationship between trade policies and macroeconomic adjustments in the Russian cheese market integration

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The relationship between trade policies and macroeconomic adjustments in the Russian cheese market integration

Abstract. Many different events happened in 2014 that affected Russia's domestic markets. Among different dairy products, cheese has been the one for which domestic production has significantly increased and cheese import decreased since the summer of 2014. This paper aims to explore the effects of trade policies and other macroeconomic changes in 2014 on cheese price development in the domestic Russian market. Based on the law of one price, we considered price cointegration and price dispersion methodologies to test the cheese prices developments between producing and consuming regions before and after the summer of 2014. We applied Johansen co-integration test, VECM and dynamic panel models. We used 39 price pairs between main cheese producing and cheese consuming regions for the period of 2008–2016 for price cointegration and partially for price dispersion. The research results show that cointegration of cheese prices between producing and consuming regions have substantially increased since the summer of 2014. Moreover, the dispersion of cheese prices between Moscow and the cheese producing regions has increased with significant effects of counter-sanctions, a reduction in cheese imports, and devaluation of the Russian currency. We conclude that the market efficiency has not increased in spite of boosted domestic cheese trade.

Keywords: trade policy; market efficiency; counter-sanctions; cointegration; price transmission; price dispersion; cheese market; Russia.

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Introduction

Russia plays an important role in global food security. It is already one of the largest producers and exporters of key crops, including wheat, barley and sunflower seeds worldwide, and the country has huge potential to further increase its list of exported agri-food products. Russia's enormous agricultural land of more than 200 million ha¹ and its favourable climate with high levels of rainfall, provides good potential for the production of agri-food products. Moreover, Russia alone accounts for more than 40 % of all chernozem (black earth) soil around the globe² [Kuznetsov, Isaeva, Pavlushkina, 2017]. However, despite the country's food growing potential and its excellent natural conditions, Russia was one of the world's largest food importing countries up until mid-2014, importing the major share of its dairy, meat and fish products, as well as fruits and vegetables consumed domestically. In the case of total food products, the share of imports in domestic consumption reached over 40 % in 2013 [Liefert et al., 2019].

To mobilise the production potential in the agri-food sector, the Russian government introduced an agricultural import substitution policy, which is comprised of two elements. On the one hand, the country's government has launched comprehensive agricultural supporting programs to attract investments in agricultural production. On the other hand, the government has gradually changed its agricultural import policies to favour a boosting of domestic agricultural production. Ultimately, this policy aims to increase self-sufficiency levels for most of the food products and, furthermore, to become one of the largest exporters of these products worldwide [Götz, Djuric, 2016]. Agricultural producers were supported within the "2006 National Project" for the development of an agro-industrial complex, which was later transformed into the "Agricultural Development Program 2008–2012", then to the "Food Security Doctrine of 2010" and eventually the "Agricultural Development Program of 2013–2020"³ [Vassilieva, 2012; Vassilieva, Smith, 2010].

The year 2014 held many events that make it a special and stand-out year for the Russian economy. Between June 2014 and January 2015, oil prices dropped by more than 50 US dollars per barrel, which resulted in a huge drop in revenues, real exchange rate depreciation and even a negative GDP growth rate in Russia [Polbin, Skrobotov, Zubarev, 2020]. Furthermore, in 2014, a set of sanctions and counter-sanctions were also implemented between Russia and certain western countries due to regional disputes [Gould-Davies, 2020]. As a result, imports were restricted by import taxes, non-tariff barriers and even an import ban, which was implemented in August 2014. The import of dairy products was particularly affected by Russia's counter-sanctions, as up to around 80 % of all dairy imports were previously imported from the sanctioned countries [Boulanger et al., 2016].

In the study, we aim to assess how efficient the Russian dairy market is with a focus on the cheese market's functioning, a question which has not been addressed in

¹ FAO. (2021). FAOSTAT, Russian Federation Country Indicators. <http://www.fao.org/faostat/en/#country/185>.

² FAO. (2001). Mineral Soils conditioned by a Steppic Climate. FAO.

³ DONLAND. (2010). National Project "Development of Agro-Industrial Complex". <http://www.donland.ru/Deyatelnost/Nacproekt/APK/?pageid=81498>. (in Russ.)

the literature before. Following a price transmission and price dispersion modelling approach, we attempt to identify and measure the effects of these post-August 2014 changes in Russian trade policies and macroeconomic adjustments on the Russian dairy market. Our hypothesis is that Russia's counter-sanctions on the import of food and agricultural commodities both positively affected the domestic regional price integration and increased the regional price dispersion within the Russian dairy sector. Because of the implementation of the counter-sanctions on food imports, importing regions of Russia substituted dairy imports from international markets with imports from domestic dairy producing regions. Therefore, the domestic dairy trade increased with the implementation of Russia's counter-sanctions and import restrictions, strengthening regional integration in the Russian dairy market. We measure the spatial price integration during free trade and restricted trade (imports) by employing the Johansen cointegration and vector error correction model (VECM) approach to weekly consumer price series from January 2008 to December 2016. Furthermore, following the price integration, the bivariate price dispersion between all market pairs in the first part are estimated before and after August 2014. Finally, possible factors that can affect the bivariate price differences between Moscow, a major urban centre, and cheese producing regions is tested with a dynamic panel model.

The paper is structured as follows. First, we provide an overview of the Russian dairy sector and its external trade of dairy products. Following, we present a review of the fundamental literature on regional price integration and price dispersion. Then, the paper gives an overview of the methodology and data used in the study and provides the empirical results. Finally, the discussion and conclusion are presented.

Specifics of the Russian dairy sector

Production. During transformation period after the collapse of the Soviet Union, milk production in Russia decreased (Figure 1), mainly due to a significant drop in the number of cows (Figure 2).

While the country's annual milk production reached 55 million tonnes in 1990, production levels amounted to only 30 million tonnes in 2016. However, the structure of milk production did not notably change during the import restrictions. Milk producers are categorised into households, large agricultural enterprises¹ and farms, and individual entrepreneurs. At the beginning of the 1990s, Russia's milk production was highly dominated by agricultural enterprises. However, their share steadily decreased until 1999, with farm households becoming the largest producers of milk since then (Figure 3). Concurrently, butter production dropped dramatically between 1990 and 2000 (Figure 4), and did not recover during this period. Moreover, an increase in butter production was not observed after the implementation of import restrictions in 2014.

¹ The Russian word for this organisation is "Сельскохозяйственные организации", which used to be called "Selkhoz".

