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ANALYSIS OF OLIGOPOLISTIC BEHAVIOUR OF KAZAKH AND RUSSIAN EXPORTERS IN THE SOUTH CAUCASUS WHEAT MARKET

Abstract. This study explores whether Kazakh and Russian wheat exporters use their privileges of being important players in the South Caucasus countries to exercise market power. We use a three-stage least squares (3SLS) estimation for systems of simultaneous equations and Zellner's seemingly unrelated regression (SUR) thmethods for our residual demand elasticity (RDE) analysis. The results show that Kazakh exporters are able to exercise market power only in the Georgian wheat market, while Russian exporters are able to do so in both the Armenian and Georgian markets. Neither country is able to exercise market power in the Azerbaijani wheat market. Further, Kazakh and Russian wheat exporters constrain each other's market powers in Azerbaijan and Georgia. Similarly, Ukrainian exporters are able to intervene to Kazakh and Russian exporters' market powers in the Azerbaijani and Georgian wheat markets, but not in the Armenian market.

1 Introduction

At the beginning of the 2000s, KRU became important wheat exporters in the world market, and the shares of the world's traditional wheat exporters were significantly affected (Gafarova et al., 2015). Due to their geographic locations, as well as historical trade relationships, the South Caucasus countries, namely Armenia, Azerbaijan and Georgia, have been key trade partners of KRU. Indeed, KRU possess significant market shares in those countries. Armenia, Azerbaijan and Georgia are middle-income countries, with bread and bakery products being main staple foods that play an important role in providing the population's demand for protein and energy. Annual per capita consumption of wheat in 2013 was 148 kg, 205 kg and 114 kg, respectively, in Armenia, Azerbaijan and Georgia (ARMSTAT, 2015; AZSTAT, 2015 and GEOSTAT, 2015).

Due to limited possibilities for the extension of wheat production, Armenia, Azerbaijan and Georgia are not able to completely meet growing domestic demands for wheat, and therefore import, mainly from Kazakhstan and Russia. From 2010 to 2014, average self-sufficiency rates for wheat were 40%, 55% and 10%, respectively, for Armenia, Azerbaijan and Georgia (ARMSTAT, 2015; AZSTAT, 2015; GEOSTAT, 2015). According to the UN Comtrade database, Kazakh and Russian wheat exporters have higher market shares in Azerbaijan and Georgia, but Ukrainian wheat exporters possess only small shares, while Russia is the main wheat exporter to Armenia. However, Kazakh and Russian wheat exporters' market shares are frequently disrupted by export restriction policies. Kazakhstan applied export restrictions on wheat from April 2008 till September 2008 (Kim, 2010), Russia implemented a wheat export tax policy from 2007-2008 and a wheat export ban policy from 2010-2011, and Ukraine set export quotas from 2006-2008 and 2010-2011 (Djuric et al., 2015).

Kazakh and Russian wheat export volumes vary across the destination countries. Because of the locational disadvantages, political instability and poor infrastructure, Armenia is able to import wheat almost only from Russia. This makes Russia a leading wheat exporter to this country (AGRICISTRADE, 2015b). Azerbaijan is the largest buyer of wheat in the South Caucasus region, importing twice the amount of Georgia, and almost 6 times more than Armenia. This high rate of purchase is because the Azerbaijani population (9.5 millions) is 3 times more than the Armenian population (3 millions) and 2 times more than the Georgian population (4.5 millions) (ARMSTAT, 2015b; AZSTAT, 2015b; GEOSTAT, 2015b). Georgia enjoys its locational advantages of being closer to Russia and Ukraine, compared to Armenia and Azerbaijan, and mainly imports wheat from Russia.

Obviously, Kazakhstan and Russia are the main wheat exporting countries in the South Caucasus region, so they have the opportunity to affect wheat export prices there. We argue that by using their higher market shares, Kazakh and Russian wheat exporters are able to exercise market power in Armenia, Azerbaijan and Georgia. However, it is expected that this effect will be the strongest in Armenia, since Russia is a leading exporter to this country. Due to the diversified wheat import policy of Georgia it is anticipated that Kazakh and Russian market powers in this country will not be very strong. The objective of this study is to investigate the extent of market power exercised by Kazakh and Russian wheat exporters in the South Caucasus region. Towards this aim, we apply the RDE approach to examine whether the Armenian, Azerbaijani and Georgian wheat import markets are competitive. To the best of our knowledge, there exists no study investigating the magnitude of Kazakh wheat exporters' market powers in any destination country. Hence, the main contribution of this article is its investigation of Kazakh and Russian wheat exporters' behaviour in their three important destinations by using quarterly time series data for the last 11 years.