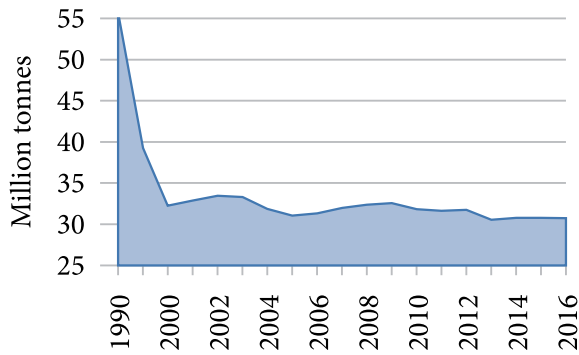


Fig. 1. Milk production, million tonnes¹

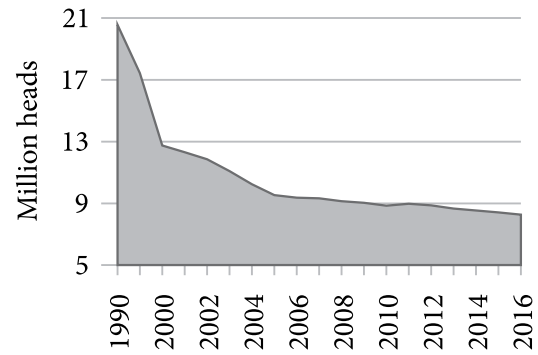


Fig. 2. Number of cows, million heads²

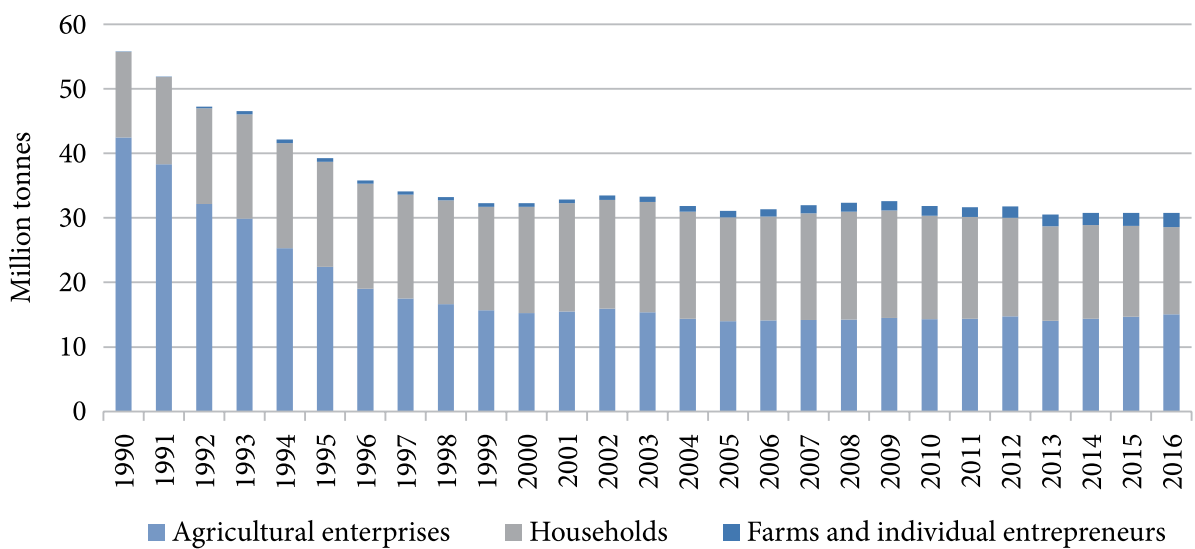


Fig. 3. Production of milk by different types of producers, million tonnes³

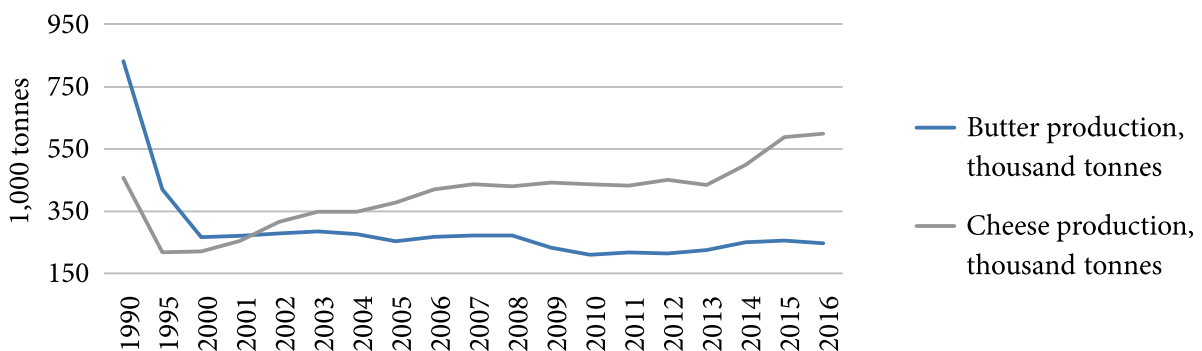


Fig. 4. Butter and cheese production, thousand tonnes⁴

¹ Own illustration based on data from Rosstat.

² Own illustration based on data from Rosstat.

³ Source: own illustration based on data from Rosstat.

⁴ Source: own illustration based on data from Rosstat.

The opposite is true in the case of cheese production. In contrast, it nearly halved between 1990 and 1995, and has steadily recovered since then. In 2006, cheese production reached the levels of 1990. Since 2013 cheese production has risen dramatically and continued to grow even during and after the import restrictions of 2014 (Figure 4). The production of skim milk powder (SMP) and whole milk powder (WMP) has been decreasing significantly over the last decade. In 2010 alone, the production of both milk powders saw a more than twofold drop. While the production of WMP has not changed substantially since 2010, the production of SMP increased by around 200 % during the period of 2010–2014, but has constantly decreased since then. In 2016, the production levels of WMP and SMP was 42 and 63 thousand tonnes, respectively¹.

Milk processing is highly concentrated and dominated by a few large enterprises. While the two largest companies, Danone and PepsiCo, jointly accounted for about 18.1 % of total milk processing in 2015, that same year, the Top 10 companies jointly processed 30.7 % of all milk around Russia². Figures 5 and 6 present the largest domestic cheese exporting and importing regions, respectively³.

While exports from almost all regions have risen since 2014, the opposite is true for the case of Moscow oblast⁴ (Figure 5). Similarly, cheese importing regions have increased their imports from domestic markets since 2014 (Figure 6). The highest growth in domestic imports is observed for Smolensk (78 %), Saint Petersburg (22 %) and Samara (18 %). This is presumably because of their higher dependence on European cheeses and relatively lower levels of local production.

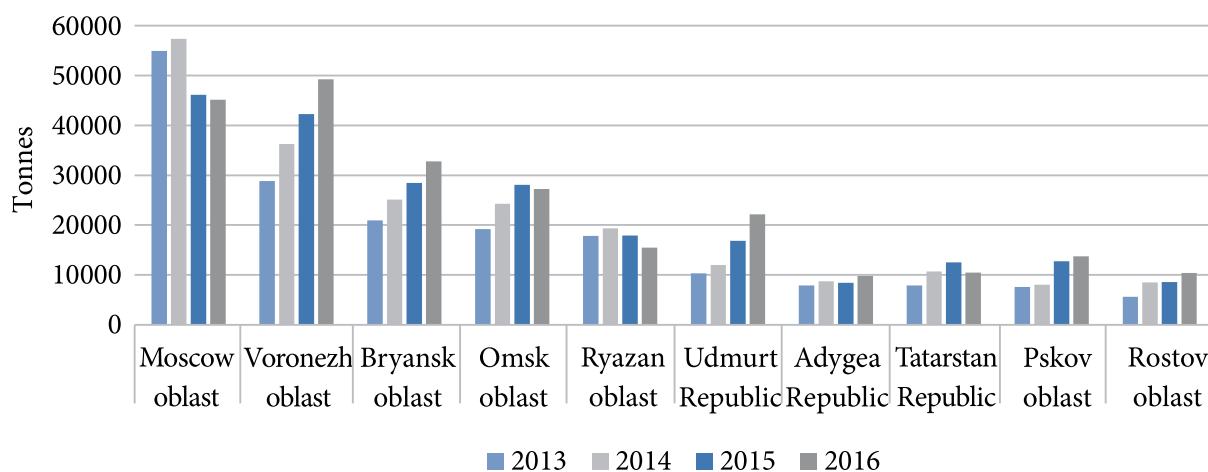


Fig. 5. Top regional cheese exporters, tonnes⁵

¹ USDA. (2017). Data & Analysis, USDA Foreign Agricultural Service. Online Database. <https://www.fas.usda.gov/data/>

² RussianDairy. (2016). Rating top-50 dairy companies. Russian Dairy Research Centre. <http://www.dairynews.ru/news-image/20161230/ТОП-50>. (in Russ.)

³ Internal regional trade data is used for these figures.

⁴ Administrative subdivision of Imperial Russia or a republic of the former Soviet Union or of the Russian Federation which can be translated to “area”, “zone”, “province” or “region”.

⁵ Source: own illustration based on data from Rosstat.

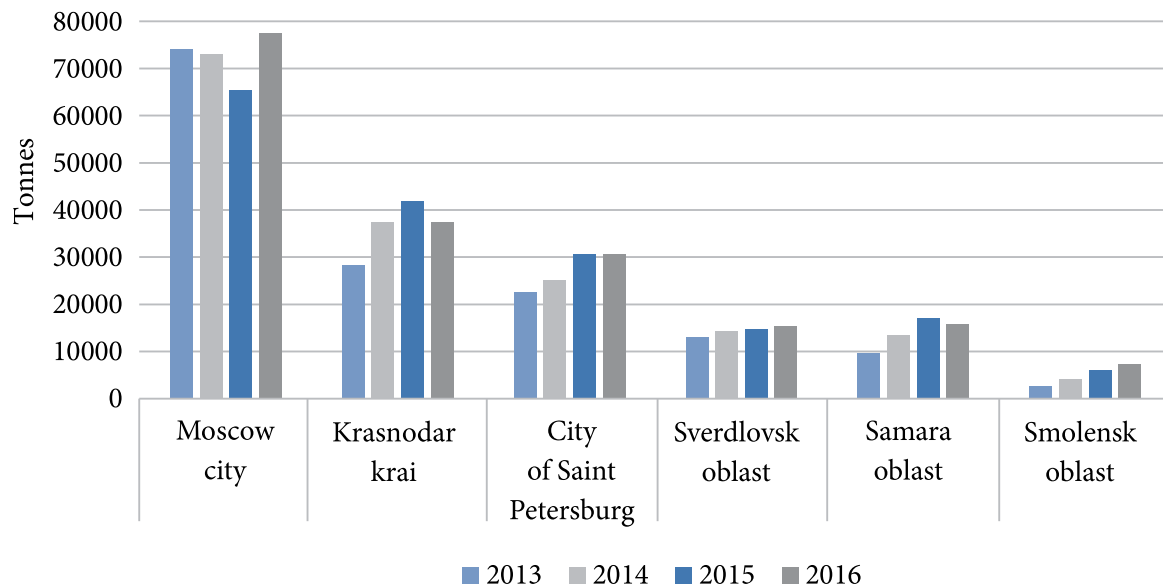


Fig. 6. Top regional cheese importers, tonnes¹

Trade patterns. Russia’s importation of dairy products has faced two major challenges recently: the Eurasian Customs Union between Russia, Belarus and Kazakhstan in 2010 and the import restrictions of August 2014 and afterwards. The food import restrictions seem to have had different effects on different types of dairy products, as were observed in the production data. The import of raw milk products and butter has more or less been replaced by imports from Belarus after Russia’s counter-sanction of August 2014 (Figures 7 and 8). As a result, total imports of butter and milk since the introduction of the import restriction have not changed much.

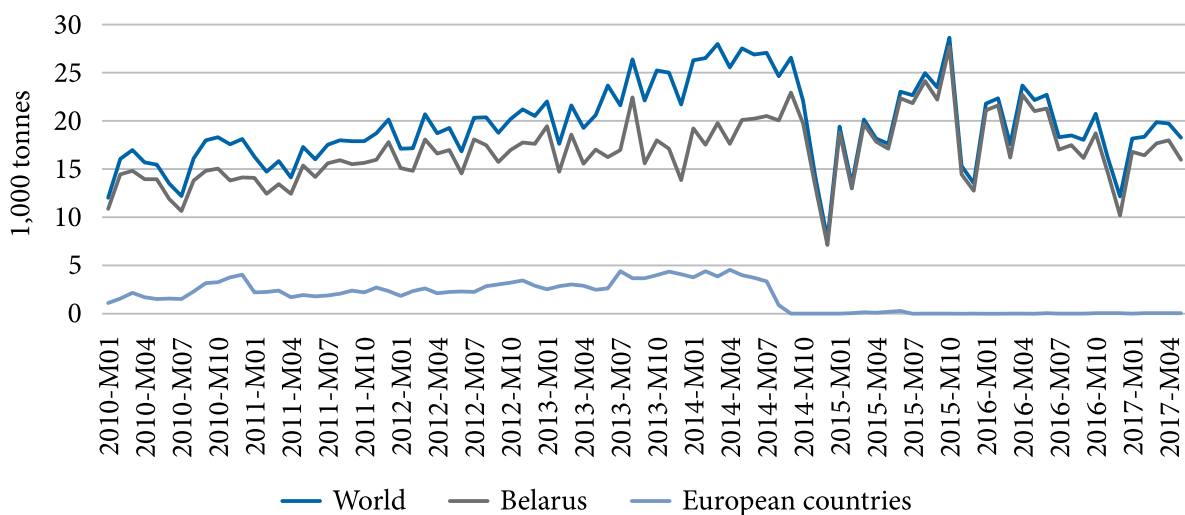


Fig. 7. Monthly milk imports, thousand tonnes²

¹ Source: own illustration based on data from Rosstat.

² Source: own illustration based on data from TradeMap.

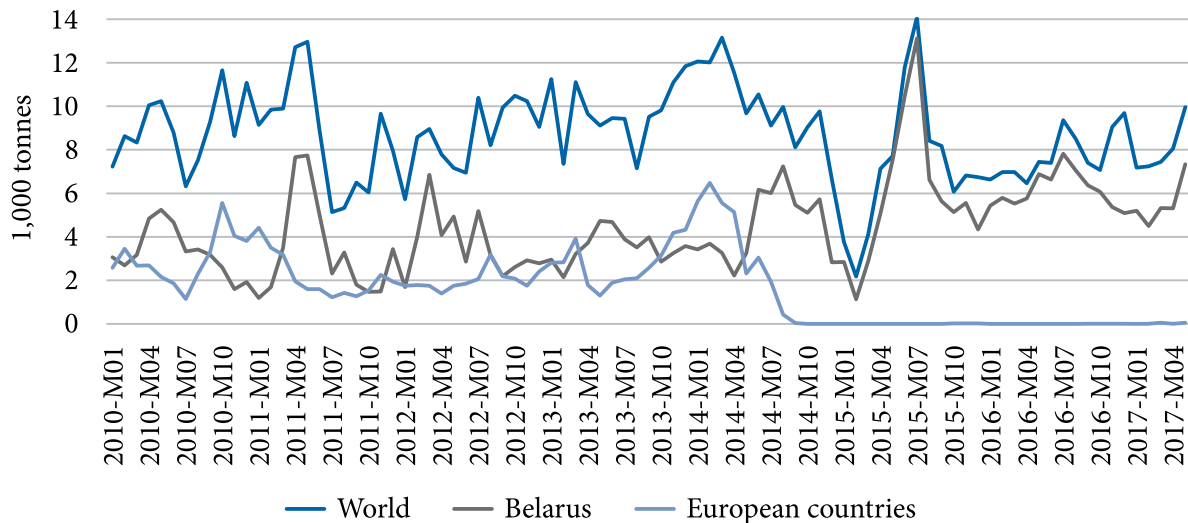


Fig. 8. Monthly butter imports, thousand tonnes¹

However, in the case of cheese, the picture is completely different (Figure 9). Total imports of cheese dropped dramatically since the import restrictions of 2014 and were at a level nearly two times lower in 2017 than before August 2014. The share of European countries in the total imports of cheese was extremely high and imports from Belarus were not enough to compensate for such a huge drop in imports.

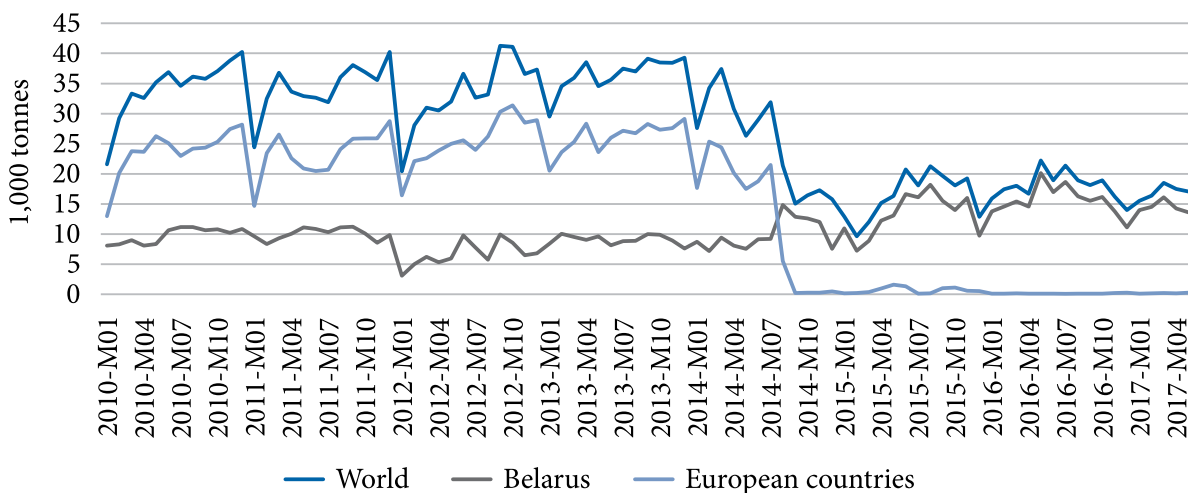


Fig. 9. Monthly cheese imports, thousand tonnes²

Imports of both SMP and WMP have increased dramatically since 2007, nearly 2.5 times and almost twofold, respectively. While imports of SMP and WMP from the European Union have been decreasing since 2010 and even totally stopped after 2014, imports of both products from Belarus have skyrocketed, with even higher rates. The share of Belarus in the imported quantity of SMP and WMP is huge. However, this share

¹ Source: own illustration based on data from TradeMap.

² Source: own illustration based on data from TradeMap.

decreased significantly in 2016 by nearly 18 % and about half for SMP and WMP, respectively¹. It must be added that a minor increase in the import of dairy products by Belarus from the EU can be observed in the trade data. However, the import of fluid milk products (HS² Code 401) from the EU to Belarus increased dramatically since 2014 (Figure 10). In 2016, Belarus exported more than 300 thousand tonnes of raw milk products (not including cheese, butter and milk powder) to Russia and imported more than 100 thousand tonnes of the same commodity from the EU. This trend was not there before 2014. It seems that Belarus covers part of its raw milk shortages with milk imports from the EU to export the dairy products to Russia.

To sum up, the import substitution strategy of Russia did not have any significant impacts for the case of milk and butter, as production and self-sufficiency have not improved since 2014. However, the opposite is true for the case of cheese, where self-sufficiency

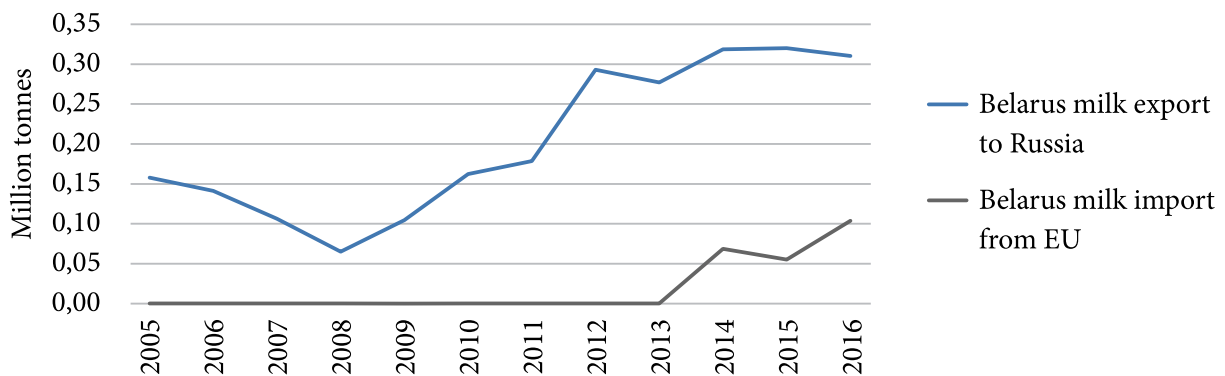


Fig. 10. Belarus fresh milk product imports and exports, million tonnes³

levels increased by almost 20 %. Therefore, in our further analysis, we concentrate only on cheese, as it is by far the major dairy product for which the import substitution strategy seems to have had a remarkable effect.

Literature review

Price transmission. Our paper contributes to the literature on the degree of market integration in spatially separated markets [Alexander, Wyeth, 1994; Goodwin, Piggott, 2001]. The degree of market integration is one of the common ways for indicating market efficiency [Faminow, Benson, 1990; Goodwin, Grennes, McCurdy, 1999; Goodwin, Schroeder, 1991]. Study techniques are mainly built on the law of one price [Sanogo, Amadou, 2010], which is an important component of almost all of the international trade models [Officer, 1986]. In an efficient market with well-developed transportation and storage infrastructure, regional price differences should at most be equal to the costs

¹ USDA. (2017). Data & Analysis, USDA Foreign Agricultural Service. Online Database. <https://www.fas.usda.gov/data/>

² Harmonized Commodity Description and Coding Systems (HS).

³ Source: own illustration based on data from TradeMap and Eurostat.

of trade between the trading regions. The prices in two trading regions tend to co-move in the long run, with price shocks transmitting from one region to the other [Asche, Gordon, Hannesson, 2004; Goodwin, 1992; Van Campenhout, 2007].