The rest of the study is organized as follows. The next section offers an overview of the relevant theoretical and empirical literature. The modelling approach is outlined in Section 3. Section 4 presents the description of the data and the summary statistics. The regression results are discussed in Section 5. The final section of the study summarizes the findings, addresses policy implications and discusses directions for future research.

2 Review of Empirical Studies

According to Goldberg and Knetter (1997), some studies focus on the market structure and competition on international markets using econometric approaches that not only analyse the existence of market power and price discrimination, but also quantify its economic significance and explain its sources. It is argued that RDE has some advantages over other trade models, like pricing-to-market (PTM) and exchange rate pass-through (ERPT) since it does not require detailed data on all price elasticities of demand, marginal costs and conduct parameters (Goldberg and Knetter, 1999). The RDE approach not only allows one to identify the extent of market power, but also explains it by the combinations of demand conditions, market conduct and market structure. Instead of dealing with a structural demand system involving all firms in an industry, the RDE approach focuses only on the estimation of a single equation (Poosiripinyo and Reed, 2005). Originally, the RDE approach was introduced by Baker and Bresnahan (1988) and later developed by Goldberg and Knetter (1999). This approach represents the effects of export quantity, cost shifters and demand shifters on export price by taking into account the reactions of competing countries (Glauben and Loy, 2003).

Despite its advantages, few studies have applied the RDE approach to determine the market power of the exporting country in destination countries' agricultural products markets (see Table A1. in the Appendix). Rather, most studies analysed a particular market power, especially in beer (Baker and Bresnahan, 1988; Glauben and Loy, 2003; Goldberg and Knetter, 1999) and meat export markets (Felt et al., 2011; Poosiripinyo and Reed, 2005; Reed and Saghaian, 2004; Xie and Zhang, 2014). The literature pertaining to market power analysis in grain markets remains quite limited. Very few studies have focused on an investigation of wheat markets in different destinations (Carter et al., 1999; Cho et al., 2002; Pall et al., 2014; Yang and Lee, 2001). However, except Pall et al. (2014), the majority of these publications have concentrated on an analysis of market power of traditional wheat exporting countries (Argentina, Australia, Canada, the European Union and the USA). For instance, Carter et al. (1999) for 1970-1991, and Yang and Lee (2001) for 1993-1999 analysed if Australia, Canada and the USA have market powers in the Japanese and South Korean wheat markets, respectively. These authors found that the USA has significant market power in both wheat

markets, whereas Australia and Canada have market power only in the South Korean wheat market. Cho et al. (2002) also examined the market power of the USA in the Japanese wheat market, together with other 5 destinations from 1973-1994. These authors argue that the USA can exercise significant market power in the Korean, Malaysian, Philippine and Singapore wheat markets, but not in the Indonesian and Japanese markets. Pall et al. (2014) dealt with the analysis of market power exercised by Russian wheat exporters in selected destinations by using generalized method of moments and instrumental variable Poisson pseudo maximum-likelihood estimators. They used quarterly data from 2002 to 2009 and argued that Russian exporters are able to exercise market power in 5 of 8 destinations, including Azerbaijan and Georgia. Although some studies use multiple-equation (systems of simultaneous equation) methods to analyse the RDE approach (Baker and Bresnahan, 1988; Chang and Inoue, 2013; Cho et al., 2002; Goldberg and Knetter, 1999; Reed and Saghaian, 2004; Song et al., 2009), the majority of them prefer single-equation model (see Table A1. in the Appendix).