One of the pioneering cointegration models was introduced by Engle and Granger [1987]. Despite its popularity among researchers, Engle & Granger (E&G) approach is subject to a number of serious limitations, such as: (i) cointegration considerations are restricted to pair-wise comparisons; (ii) one of the two prices must be designated as exogenous; (iii) the potential for small sample biases in parameter estimates; and lastly, (iv) the E&G approach does not have well defined limiting distributions and therefore the direct testing of a hypothesis is not possible [Asche, Gordon, Hannesson, 2004; Banerjee et al., 1986; Goodwin, 1992; Hall, 1986].

A more powerful approach for the cointegration test, introduced by Johansen [1988], can be a good alternative in this regard [Alexander, Wyeth, 1994]. Johansen's approach can be used for the multivariate cointegration analysis [Goodwin, 1992]. It also allows the generation of test statistics with exact limiting distributions, which makes the straightforward hypothesis testing possible [Asche, Gordon, Hannesson, 2004; Asche et al., 2012; Johansen, Juselius, 1990]. Moreover, the restriction for one price to be designated as exogenous can be relaxed, which is especially important when the two prices illustrate two-way causality, as is the case with the data used in this study. Therefore, the Johansen cointegration approach is used in the current work to analyse the regional price integration of dairy products before and after the implementation of counter-sanctions.

Studies on the effects of trade policies on domestic prices are rare (see, for example, [Diao, Kennedy, 2016; Djuric, Götz, 2016; Nogues, 2014; Wong, 2014]), especially for transition countries like Russia (see, for example, [Götz, Glauben, Brümmer, 2013; Götz et al., 2016; Svanidze, Götz, Serebrennikov, 2021; Svanidze, Götz, 2019a, 2019b]). One such study, which analysed the effects of wheat export restrictions in Russia and Ukraine during the world food crisis was conducted by Götz, Glauben and Brümmer [2013]. They found that export restrictions reduced the degree of price transmission with the world market during the world food crisis. A similar finding was observed by Nogues [2014], who did not observe any significant impacts of export restrictions on lowering domestic consumer prices in the case of Argentina. Furthermore, Svanidze, Götz and Serebrennikov [2021], focusing exclusively on Russia's domestic wheat market integration, found that price co-movement strengthened during the 2010/11 wheat export ban period, however, transaction costs of trade also increased.

Price dispersion. In this research, we also contribute to price dispersion, which has attracted attention among agricultural market studies, especially in developing countries. There are different meanings for price dispersion. Generally, it refers to price differences between two markets or price differences that can be observed for the same commodity in the same market. Market power and imperfect competition are considered to be the main causes of price dispersion among many scholars

[Wang, 2018]. The availability of price dispersion among commodities, such as irrigation water in segregated spot water markets [Jaghdani, Brümmer, 2016; Yoskowitz, 2002] or fish quota markets [Newell, Sanchirico, Kerr, 2005], is a recognised phenomenon. In addition, the existence of price dispersion, even for homogenous products, which is less expected, is among the most replicated findings in empirical economics [Anania, Nisticò, 2014]. For example, Aker [2010] studied the effects of mobile phone introduction on price dispersion in grain markets in Niger. She used panel econometrics and bivariate price differences between different markets, with her results showing that mobile phone introduction increased information availability and reduced price dispersion by 10–16 %. Anania and Nisticò [2014] studied the price dispersion among 14 perfectly homogenous food items in 437 stores located in different towns in Calabria, Italy. They concluded that heterogeneity between retailers and consumers are two important factors of the observed price dispersion. Cerasa and Buscaglia [2017] used hedonic pricing to test the convergence of coffee prices in the EU market. In contrast to the convergence hypothesis, the results show significant price dispersion in this market. Andersson, Bezabih and Mannberg [2017] have followed Aker's [2010] approach to find the possible effects of the Ethiopian Commodity Exchange (ECX) and its connected warehouses on price dispersion of coffee at the local level. They found price dispersion reduction as a result of ECX availability.

The effect of trade policy on domestic price dispersion of agricultural commodities is an area which has not yet been studied. Therefore, apart from the possible effect of market integration, we have also considered price dispersion in this study.

Methodology and data

Price transmission. In this study, we use the Johansen cointegration test and a vector error correction model (VECM) to test the effects of trade policy on spatial market integration of the Russian dairy market. Most of the market integration analysis was built upon the concept of the law of one price, which can be expressed as follows:

$$p_t^i = \beta_0 + \beta_1 p_t^e + \varepsilon_t, \quad (1)$$

where p_t^i is the price in the importing region; p_t^e is the price in the exporting region; β_1 is the coefficient of the long-term equilibrium. Prices in two regions are equal if $\beta_0 = 0$ and $\beta_1 = 1$, which is the strict version of the law of one price. If $\beta_0 \neq 0$ and $\beta_1 = 1$, the two prices have a proportional relationship and their levels differ due to factors, such as transportation costs. This is the weak version of the law of one price. This regression, however, cannot be used when series are non-stationary, in which case using cointegration techniques is advised [Ardeni, 1989; Asche, Bremnes, Wessells, 1999; Ghosh, 2003]. Long-term dynamics in price relationships can be extracted from cointegration models and they can be empirically specified in the form of the basic VECM:

$$\Delta \ln p_t = \alpha \beta' \ln p_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta \ln p_{t-i} + \varepsilon_t, \quad (2)$$

where $\ln p_t$ is a vector of the natural logarithms of n prices at time t ; α and β' are the vectors of parameters for the speed adjustment and degree of long-run price transmission, respectively; Γ_i is a matrix of parameters for the short-run relationship. By considering equation (1), β' in equation (2) can be represented as vector of parameters: $[1 - \beta_0 - \beta_1]$.

Price dispersion. To assess the effect of trade policies on price performance and price dispersion, we follow Aker [2010] and Andersson, Bezabih and Mannberg [2017] and use a panel model approach. The price difference between markets j and k at month t is defined as $Y_{jk,t} = |P_{j,t} - P_{k,t}|$. We have tested the effect of trade policies on $Y_{jk,t}$. As empirical evidence indicates that trade policy in Russia has reduced the size of imports, we use the quantity of imports as an effective proxy for policy implementation. Additionally, since the cheese was mainly imported from the EU and Belarus, the RUB/EUR exchange rate is also considered as proxy regressors. The average European Gouda cheese is selected to represent the international cheese price. The regression model is given as:

$$Y_{jk,t} = \beta_0 + X_{jk,t} \lambda + \alpha_{jk} + \theta_t + \varepsilon_{jk,t}, \quad (3)$$

where $X_{jk,t}$ is the vector of variables affecting the price dispersion; α_{jk} are market-pair fixed effects; θ_t are time-fixed effects. To capture the dynamics of price dispersion, following Aker [2010], we use the dynamic panel approach and utilise the first lag value of the dependent variable to the right-hand side of the dispersion equation:

$$Y_{jk,t} = \beta_0 + \rho Y_{jk,t-1} + X_{jk,t} \lambda + \delta D_t + \alpha_{jk} + \theta_t + \varepsilon_{jk,t}. \quad (4)$$

D_t is a dummy for testing the shock from the 2014 trade restrictions. This dummy is added as the imported commodities at the monthly intervals cannot reflect the effect of trade restrictions and other developments during 2014, at least for a short period. In order to control for endogeneity, Blundell-Bond type of instruments and estimators are used [Blundell, Bond, 1998]. The model is tested for temporal autocorrelation in residuals and robust clustered standard errors are used for heteroscedasticity in the model [Wooldridge, 2016: ch14]. This model is estimated with generalized method of moments (GMM).

Data. This analysis of regional cheese market integration is conducted for regions of Russia that are comprised of cheese producing as well as consuming regions. Among those, the largest producing regions are the oblasts of Voronezh, Bryansk, Omsk, Pskov, Ryazan, Rostov, and Moscow and the Republics of Udmurt, Adygea, and Tatarstan (Figure 5). The largest cheese consuming regions are Moscow City, Krasnodar krai, Saint Petersburg, and the oblasts of Sverdlovsk, Samara, and Smolensk (Figure 6). The analysis is based on 39 regional price pairs, each consisting of the price series of a cheese exporting and a cheese importing region. We use the natural logarithms of weekly consumer prices of solid and soft rennet cheese for the period from January 2008 to December

2016, comprising 460 observations for each price series¹. This type of cheese is produced domestically and also imported from international markets. The Chow breakpoint test [Chow, 1960] suggests the existence of the structural break in the long-run equilibrium in August of 2014 for all of the price pairs. Thus, the date of the structural break coincides with the date of the implementation of the Russian food import restrictions. We account for the structural break in our modelling approach by distinguishing a “free trade” regime (from January 2008 to July 2014) and a “counter-sanction” regime (August 2014 to December 2016) in the price transmission as well as the price dispersion modelling approach. This regime-switching framework allows identifying the possible effects of the counter-sanctions on the degree of market integration. The parameters of the “free trade” and the “counter-sanction” regime are estimated based on 336 and 124 observations, respectively (Table 1).

Table 1. Descriptive statistics of the average cheese prices in 16 regions under study, rubles²/kg

Indicator	No of observations in each region	Mean	Standard deviation	Max	Min
Total	460	293.93	84.05	598.41	159.64
Free trade regime	336	251.67	42.56	424.58	159.64
Counter-sanction regime	124	408.44	58.29	598.41	281.75

Source: own estimations.