3 Modelling Approach

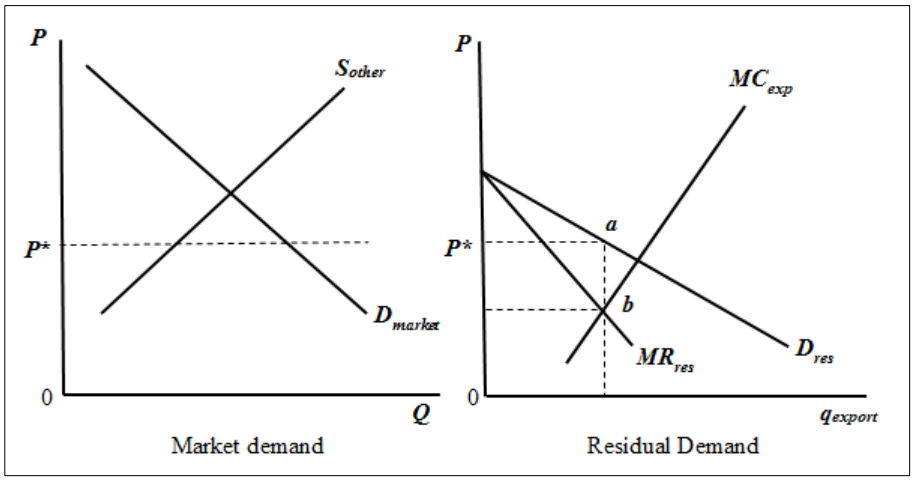
3.1 Graphical Analysis

The demand that an exporting country faces in an importing country is the difference between market demand and other competing countries' supply; this is called residual demand. Figure 1 describes a residual demand curve for a special case in which an exporting country has a monopolistic position in an importing country while it faces competition from other exporters.

The left side of the graph shows an intersection of market demand curve D_{market} and supply curve of all other competing countries except the exporting country considered S_{other}. The right side graph depicts an intersection of residual demand curve $D_{res.}$ and the considered exporting country's supply curve MC_{exp}. As the exporting country meets residual demand alone, it has a monopolistic power. However, the degree of market power depends on the slope of residual demand curve. If residual demand curve is flat, an exporting country is a price-taker, cannot exercise monopolistic power and faces the price identified by the left side graph. However, if the residual demand curve is steep, an exporting country is a price-maker; in this case it is able to exercise monopolistic market power and makes a profit by equalizing the marginal cost to marginal revenue.

As the residual demand is the difference between market demand and the competitors' supply, the demand shifters in the importing countries and the supply shifters in the competing countries are the crucial aspects of identifying the price (Goldberg and Knetter, 1999).

Figure 1. The concept of market demand and residual demand.



Source: Goldberg and Knetter (1999).

3.2 Residual demand elasticity approach

It is often assumed that higher market share is a sign of higher market power, ceteris paribus. However, in some cases this relationship does not hold. For example, in the case of elastic demand, the exporter cannot possess any market power, even if it has a higher market share. On the contrary, in the case of differentiated products, an exporter might achieve higher market power and set higher mark-up over prices, even if it has a small market share (Goldberg and Knetter, 1999).

Consequently, to measure market power indirectly, the relationship between market power and exporting country's inverse RDE should be detected (Baker and Bresnahan, 1988). RDE, which is a measure of market power, represents the relationship between export price and quantity by taking into account the supplies of competitors. In the case of a perfectly competitive market, residual demand is elastic and mark-up is zero. This means that an exporting country does not have any market power, changes in export quantity do not alter export price, and residual inverse demand function will be horizontal. Export price might be changed only because of variations in competing countries' costs. In the case of an imperfect market, an exporting country has market power and there is a negative relationship between export price and quantity. Degree of market power increases as the slope of residual demand becomes steeper.

In order to build the relationship between export price and quantity, we assume an exporter i sells its product to an importing country and inverse residual demand depends on its own export quantity, Q_i, other competitors' export quantities, Q_j $(i \neq j)$, and demand shifters in an importing country, Z:

$$P = P(Q_i, Q_j, Z) \tag{1}$$

The profit maximization problem of an exporter i will be as follows:

$$\max_{Q_i} \pi_i = Q_i P_i(Q_i, Q_j, Z) - e_i C_i(Q_i, W_i) \tag{2}$$

where, e_i is the exchange rate between importing and exporting countries' currency, and C_i denotes an exporting country's cost function, which depends on export quantity and cost shifters, W_i. From the first-order condition for profit maximization, marginal revenue should equal marginal cost:

$$P_i + Q_i \left[\frac{\partial P_i}{\partial Q_i} + \left(\frac{\partial P_i}{\partial Q_j}\right)\left(\frac{\partial Q_j}{\partial Q_i}\right)\right] - e_i MC_i = 0 \tag{3}$$

In the case of a perfect competitive market, terms inside the brackets are zero, and an export price equals marginal cost. If the terms are not zero, it is possible to measure the degree of market power through an inverse demand relationship and first-order conditions (Baker and Bresnahan, 1988).