As price dispersion is being analysed descriptively and analytically, both weekly and monthly price intervals are used³. Primarily, the weekly price dispersion is used for the descriptive analysis of price dispersion before and after the counter-sanctions of 2014, in line with previous price transmission study. Furthermore, the price dispersion is investigated econometrically based on a monthly price series in order to make it possible to include the quantity of cheese imports, which is available at a monthly frequency only. The monthly price series is constructed by selecting the end of the monthly prices of weekly price data used in the price transmission analysis. We further include monthly European cheese price, monthly cheese and milk imports to Russia and the exchange rate as explanatory variables in our model approach. The time period underlying this analysis is January 2008 to December 2016.

Appendix A shows the descriptive elements of the dependent and independent variables in the price dispersion model (not transformed). As will be explained in the results, only the bivariate price dispersions between Moscow City and its cheese providers are selected. Some transformations are used on some of the data series for the model estimation. The exchange rates and import levels are transformed into logarithms.

¹ Source: MilkNews. <https://milknews.ru/>

² Russian ruble will be referred to as RUB inside the tables.

³ Source: MilkNews. <https://milknews.ru/>

Results and discussion

Price transmission. The vast majority of the analysed price pairs were not cointegrated when we conducted the test over the entire time frame under study. To estimate the effects of the 2014 import restrictions and all macroeconomic adjustments occurring since summer 2014, we split the data into “free trade” and “counter-sanction” sub-periods and conducted cointegration tests separately for each sub-period. The Chow breakpoint test [Chow, 1960] supported the existence of the structural break in the long-run equilibrium in August 2014 (the starting period of the import restriction and counter-sanctions). The degree of price transmission (parameter β_1 in equation (2)) and speed of adjustment (parameter α in equation (2)) were then estimated for cointegrated price pairs using a VECM for both the “free trade” and “counter-sanction” regimes. The results suggest that 29 out of the 39 price pairs were not cointegrated during the “free trade” period, but became cointegrated afterwards, during the “counter-sanction” regime (see Appendix B). The remaining 10 price pairs were already cointegrated before the counter-sanctions were implemented. Half of these price pairs illustrate higher integration (increased price transmission and speed of adjustments), whereas the remaining half became less integrated (decreased price transmission and speed of adjustments or no cointegration) during the “counter-sanctions” regime. The results of the z-test [Paternoster et al., 1998] suggest that the changes in price transmission and speed of adjustment parameters between “free trade” and “counter-sanction” regimes are statistically significant¹ (see Appendix C). Overall, out of the 39 price pairs, we have 34 cases where integration emerged or improved and five cases where integration disappeared or worsened. While the highest degree of price transmission during the “counter-sanction” regime was observed between pairs like Moscow City and Bryansk oblast (1.12) and between Samara oblast and the Tatarstan Republic (1.15), the highest speed of adjustment was for pairs like Sverdlovsk and Pskov oblasts (0.29) and Samara oblast and the Tatarstan Republic (0.27).

Saint Petersburg and the Tatarstan Republic are among the regions for which cheese markets became more weakly integrated in regional markets during the “counter-sanction” regime. For example, we find market integration to have decreased during the counter-sanction regime for two out of five price pairs involving Tartastan and three out of seven price pairs involving Saint Petersburg compared to the time period when trade was possible.

Moreover, compared to other consumer regions, the average degree of price transmission (0.51) and speed of adjustment (0.06) in Saint Petersburg in the “counter-sanction” regime is considerably low (Table 2).

We assume that the decrease in market integration in Tartastan can be explained by the decrease in Tartastan’s cheese exports during the import restriction period. In particular, regional exports of cheese from Tatarstan decreased by nearly 30 % in 2014–2016 (Figure 11). This might have resulted in weaker co-movements of the cheese prices in importing regions with the prices in Tatarstan.

¹ Only in the case of the “Sverdlovsk Oblast –Tatarstan Republic” price pair was the z-test of the price transmission parameters not significant due to similar betas in both regimes. However, the difference in the speed of adjustment was positive and statistically significant.

Table 2. Average price transmission coefficients of major consuming and producing regions

Region	Average degree of price transmission (β_1)	Average speed of adjustment (α)
Moscow City – producing regions	0.81	0.12
Krasnodar krai – producing regions	0.84	0.12
St Petersburg – producing regions	0.51	0.06
Sverdlovsk oblast – producing regions	0.84	0.16
Samara oblast – producing regions	0.82	0.13
Smolensk oblast – producing regions	0.73	0.09

Note: the averages are calculated based on estimations in Appendix C.

Source: own estimations.

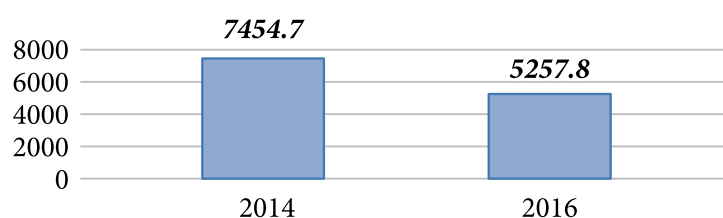


Fig. 11. Regional net exports of cheese from the Republic of Tatarstan, tonnes¹

Before the counter-sanctions was implemented, Saint Petersburg was mainly a cheese-importing region and cheese were primarily imported from the bordering countries like Estonia and Finland. According to media reports, despite the counter-sanctions against those European countries, Estonian and Finnish cheese continued to be supplied in Saint Petersburg even after the import restrictions were implemented². Therefore, cheese prices in Saint Petersburg remained influenced by cheese imports, which explains the decrease in integration with other regional cheese markets in Russia.

¹ Source: own illustration based on data from Rosstat.

² Even after the counter-sanction implementation, Estonian and Finnish cheeses were supplied in the markets around Saint Petersburg. Cheese from those countries could also be ordered through various internet shops. Transporting of goods over the border by individuals for the purpose of self-consumption is not banned, and as a result it became the main way for citizens of Saint Petersburg to import cheese and other food products from Estonia and Finland during the import ban. Moreover, in the first half of 2017, Narva, the Estonian city that borders Saint Petersburg, was again ahead of Tallin in the amount and volume of tax free deals registered, which included food products as well [BumagaMedia. (2015). Market of Sanctions: How to bring Finnish cheese and roll back the visa at the expense of smugglers. <http://paperpaper.ru/say-cheese/> (in Russ.); DELFI. (2017). Large cross-border business on a banned basis: Narva-shuttles, cheese tours from Saint Petersburg and resale from under the floor. <http://rus.delfi.ee/daily/estonia/bolshoj-transgranichnyj-biznes-na-zapreschenke-narvityane-chelnoki-syrnye-tury-iz-peterburga-i-pereprodazha-iz-pod-poly?id=78976776> (in Russ.); Inosmi.ru. (2016). Russian tourists again bring food from Finland - so they go around sanctions. <http://inosmi.ru/social/20160913/237835927.html> (in Russ.); Vedomosti. (2016). The food embargo has created a whole network of cheese suppliers. <https://www.vedomosti.ru/management/articles/2016/03/11/633113-prodovolstvennoe-embargo-porodilo-tseluyu-set-postavschikov-sira> (in Russ.)].

Price dispersion. Primarily, the simple weekly price dispersion ($|P_{jt} - P_{kt}|$) is conducted between the same pairs used in price cointegration (see Appendix D). The results of the descriptive analysis of weekly price dispersion show that the pairwise price dispersion generally increased during the counter-sanction regime. This increase was extreme for Moscow City and Sverdlovsk oblast and their cheese providing regions. As a result, Moscow City is selected for the price dispersion model estimation. As it was explained in the methodology section, the price dispersion and its explanatory variables can show systematic dynamic structure. Therefore, the dynamic panel data is prepared for monthly intervals. Furthermore, the logarithmic forms of the exchange rate, milk and cheese imports and European cheese prices are used as covariates for this estimation. The logarithm transformation for these covariates has been used to reduce huge variations on the absolute value. The “plm” package in R statistical software was used for estimation [Croissant, Millo, 2008; 2018]. Table 3 shows the results of the estimation for the dynamic panel model of price dispersion.

Table 3. Results of panel estimation of price dispersion by GMM

Indicator	Coefficients
Instruments of the first lag of dependant variable ($y_{i,t-1}$)	52,309 (4,753) ***
Dummy for counter-sanction period	31,332 (6,334) ***
EUR-RUB exchange rate (logarithm transformation)	27,696 (4,622) ***
Total monthly milk import in 1,000 tonne (logarithm transformation)	-2,314 (3,394)
Total cheese imports in 1,000 tonne (logarithm transformation)	-20,620 (3,862) ***
EU Gouda cheese price Euro/100 kg (logarithm transformation)	0,001 (0,001)
Balanced panel: n = 8, T = 108, N = 864, number of observations used: 1704	
Autocorrelation test (1): normal = -1.3 (p-value = 0.19)	
Autocorrelation test (2): normal = -1.5 (p-value = 0.12)	

Note: Signif. codes: 0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

In () standard deviation

Source: own calculations.

The Sargen test shows the right identification of instruments and the autocorrelation test shows no serial autocorrelation in the residuals of the estimated GMM model. The results of the price dispersion model show that increases in cheese imports reduce the price dispersion between Moscow and its cheese providing regions. The effect of raw milk imports is not significant, but it shows the same direction as cheese imports. The dummy variable for the counter-sanction period was also significant. It is worth

mentioning that the counter-sanction period covers multiple effects that can directly be captured by the dummy variable. The Russian ruble devaluation caused the increase of dispersion between the domestic markets. It shows that, by devaluation, the foreign cheeses become more expensive and their imports are probably reduced. The increase in European cheese prices does not affect the domestic price dispersion. This could be due to lower levels of volatility in this price. No effects are recognised from changes in the Belarusian ruble and it was not included in the model.

Generally speaking, the increase in price cointegration between domestic cheese markets, especially for a city like Moscow, does not show increases in market efficiency directly. The available price dispersion shows that the supply demand gap in this metropolis is not really covered by domestic supply.