Goldberg and Knetter (1999) introduce a reduced form of the above equation, which allows one to evaluate the degree of market power without having detailed cost shifters of competing countries:

$$\ln P_{mt}^{ex} = \lambda_m + \eta_m \ln \hat{Q}_{mt}^{ex} + \alpha'_{\mathrm{m}} \ln \mathrm{Z_{mt}} + \beta' \ln \mathrm{W_{mt}^{N}} + \varepsilon_{t}^{m} \tag{4}$$

where, m and t denote importing market and time, respectively, N is a number of competitors in a specific market, $\alpha'$and β' are vectors of parameters, and $\hat{Q}_{mt}^{ex}$ is the instrumented quantity exported. Further, export prices, P_{mt}^{ex}, and vector of demand shifters of m number of destinations, Z_{mt}, are expressed in the destination country's currency. The real gross domestic product (GDP) of an importing country and time trend are demand shifters and expressed in the importing country's currency. The cost shifters of N competitors, W_{mt}^{N}, can be divided into

two parts: first, a part that does not vary by destination and is expressed in the competing country's currency (producer price), and second, a part that is destination-specific (exchange rate). Cost shifters comprise a destination-specific exchange rate and average producer price of wheat of the competitors; both are expressed in the competing country's currency. As the above equation is expressed in double-log form, coefficients are explained as elasticities and ε_{mt}, an error term, is independent and identically distributed (i.i.d.).

The main coefficient in equation (4.4) is η that is inverse of RDE. If $\eta = 0$, it means a market is perfectly competitive and the exporting country faces a perfectly elastic demand curve. In this situation, export price is not affected by a change in quantity exported, but by the costs of competitors. This means that an exporting country does not have any market power and is a price taker. However, if $\eta < 0$, it means that the market is imperfectly competitive and the exporting country is a price maker. In this situation, the exporting country has market power and it increases as the absolute value of η gets larger.

Coefficients of cost shifters, β', define whether competing countries' products are a perfect or imperfect substitute to an exporting country's product. If $\beta' > 0$, a product from a competing country is a perfect substitute to a product of the exporting country. This means the exporting country can raise its export price in the case of an increase in the competing country's costs. In this way, these two countries compete in the importing country and intervene with each other's market powers. On the contrary, if $\beta' < 0$, a product of the competing country is an imperfect substitute to a product of the exporting country.

4 Data sources and descriptive statistics

This study covers five country combinations: Kazakhstan-Azerbaijan, Kazakhstan-Georgia, Russia-Armenia, Russia-Azerbaijan and Russian-Georgia. Quarterly time series data for export quantity and value are collected from the Global Trade Information Services database from the 1st quarter of 2004 to the 4th quarter of 2014. The HS-6 digit codes of the product are 100190 and 100199. Unit-value data are calculated by dividing export value by export quantity, expressed in importing country's currency, and used as a proxy for export price.

Consumer price index (CPI) data are collected from the National Statistical Service of the Republic of Armenia (ARMSTAT), the Central Bank of the Republic of Azerbaijan (CBAR) and the National Statistics Office of Georgia (GEOSTAT). Nominal GDP are from ARMSTAT, CBAR and the National Bank of Georgia (NBG) and have been deflated by the overall CPI across the estimated period, taking the first quarter of 2004 as a base period. Quarterly GDP data for Azerbaijan have been interpolated from monthly data. Nominal exchange rate data are taken from ARMSTAT, CBAR, and NBG. Producer price data for Kazakhstan, Russia and Ukraine are collected from the Agency of the Republic of Kazakhstan on Statistics (KAZSTAT), the Russian Federal State Statistics Service (ROSSTAT) and the Food Price Monitoring and Analysis (FPMA) Tool published by the Food and Agriculture Organization of the United Nations, respectively. Summary statistics for Armenia, Azerbaijan and Georgia are presented, respectively, in Tables A2. – A4. in the Appendix.

5 Results and discussion

The majority of the studies that examine market power use a single-equation method to analyse the RDE approach (see Table A1. in the Appendix). However, the results of single-equation models are not always precise and efficient. This study uses a system of simultaneous equations method and jointly estimates individual equations in order to increase efficiency and achieve more precise results. Further, the wheat market is interdependent, and

making decisions over the export price to one country depends on the decisions made for the other countries.

The 3SLS estimation for systems of simultaneous equations method and the SUR method have been investigated in this study. The 3SLS method has an advantage over the SUR method since the former corrects for simultaneity bias. The results of the 3SLS and SUR methods are listed below in Tables 2 and 3, respectively, for Russia and Kazakhstan. All exogenous variables, together with the CPI and total population of an importing country, and total export quantity of an exporting country are treated as instruments. Our primary interest is estimating the coefficients of the export quantity variable (EQ) that corresponds to RDE. If it is negative and significant, then the destination market is imperfectly competitive. The absolute value of RDE represents the mark-up over marginal cost; the larger its absolute value, the larger the mark-up over marginal cost, and the more market power an exporter has over export price. In this situation an exporting country exercises market power in a destination country. As expected, all export quantity coefficients are negative, meaning that Russian and Kazakh wheat exporters face negatively-sloped demand curves in the South Caucasus region (see Tables 2 - 3). Besides RDE, the other important factors are the estimates of cost shifters (destination-specific exchange rate and producer price of competing countries) and demand shifters (GDP and time trend of destination countries).

5.1 Russian wheat exports

Table 1 reports 3SLS and SUR results for Russian wheat exports that are jointly estimated for all three destinations in the South Caucasus region: Armenia, Azerbaijan and Georgia. Both 3SLS and SUR results demonstrate that Russia achieves its highest market power in the Armenian wheat market. The highly statistically significant results for Armenia provide a clear picture of a market situation in a country where Russian exporters have substantial market powers. Russian exporters achieve higher mark-ups over marginal cost, which is approximated with the RDE, compared to other destination countries in the South Caucasus region. Russian wheat exporters are able to obtain more than 15% (more than 11% with the SUR model) profit over margin in the Armenian market.

This might be explained by several facts: first, Armenia has an unfavourable location in terms of wheat transportation compared to Azerbaijan and Georgia. Second, due to the ongoing political conflict between Armenia and Azerbaijan, the country has closed borders with Azerbaijan and Turkey. Therefore, Armenia is a landlocked country and is able to import wheat only from Russia through the Black Sea and the Georgian area. Third, Armenia still possesses weak infrastructure in terms of wheat transportation, and mainly uses Russian rail wagons, which gives Russia a privilege and allows it to obtain the largest share of the Armenian wheat market and thus exercise market power (AGRICISTRADE, 2015b, p. 25). Fourth, according to APK Inform database the average number of Russian companies, that exporting wheat to Armenia, was only 19 from 2006-2014, whereas 40 and 39 Russian companies exported wheat to Azerbaijan and Georgia, respectively, during the same period. Furthermore, the concentration ratio of top 5 (top 10) Russian wheat companies exporting wheat to Armenia was 77% (91%) from 2006-2014. The concentration ratios of top 5 (top 10) Russian companies exporting wheat to the Azerbaijani and Georgian markets were 65% (81%) and 65% (79%), respectively. The Herfindahl-Hirschman Indexes (HHIs) are 0.211, 0.154 and 0.146, respectively, for Armenia, Azerbaijan and Georgia from 2006-2014. The HHI indicate a moderate concentration of Russian companies in the Armenian wheat market. This fact might create a non-competitive environment on the Armenian wheat market compared to the other two South Caucasus countries.