Conclusion

In the paper, we investigate the effects of the combined events that started in the summer of 2014 with the Russian food import restrictions (counter-sanctions) in August of 2014. We also look at the macroeconomic adjustments of currency devaluation and oil price reductions on spatial integration in the Russian dairy market following the Johansen cointegration and VECM approach on the one side and the price dispersion approach on the other. We have used consumer cheese prices to represent the Russian dairy market, since cheese so far is the only dairy item that was significantly affected by the import restrictions. While the production of cheese increased by about 20 %, the imports dropped by around 40 % since the introduction of the counter-sanctions. Our results suggest that the Russian dairy market became more integrated during the “counter-sanction” regime. Our results are in line with Svanidze, Götz, Serebrennikov [2021], who found that the domestic wheat market integration strengthened in Russia amid restrictions of wheat exports in 2010/11. After the implementation of the counter-sanctions, the Russian market was mainly dominated by locally produced cheese, which led prices in domestic importing and exporting regions to co-move. In 29 out of the 39 price pairs, we observe an emergence in cointegration between major cheese importing and exporting regions. In addition, in five price pairs, the degree of long-term price transmission improved significantly, whereas for the remaining five pairs cointegration disappeared or price transmission parameters decreased significantly during the “counter-sanction” regime.

The highest price transmission during the “counter-sanction” regime was observed between pairs like Moscow City and Bryansk oblast and between Samara oblast and the Tatarstan Republic. In contrast, the price pairs that included Saint Petersburg demonstrated the lowest price transmission levels during the “counter-sanction” regime on average. Despite the food import restrictions, cheese from Estonia and Finland was supplied in supermarkets in Saint Petersburg, which explains the relatively low integration with other regional cheese markets on average in Russia. Furthermore, cointegration

of the prices in the Tatarstan Republic with the prices in the other consuming regions decreased in three out of five price pairs, which can possibly be explained by a notable decrease in the level of exports from Tatarstan between 2014 and 2016. We also find increased market integration reflected by the increase in the speed of adjustment parameter for five out of ten price pairs. The highest speed of adjustment was for pairs like Sverdlovsk and Pskov oblasts and Samara oblast and the Tatarstan Republic.

In order to check the efficiency of the dairy market of Russia and the effects of import restrictions, apart from market cointegration, we also study the effects of counter-sanctions on price dispersion between major cheese producing (exporters) and cheese consuming regions (importers). The results show that an extreme dispersion occurred between Moscow City and Sverdlovsk oblast as major inland metropolises (not on the border) and the major cheese producing regions. Moscow City was selected and the bivariate price dispersion and the price dispersion variables was regressed on potential factors that can affect the price dispersion apart from counter-sanctions. The results show that the import restrictions have increased price dispersions between metropolitan cities such as Moscow and cheese producing regions. We find substantially lower price dispersion for other major consuming cities with lower populations on the western borders of Russia. The reduction in import levels and the devaluation of the Russian ruble caused increases in the price dispersion. The inverse effects of counter-sanctions on market integration and price dispersion is an interesting observation that can be considered for further policy developments for market efficiency in dairy markets.

Appendix A. Descriptive statistics, model covariates and source of the monthly cheese prices for Moscow and its cheese providers

Variable	Pairs	Mean	Sd	Min	Max	Source of data
Dependent variable (price difference pairs in panel)	Moscow City – Voronezh oblast (RUB)	87.14	41.58	30.5	165.0	MilkNews
	Moscow City – Bryansk oblast (RUB)	91.05	43.77	43.9	177.4	
	Moscow City – Omsk oblast (RUB)	104.26	63.5	17.93	234.58	
	Moscow City – Adygea Republic (RUB)	59.08	24.36	11.73	114.85	
	Moscow City – Pskov oblast (RUB)	50.29	21.3	11.45	98.9	
	Moscow City – Tatarstan Republic (RUB)	110.11	48.17	50.08	209.09	
	Moscow City – Ryazan oblast (RUB)	99.04	48.87	37.27	193.6	
	Moscow City – Rostov oblast (RUB)	88.13	40.47	41.18	167.84	
Covariates	Dummy for counter-sanctions	0.27	0.45	0	1	–
	EUR-Ruble exchange rate	48.69	13.22	34.49	82.39	OANDA
	Total monthly milk import in 1,000 tonne	17.1	6.14	6.27	28.64	TradeMap. Eurostat
	Total cheese import in 1,000 tonne	30.91	10.03	9.63	47.9	TradeMap. Eurostat
	EU Gouda cheese price (Euro/100 kg)	298.25	40.28	217.94	381.97	EU website

Sources: Milknews website. <https://milknews.ru> (in Russ.); Oanda Corporation. <https://www.oanda.com/rw-en/>; TradeMap. Trade statistics for international business development. <https://www.trademap.org/Index.aspx>; Eurostat. <https://ec.europa.eu/eurostat>; Official website of the European Union. https://europa.eu/european-union/index_en.

Appendix B. Estimated parameters for regional cheese market cointegration

№	Pairs (Importer – Exporter)	Johansen cointegration test (p-value)			Chow-test (p-value) (08/2014)
		Whole period (01/2008–12/2016)	Free trade (01/2008–08/2014)	Counter-sanction (08/2014–12/2016)	
1	Moscow City – Voronezh oblast	0.613	0.678	0.001	0.000
2	Moscow City – Bryansk oblast	0.049	0.092	0.008	0.000
3	Moscow City – Omsk oblast	0.033	0.092	0.000	0.000
4	Moscow City – Adygea Republic	0.104	0.279	0.010	0.000
5	Moscow City – Pskov oblast	0.458	0.810	0.005	0.000
6	Moscow City – Tatarstan Republic	0.004	0.007	0.001	0.000
7	Moscow City – Ryazan oblast	0.233	0.495	0.001	0.000
8	Moscow City – Rostov oblast	0.001	0.070	0.000	0.047
9	Krasnodar krai – Bryansk oblast	0.504	0.812	0.003	0.000
10	Krasnodar krai – Tatarstan Republic	0.038	0.041	0.411	0.000
11	Krasnodar krai – Moscow oblast	0.815	0.719	0.011	0.002
12	Krasnodar krai – Rostov oblast	0.169	0.799	0.005	0.002
13	St Petersburg – Voronezh oblast	0.452	0.780	0.045	0.000
14	St Petersburg – Bryansk oblast	0.043	0.015	0.024	0.000
15	St Petersburg – Omsk oblast	0.161	0.311	0.032	0.000
16	St Petersburg – Tatarstan Republic	0.086	0.098	0.042	0.000
17	St Petersburg – Moscow oblast	0.102	0.340	0.009	0.000
18	St Petersburg – Ryazan oblast	0.269	0.372	0.071	0.000
19	St Petersburg – Rostov oblast	0.081	0.015	0.152	0.000
20	Sverdlovsk oblast – Voronezh oblast	0.901	0.935	0.061	0.000
21	Sverdlovsk oblast – Omsk oblast	0.192	0.236	0.000	0.000
22	Sverdlovsk oblast – Adygea Republic	0.280	0.468	0.001	0.000
23	Sverdlovsk oblast – Pskov oblast	0.497	0.605	0.014	0.000
24	Sverdlovsk oblast – Tatarstan Republic	0.002	0.016	0.001	0.001
25	Sverdlovsk oblast – Ryazan oblast	0.653	0.600	0.049	0.000
26	Sverdlovsk oblast – Rostov oblast	0.124	0.153	0.031	0.000
27	Samara oblast – Voronezh oblast	0.831	0.954	0.007	0.000
28	Samara oblast – Bryansk oblast	0.105	0.354	0.038	0.000
29	Samara oblast – Omsk oblast	0.284	0.348	0.011	0.000
30	Samara oblast – Udmurt Republic	0.370	0.242	0.047	0.000
31	Samara oblast – Tatarstan Republic	0.049	0.049	0.000	0.000
32	Samara oblast – Moscow oblast	0.223	0.588	0.011	0.000
33	Samara oblast – Ryazan oblast	0.452	0.676	0.001	0.000
34	Smolensk oblast – Voronezh oblast	0.723	0.937	0.019	0.002
35	Smolensk oblast – Udmurt Republic	0.889	0.802	0.065	0.000
36	Smolensk oblast – Adygea Republic	0.318	0.651	0.022	0.000
37	Smolensk oblast – Pskov oblast	0.086	0.225	0.040	0.000
38	Smolensk oblast – Moscow oblast	0.202	0.235	0.042	0.000
39	Smolensk oblast – Rostov oblast	0.059	0.229	0.000	0.000

Source: own estimations.