Table 1. The RDE approach results for Russia

Variables	3SLS			SUR		
	Armenia	Azerbaijan	Georgia	Armenia	Azerbaijan	Georgia
EQ	-0.1510*** [-5.362]	-0.0045 [-0.351]	-0.0267* [-1.923]	-0.1056*** [-4.553]	-0.0054 [-0.451]	-0.0218* [-1.692]
ER KZT	-0.8345 [-1.372]	0.7676* [1.927]	0.0357* [1.760]	-0.6045 [-1.015]	0.7765* [1.952]	0.0323 [1.572]
ER RUB	0.7553 [1.265]	0.3308 [1.023]	0.3586 [1.531]	0.8575 [1.478]	0.3236 [1.003]	0.3634 [1.546]
ER UAH	0.0128 [0.029]	0.0826 [0.363]	0.1766 [1.127]	-0.0294 [-0.070]	0.0827 [0.363]	0.1988 [1.274]
PP KAZ	0.0647 [0.328]	0.0785 [0.842]	-0.0263 [-0.357]	0.0993 [0.518]	0.0801 [0.863]	-0.0225 [-0.306]
PP RUS	0.5203** [1.980]	0.4978*** [3.847]	0.5089*** [5.026]	0.5971** [2.342]	0.4984*** [3.854]	0.5090*** [5.033]
PP UKR	0.2983 [1.482]	0.2936*** [2.917]	0.3322*** [4.233]	0.2387 [1.225]	0.2909*** [2.928]	0.3393*** [4.363]
GDP	0.4328*** [4.334]	0.0467 [0.807]	0.3101*** [3.426]	0.3409*** [3.590]	0.0466 [0.805]	0.3062*** [3.387]
TIME	-0.0140* [-1.835]	0.0033 [0.539]	-0.0080* [-1.683]	-0.0129* [-1.743]	0.0034 [0.548]	-0.0080* [-1.675]
Constant	-5.0993 [-1.549]	2.2424 [0.780]	-5.580*** [-2.673]	-4.4884 [-1.387]	2.2707 [0.788]	-5.6060*** [-2.677]
Observation	39	39	39	39	39	39
R-squared	0.7181	0.9280	0.9592	0.7572	0.9280	0.9593
DW statistics	2.1284	1.7237	1.4569	2.1934	1.7298	1.4567
Hausman statistic	15.33	0.78	32.03	-	-	-
(p-value)	0.0823	0.9993	0.0002	-	-	-

Notes: EQ, export quantity in tons; ER, destination-specific exchange rate; KZT, RUB and UAH, the currency codes for Kazakhstani Tenge, Russian Ruble and Ukrainian Hryvnia, respectively; PP, producer price of wheat; GDP, gross domestic product; TIME, time trend. All exogenous variables, together with consumer price index and total population of an importing country, and total export quantity of an exporting country are treated as instruments. All variables except the categorical variables are expressed as natural logs. Values in parentheses are t-statistics. Asterisks ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

The results of 3SLS and SUR methods demonstrate that Russian wheat exporters do not have significant market power in the Azerbaijani wheat market; the RDE coefficient is very small and not significant. That might be explained by several facts; first, self-sufficiency rates for wheat is higher in Azerbaijan (55%) in comparison to Armenia (40%) and Georgia (10%) (ARMSTAT, 2015; AZSTAT, 2015; GEOSTAT, 2015). Second, since 2007 wheat producers in Azerbaijan receive 80 Azerbaijani Manat (around 47 EUR) of direct subsidy per planted hectare, while 50% of their seed costs and 70% of their fertiliser costs are covered by the

government (AGRICISTRADE, 2015a, p. 69-70). This stimulates the local wheat producers to expand wheat production. Third, according to APK Inform database, the average number of Russian companies exporting wheat to Azerbaijan was around 40 from 2006-2014 compared to Armenia, which had only 19 such companies. Moreover, the concentration ratio of top 5 (top 10) Russian wheat companies exporting wheat to Azerbaijan was 65% (81%) compared to Armenia, which was 77% (91%) from 2006-2014. The HHI demonstrate that Russian firms are less concentrated in the Azerbaijani wheat market (0.154) than in the Armenian market (0.211). This fact might bring a competitive environment to the Azerbaijani wheat market compared to Armenia.

The 3SLS results suggest that Russian exporters are able to obtain almost 3% (SUR results demonstrate more than 2%) profit over margin in the Georgian wheat market. This result might be explained by the following facts: first, Russia has the highest market share in the Georgian market compared to any other wheat exporter (see Figure 1 above). Second, Russia has a land border with Georgia and enjoys locational advantages compared to Kazakhstan; this makes the export process much faster and less costly. Third, even though Russia has implemented export restrictions on wheat several times and because of that is not a reliable wheat exporter for Georgia, Georgia still continues to import wheat from Russia because of their historical relationships. More precisely, speaking Russian language in trade negotiations and long term political ties between two countries makes Russia important trade partner. Fourth, according to APK Inform database, the average number of Russian companies exporting wheat to Georgia (39) was twice as much as the number of Russian companies exporting wheat to Armenia (19) over the period 2006-2014. Moreover, the concentration ratio of top 5 (top 10) Russian wheat companies exporting wheat to Georgia is 65% (79%) compared to Armenia, which was 77% (91%) over the period 2006-2014. The HHI show that Russian firms are less concentrated in the Georgian wheat market (0.146) than in the Armenian market (0.211). This fact might soften the competitive environment in the Georgian wheat market compared to the Armenian wheat market.

The coefficients of cost shifters determine the factors that constrain the exporting country's market power in the destination market. Destination-specific exchange rates and average producer prices of wheat from competing countries are considered as cost shifters in this study. Table 1 shows that neither Kazakh and Ukrainian destination-specific exchange-rates, nor the producer prices of wheat are statistically significant in the Armenian market. This means that the pricing behaviour of Russian exporters does not appear to be restricted in the Armenian wheat market by their two main competitors, Kazakhstan and Ukraine. However, in the Azerbaijani and Georgian wheat markets, Kazakh destination-specific exchange rates and Ukrainian producer prices of wheat are positively significant. This means that Russian exporters' market powers are constrained by Kazakh and Ukrainian wheat exporters in the Azerbaijani and Georgian wheat markets. More specifically, Russian exporters' market powers are constrained more effectively by Kazakh exporters in Azerbaijan, while they are constrained by Ukrainian exporters in Georgia. In the latter case, this might be explained by the geographic locations of exporting country with respect to importing country since Ukraine is relatively closer to Georgia than Kazakhstan and has water borders with Georgia.

The sign of the coefficients of cost shifters define whether competing countries' products are a perfect or imperfect substitute to an exporting country's product. Therefore, it might be concluded that both Kazakh and Ukrainian wheats are perfect substitutes to Russian wheat in the Azerbaijani and Georgian markets. However, this result should be considered with caution since the quality of Russian wheat is considered lower than Kazakh wheat, but higher than Ukrainian wheat (Gafarova et al., 2015).

The real GDP of importing countries and time trend are demand shifters in this analysis. The results show that an increase in Armenian and Georgian GDPs stimulates demand for Russian wheat and consequently causes an upsurge in wheat prices exported from Russia to Armenia and Georgia. However, an increase in Azerbaijani GDP does not stimulate Russian wheat exports to this country. The other demand shifter, time trend, is statistically negative in Armenia and Georgia. This suggests that as time passes there is a tiny decrease in demand for Russian wheat by the Armenian and Georgian populations, which shifts Russian wheat export prices down. Although the time trend is positive, it is not significant in Azerbaijan.

Comparisons between the 3SLS and SUR results based on a Hausman test are quite informative regarding the presence and magnitude of simultaneity bias, and examine the validity of the used instruments. The Hausman statistic reported in Table 1 suggests that the null hypotheses of exogeneity for the quantity variable can be rejected at the 10% significance level, but not at the 5% significance level for Armenia. Thus, the results achieved by 3SLS are more appropriate than those obtained by SUR. However, the magnitude of simultaneity bias looks quite higher since RDE increases from 0.1056 in SUR to 0.1510 in 3SLS. The Hausman statistic does not reject the hypothesis of exogeneity of the quantity variable for Azerbaijan. However it does reject it for Georgia at the 1% significance level. The magnitude of the simultaneity bias seems to be smaller since RDE increases only from 0.0218 in SUR to 0.0267 in 3SLS.

The 3SLS results show that the *R*-squared values are quite high for Azerbaijan and Georgia compared to Armenia. None of the three equations obtained by 3SLS and SUR estimators has a significant serial correlation, according to the Durbin–Watson tests. More precisely, the Durbin–Watson statistics from 3SLS estimation range from 1.4569 for Georgia, 1.7237 for Azerbaijan, and 2.1284 for Armenia (from SUR estimation range from 1.4567 for Georgia, 1.7298 for Azerbaijan, and 2.1934 for Armenia).

5.2 Kazakh wheat exports

Table 2 reports 3SLS and SUR results for Kazakh wheat exports that are jointly estimated for two destinations in the South Caucasus region: Azerbaijan and Georgia. Both 3SLS and SUR results demonstrate that Kazakhstan does not have any market power in the Azerbaijani wheat market and it is a price-taker. This might be explained by several facts that have already been discussed in the previous sub-section. First, relatively higher self-sufficiency rates for wheat in Azerbaijan (55%) compared to Armenia (40%) and Georgia (10%) plays an important role in building a competitive environment in the Azerbaijani wheat market (ARMSTAT, 2015; AZSTAT, 2015; GEOSTAT, 2015). Second, Azerbaijani wheat producers obtain support from the government through direct subsidy since 2007 (AGRICISTRADE, 2015a, p. 69-70). This increases number of local wheat producers and contributes to local wheat production.