Appendix C. Estimated price transmission parameters

№	Pairs (Importer – Exporter)	Degree of price transmission (parameter β_1)			Speed of adjustment (α)		
		Free trade	Counter-sanction	z-test	Free trade	Counter-Sanction	z-test
1	Moscow City – Voronezh oblast	–	0.94	–	–	0.15	–
2	Moscow City – Bryansk oblast	0.85	1.12	1.65	0.02	0.05	2.42
3	Moscow City – Omsk oblast	0.34	0.58	1.76	0.01	0.11	3.47
4	Moscow City – Adygea Republic	–	0.81	–	–	0.16	–
5	Moscow City – Pskov oblast	–	0.70	–	–	0.20	–
6	Moscow City – Tatarstan Republic	0.76	0.60	-1.68	0.07	0.03	-2.08
7	Moscow City – Ryazan oblast	–	0.85	–	–	0.15	–
8	Moscow City – Rostov oblast	0.77	0.89	1.71	0.02	0.11	2.59
9	Krasnodar krai – Bryansk oblast	–	0.82	–	–	0.11	–
10	Krasnodar krai – Tatarstan Republic	0.88	–	–	0.02	–	–
11	Krasnodar krai – Moscow oblast	–	0.87	–	–	0.21	–
12	Krasnodar krai – Rostov oblast	–	0.85	–	–	0.06	–
13	St Petersburg – Voronezh oblast	–	0.41	–	–	0.09	–
14	St Petersburg – Bryansk oblast	0.92	0.44	-3.30	0.08	0.04	-1.67
15	St Petersburg – Omsk oblast	–	0.39	–	–	0.05	–
16	St Petersburg – Tatarstan Republic	0.96	0.48	-2.14	0.06	0.03	-1.75
17	St Petersburg – Moscow oblast	–	0.56	–	–	0.08	–
18	St Petersburg – Ryazan oblast	–	0.79	–	–	0.09	–
19	St Petersburg – Rostov oblast	0.99	–	–	0.05	–	–
20	Sverdlovsk oblast – Voronezh oblast	–	0.82	–	–	0.20	–
21	Sverdlovsk oblast – Omsk oblast	–	0.69	–	–	0.15	–
22	Sverdlovsk oblast – Adygea Republic	–	0.88	–	–	0.18	–
23	Sverdlovsk oblast – Pskov oblast	–	0.86	–	–	0.29	–
24	Sverdlovsk oblast – Tatarstan Republic	0.78	0.78	-0.05	0.03	0.14	2.29
25	Sverdlovsk oblast – Ryazan oblast	–	0.90	–	–	0.08	–
26	Sverdlovsk oblast – Rostov oblast	–	0.94	–	–	0.05	–
27	Samara oblast – Voronezh oblast	–	0.86	–	–	0.09	–
28	Samara oblast – Bryansk oblast	–	0.87	–	–	0.08	–
29	Samara oblast – Omsk oblast	–	0.44	–	–	0.08	–
30	Samara oblast – Udmurt Republic	–	0.92	–	–	0.13	–
31	Samara oblast – Tatarstan Republic	0.99	1.15	1.71	0.03	0.27	3.79
32	Samara oblast – Moscow oblast	–	0.57	–	–	0.06	–
33	Samara oblast – Ryazan oblast	–	0.94	–	–	0.20	–
34	Smolensk oblast – Voronezh oblast	–	0.99	–	–	0.05	–
35	Smolensk oblast – Udmurt Republic	–	0.35	–	–	0.02	–
36	Smolensk oblast – Adygea Republic	–	0.72	–	–	0.11	–
37	Smolensk oblast – Pskov oblast	–	0.74	–	–	0.22	–
38	Smolensk oblast – Moscow oblast	–	0.73	–	–	0.07	–
39	Smolensk oblast – Rostov oblast	–	0.86	–	–	0.08	–

Source: own estimations.

Appendix D. Descriptive results of bivariate price dispersion ($|P_{j,t} - P_{k,t}|$)

Consumption region	Production region	Average		SD		Free regime		Counter-sanction	
		Before ban	After ban	Before ban	After ban	Min	Max	Min	Max
City of Moscow	Voronezh oblast	66.74	143.76	25.84	15.18	30.41	113.12	107.16	164.99
	Bryansk oblast	67.22	156.96	14.86	24.39	41.27	97.48	90.77	177.4
	Omsk oblast	71.17	195.08	31.71	30.89	14.75	143.29	133.21	234.98
	Adygea Republic	47.38	90.63	14.97	14.78	11.73	82.64	55.9	117.97
	Pskov oblast	42.48	72.78	15.4	19.18	11.45	73.13	30.96	102.25
	Tatarstan Republic	84.22	180.28	19.8	27.51	48.53	126.99	122.27	209.09
	Ryazan oblast	73.55	168.89	24.23	23.79	36.28	126.15	117.27	193.6
	Rostov oblast	66.41	147.73	17.3	20.7	39.73	109.23	104.73	168.32
Krasnodar krai	Bryansk oblast	11.46	20.1	7.87	9.0	0.09	30.56	0.27	34.22
	Tatarstan Republic	27.61	43.41	9.1	14.12	8.61	53.11	11.97	73.03
	Moscow oblast	9.73	9.11	6.12	5.4	0.05	23.66	0.04	19.21
	Rostov oblast	10.09	12.59	6.49	6.1	0.03	25.67	0.05	27.41
City of Saint Petersburg	Voronezh oblast	18.32	16.73	11.77	16.68	0.04	47.22	0.46	65.8
	Bryansk oblast	18.79	23.74	5.47	11.2	5.13	31.44	3.01	54.52
	Omsk oblast	24.39	61.86	15.1	10.88	0.03	64.87	35.91	76.88
	Tatarstan Republic	35.8	47.06	7.0	9.78	18.68	50.06	24.11	63.15
	Moscow oblast	11.22	16.3	6.98	8.69	0.05	27.52	1.69	33.44
	Ryazan oblast	25.15	35.67	11.1	10.38	0.2	46.95	18.01	57.34
	Rostov oblast	17.99	14.54	6.84	12.15	6.06	38.28	0.04	44.23
Sverdlovsk oblast	Voronezh oblast	39.99	99.41	26.14	7.96	0.32	87.57	82.74	122.2
	Omsk oblast	44.4	150.73	31.53	20.91	0.4	118.76	105.5	173.47
	Adygea Republic	20.86	46.28	15.08	7.07	0.0	60.88	23.9	64.55
	Pskov oblast	21.1	28.43	10.11	10.18	0.02	47.96	2.8	45.54
	Tatarstan Republic	57.43	135.93	18.49	18.22	28.7	102.78	96.32	153.93
	Ryazan oblast	46.76	124.55	24.93	16.24	5.3	99.93	82.63	151.08
	Rostov oblast	39.62	103.39	19.42	13.39	4.69	84.7	74.36	130.47
Samara oblast	Voronezh oblast	16.02	9.91	8.99	6.52	0.02	36.57	0.41	31.15
	Bryansk oblast	13.49	14.43	9.1	8.38	0.03	39.24	0.63	35.93
	Omsk oblast	19.83	50.92	13.76	13.4	0.11	52.76	23.52	75.07
	Udmurt Republic	15.61	17.69	11.0	11.16	0.1	38.16	0.53	37.85
	Tatarstan Republic	29.25	36.12	11.21	8.7	0.52	54.5	14.85	55.4
	Moscow oblast	7.2	16.98	5.54	12.54	0.01	23.53	0.02	39.49
	Ryazan oblast	18.72	24.74	11.04	8.07	0.01	38.94	5.14	47.68
Smolensk oblast	Voronezh oblast	9.55	11.34	5.53	8.01	0.0	24.12	0.24	54.47
	Omsk oblast	13.64	61.68	8.73	14.46	0.16	43.06	32.02	85.83
	Udmurt Republic	10.63	28.18	8.9	13.45	0.03	33.04	2.29	48.12
	Adygea Republic	16.94	42.77	11.67	10.97	0.0	41.64	19.52	64.05
	Pskov oblast	21.3	60.63	8.56	7.97	1.73	47.9	43.95	82.42
	Moscow oblast	7.17	8.45	5.43	5.59	0.01	23.96	0.06	23.87
	Ryazan oblast	10.64	35.49	6.05	7.74	0.04	26.79	15.65	51.6
	Rostov oblast	4.71	14.33	4.07	5.17	0.01	16.0	4.0	27.1

Source: own estimations.

References

- Aker J. C. (2010). Information from markets near and far: Mobile phones and agricultural markets in Niger. *American Economic Journal: Applied Economics*, vol. 2, no. 3, pp. 46–59. <https://doi.org/10.1257/app.2.3.46>.
- Alexander C., Wyeth J. (1994). Cointegration and market integration: An application to the Indonesian rice market. *Journal of Development Studies*, vol. 30, no. 2, pp. 303–334. <https://doi.org/10.1080/00220389408422317>.
- Anania G., Nisticò R. (2014). Price dispersion and seller heterogeneity in retail food markets. *Food Policy*, no. 44, pp. 190–201. <https://doi.org/10.1016/J.FOODPOL.2013.12.004>.
- Andersson C., Bezabih M., Mannberg A. (2017). The Ethiopian Commodity Exchange and spatial price dispersion. *Food Policy*, no. 66, pp. 1–11. <https://doi.org/10.1016/J.FOODPOL.2016.11.003>.
- Ardeni P. G. (1989). Does the law of one price really hold for commodity prices? *American Journal of Agricultural Economics*, vol. 71, no. 3, pp. 661–669. <https://doi.org/10.2307/1242021>.
- Asche F., Benneer L. S., Oglend A., Smith M. D. (2012). U.S. shrimp market integration. *Marine Resource Economics*, vol. 27, no. 2, pp. 181–192. <https://doi.org/10.5950/0738-1360-27.2.181>.
- Asche F., Bremnes H., Wessells C. R. (1999). Product aggregation, market integration, and relationships between prices: An application to world salmon markets. *American Journal of Agricultural Economics*, vol. 81, no. 3, pp. 568–581. <https://doi.org/10.2307/1244016>.
- Asche F., Gordon D. V, Hannesson R. (2004). Tests for market integration and the law of one price: The market for whitefish in France. *Marine Resource Economics*, vol. 19, no. 2, pp. 195–210. <https://doi.org/10.1086/mre.19.2.42629428>.
- Banerjee A., Dolado J. J., Hendry D. F., Smith G. W. (1986). Exploring equilibrium relationships in econometrics through static models: Some Monte-Carlo evidence. *Oxford Bulletin of Economics and Statistics*, vol. 48, no. 3, pp. 253–277. <https://doi.org/10.1111/j.1468-0084.1986.mp48003005.x>.
- Blundell R., Bond S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, vol. 87, no. 1, pp. 115–143. [https://doi.org/10.1016/S0304-4076\(98\)00009-8](https://doi.org/10.1016/S0304-4076(98)00009-8).
- Boulanger P., Dudu H., Ferrari E., Philippidis G. (2016). Russian roulette at the trade table: A specific factors CGE analysis of an agri-food import ban. *Journal of Agricultural Economics*, vol. 67, no. 2, pp. 272–291. <https://doi.org/10.1111/1477-9552.12156>.
- Cerasa A., Buscaglia D. (2017). Do the EU countries import at the same price? The case of coffee. *Agricultural Economics*, vol. 48, no. 3, pp. 397–408. <https://doi.org/10.1111/agec.12342>.
- Chow G. C. (1960). Tests of equality between sets of coefficients in two linear regressions. *Econometrica*, vol. 28, no. 3, pp. 591–605. <https://doi.org/10.2307/1910133>.
- Croissant Y., Millo G. (2008). Panel data econometrics in R: The plm package. *Journal of Statistical Software*, vol. 27, no. 2, pp. 1–43. <https://doi.org/10.18637/jss.v027.i02>
- Croissant Y., Millo G. (2018). Panel data econometrics with R. In *Panel Data Econometrics with R*. John Wiley & Sons, Ltd. <https://doi.org/10.1002/9781119504641>.
- Diao X., Kennedy A. (2016). Economywide impact of maize export bans on agricultural growth and household welfare in Tanzania: A dynamic computable general equilibrium model analysis. *Development Policy Review*, vol. 34 no. 1, pp. 101–134. <https://doi.org/10.1111/dpr.12143>.
- Djuric I., Götz L. (2016). Export restrictions – Do consumers really benefit? The wheat-to-bread supply chain in Serbia. *Food Policy*, vol. 63, pp. 112–123. <https://doi.org/10.1016/J.FOODPOL.2016.07.002>.
- Engle R. F., Granger C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica*, vol. 55, no. 2, pp. 251–276. <https://doi.org/10.2307/1913236>.

Faminow M. D., Benson B. L. (1990). Integration of spatial markets. *American Journal of Agricultural Economics*, vol. 72, no. 1, pp. 49–62. <https://doi.org/10.2307/1243144>.

Ghosh M. (2003). Spatial integration of wheat markets in India: Evidence from cointegration tests. *Oxford Development Studies*, vol. 31, no. 2, pp. 159–171. <https://doi.org/10.1080/13600810307426>.

Goodwin B. K. (1992). Multivariate cointegration tests and the law of one price in international wheat markets. *Review of Agricultural Economics*, vol. 14, no. 1, pp. 117–124. <https://doi.org/10.2307/1349612>.

Goodwin B. K., Grennes T. J., McCurdy C. (1999). Spatial price dynamics and integration in Russian food markets. *The Journal of Policy Reform*, vol. 3, no. 2, pp. 157–193. <https://doi.org/10.1080/13841289908523402>.

Goodwin B. K., Piggott N. E. (2001). Spatial market integration in the presence of threshold effects. *American Journal of Agricultural Economics*, vol. 83, no. 2, pp. 302–317. <https://doi.org/10.1111/0002-9092.00157>.

Goodwin B. K., Schroeder T. C. (1991). Cointegration tests and spatial price linkages in regional cattle markets. *American Journal of Agricultural Economics*, vol. 73, no. 2, pp. 452–464. <https://doi.org/10.2307/1242730>.

Götz L., Djuric I. (2016, January). Russia wants to become the largest agricultural exporter (Russland will größter Agrarexporteur werden). *BWagrar*.

Götz L., Glauben T., Brümmer B. (2013). Wheat export restrictions and domestic market effects in Russia and Ukraine during the food crisis. *Food Policy*, no. 38, pp. 214–226. <https://doi.org/10.1016/j.foodpol.2012.12.001>.

Götz L., Qiu F., Gervais J.-P., Glauben T. (2016). Export restrictions and smooth transition cointegration: Export quotas for wheat in Ukraine. *Journal of Agricultural Economics*, vol. 67, no. 2, pp. 398–419. <https://doi.org/10.1111/1477-9552.12149>.

Gould-Davies N. (2020). Russia, the West and Sanctions. *Survival*, vol. 62, no. 1, pp. 7–28. <https://doi.org/10.1080/00396338.2020.1715060>.

Hall S. G. (1986). An application of the Granger & Engle two-step estimation procedure to United Kingdom aggregate wage data. *Oxford Bulletin of Economics and Statistics*, vol. 48, no. 3, pp. 229–239. <https://doi.org/10.1111/j.1468-0084.1986.mp48003003.x>.

Jaghdani T. J., Brümmer B. (2016). Determinants of willingness to pay for groundwater: Insights from informal water markets in Rafsanjan, Iran. *International Journal of Water Resources Development*, vol. 32, no. 6, pp. 944–960. <https://doi.org/10.1080/07900627.2015.1133405>.

Johansen S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control*, vol. 12, no. 2–3, pp. 231–254. [https://doi.org/10.1016/0165-1889\(88\)90041-3](https://doi.org/10.1016/0165-1889(88)90041-3).

Johansen S., Juselius K. (1990). Maximum likelihood estimation and inference on cointegration – with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, vol. 52, no. 2, pp. 169–210. <https://doi.org/10.1111/j.1468-0084.1990.mp52002003.x>.

Kuznetsov V. V., Isaeva O. V., Pavlushkina O. I. (2017). Issues of efficient use of land resources. *Scientific Review: Theory and Practice*, no. 2, pp. 6–15. <https://www.elibrary.ru/item.asp?id=29851282>. (in Russ.)

Liefert W. M., Liefert O., Seeley R., Lee T. (2019). The effect of Russia's economic crisis and import ban on its agricultural and food sector. *Journal of Eurasian Studies*, vol. 10, no. 2, pp. 119–135. <https://doi.org/10.1177/1879366519840185>.

Newell R. G., Sanchirico J. N., Kerr S. (2005). Fishing quota markets. *Journal of Environmental Economics and Management*, vol. 49, no. 3, pp. 437–462. <https://doi.org/10.1016/J.JEEM.2004.06.005>.

- Nogues J. J. (2014). Policy responses to high food prices in Latin America and the Caribbean. *FAO, Country Case Studies*, pp. 13–33 (Chapter 2). <http://www.fao.org/3/a-i3909e.pdf>
- Officer L. H. (1986). The law of one price cannot be rejected: Two tests based on the tradable/nontradable price ratio. *Journal of Macroeconomics*, vol. 8, no. 2, pp. 159–182. [https://doi.org/10.1016/0164-0704\(86\)90002-9](https://doi.org/10.1016/0164-0704(86)90002-9).
- Paternoster R., Brame R., Mazerolle P., Piquero A. R. (1998). Using the correct statistical test for equality of regression coefficients. *Criminology*, vol. 36, no. 4, pp. 859–866. <https://doi.org/10.1111/j.1745-9125.1998.tb01268.x>.
- Polbin A., Skrobotov A., Zubarev A. (2020). How the oil price and other factors of real exchange rate dynamics affect real GDP in Russia. *Emerging Markets Finance and Trade*, vol. 56, no. 15, pp. 3732–3745. <https://doi.org/10.1080/1540496X.2019.1573667>.
- Sanogo I., Amadou M. M. (2010). Rice market integration and food security in Nepal: The role of cross-border trade with India. *Food Policy*, vol. 35, no. 4, pp. 312–322. <https://doi.org/10.1016/J.FOODPOL.2010.03.002>.
- Svanidze M., Götz L. (2019a). Spatial market efficiency of grain markets in Russia: Implications of high trade costs for export potential. *Global Food Security*, vol. 21, pp. 60–68. <https://doi.org/10.1016/j.gfs.2019.07.004>.
- Svanidze M., Götz L. (2019b). Determinants of spatial market efficiency of grain markets in Russia. *Food Policy*, vol. 89, 101769. <https://doi.org/10.1016/j.foodpol.2019.101769>.
- Svanidze M., Götz L., Serebrennikov D. (2021). The influence of Russia's 2010/2011 wheat export ban on spatial market integration and transaction costs of grain markets. *Applied Economic Perspectives and Policy*. <https://doi.org/10.1002/aapp.13168>.
- Van Campenhout B. (2007). Modelling trends in food market integration: Method and an application to Tanzanian maize markets. *Food Policy*, vol. 32, no. 1, pp. 112–127. <https://doi.org/10.1016/J.FOODPOL.2006.03.011>.
- Vassilieva Y. (2012). Agriculture Development Program 2013–2020 Russian Federation. In *USDA GAIN Report* (Issue RS1270).
- Vassilieva Y., Smith M. E. (2010). Russian Federation Food Security Doctrine Adopted. In *USDA GAIN Report* (Issue RS1008).
- Wang H. (2018). Pricing used books on Amazon.com: A spatial approach to price dispersion. *Spatial Economic Analysis*, vol. 13, issue 1, pp. 99–117. <https://doi.org/10.1080/17421772.2017.1369147>.
- Wong S. A. (2014). Chapter 6 Ecuador. In E. Krivonos, D. Dawe. (Eds.). *Policy responses to high food prices in Latin America and the Caribbean* (1st ed., pp. 87–118 (Chapter 6)). FAO. <http://www.fao.org/3/a-i3909e.pdf>.
- Wooldridge J. M. (2016). *Introductory econometrics: A modern approach* (6th ed.). Cengage Learning. <https://www.cengagebrain.co.uk/shop/isbn/9781305270107>.
- Yoskowitz D. (2002). Price dispersion and price discrimination: Empirical evidence from a spot market for water. *Review of Industrial Organization*, vol. 20, no. 3, pp. 283–289.

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