Contrary to the results for Armenia and Azerbaijan, 3SLS results do not coincide with SUR results in the case of Georgia. Rather, 3SLS results suggest that Kazakh exporters are not able to exercise market power in the Georgian wheat market. Again, this result might be explained by some facts that have been discussed in sub-section 5.1.: first, Kazakh market share in Georgia is not as strong as Russian market share. In other words, Russian wheat exports significantly affect the performance of Kazakh wheat exporters in Georgia since dominance of Russian wheat exporters in the South Caucasus region restricts Kazakh wheat exports to this region (Imamverdiyev et al., 2015). Second, Kazakhstan does not share a border with Georgia and usually Kazakh wheat is exported to Georgia through Azerbaijan, which makes the export process slower and more expensive since due to higher transaction costs, an import from Kazakhstan is more costly and takes longer. According to SUR results, Kazakh exporters obtain more than 2% profit over margin in the Georgian market. The possible

explanation of this finding might be that the quality of Kazakh wheat is much higher than Russian wheat; this might bring a privilege to Kazakh exporters to exercise market power in the Georgian wheat market.

Table 2. The RDE approach results for Kazakhstan

Variables	3SLS		SUR	
	Azerbaijan	**Georgia**	**Azerbaijan**	**Georgia**
EQ	-0.0122	-0.0131	-0.0131	-0.0219**
	[-0.706]	[-0.846]	[-1.254]	[-2.224]
ER KZT	1.1549***	0.0918***	1.1317***	0.0813***
	[2.800]	[2.928]	[2.884]	[2.968]
ER RUB	-0.2312	-0.2450	-0.2516	-0.2751
	[-0.632]	[-0.783]	[-0.710]	[-0.898]
ER UAH	0.1288	0.6123**	0.1447	0.6664***
	[0.431]	[2.510]	[0.523]	[2.896]
PP KAZ	0.5623***	0.4394***	0.5595***	0.4127***
	[5.630]	[4.402]	[5.775]	[4.506]
PP RUS	0.5167***	0.2588**	0.5170***	0.2486**
	[3.981]	[2.126]	[4.066]	[2.080]
PP UKR	0.1986*	0.2826***	0.2023**	0.3021***
	[1.732]	[2.816]	[1.972]	[3.156]
GDP	0.1261**	0.0785	0.1308**	0.1254
	[2.085]	[0.601]	[2.294]	[1.113]
TIME	-0.0111*	0.0055	-0.0115**	0.0043
	[-1.871]	[0.953]	[-1.980]	[0.779]
Constant	-3.4184	-3.9729	-3.6678	-4.7385*
	[-1.151]	[-1.422]	[-1.302]	[-1.850]
Observation	42	42	42	42
R-squared	0.9237	0.9291	0.9236	0.9302
DW statistics	1.8879	1.9117	1.8892	1.8610
Hausman statistic	0.35	0.54	-	-
(p-value)	1.0000	1.0000	-	-

Notes: EQ, export quantity in tons; ER, destination-specific exchange rate; KZT, RUB and UAH, the currency codes for Kazakhstani Tenge, Russian Ruble and Ukrainian Hryvnia, respectively; PP, producer price of wheat; GDP, gross domestic product; TIME, time trend. All exogenous variables, together with consumer price index and total population of an importing country, and total export quantity of an exporting country are treated as instruments. All variables except the categorical variables are expressed as natural logs. Values in parentheses are t-statistics. Asterisks ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Table 2 demonstrates that Russian and Ukrainian producer prices of wheat and Ukrainian destination-specific exchange rates are positively significant. This asserts that the profit margins of Kazakh exporters' market powers are constrained by the supply of Russian and Ukrainian wheat exporters in Azerbaijani and Georgian wheat markets. However, Kazakh exporters' market powers are constrained more effectively by Russian exporters in

Azerbaijan, while they are constrained by Ukrainian exporters in Georgia. Again, this finding might be explained by the geographic locations of exporting countries with respect to importing countries.

As the sign of the cost shifters might provide a signal about the product type and whether it is a perfect or imperfect substitute for the competing country's product, it might be concluded that both Russian and Ukrainian wheats are perfect substitutes to Kazakh wheat in the Azerbaijani and Georgian markets. However, this result should be explained with caution, since the quality of Kazakh wheat is considered much higher than the quality of Russian and Ukrainian wheats.

The 3SLS and SUR results argue that an increase in Azerbaijani GDP boosts demand for Kazakh wheat, and because of that causes an upward shift in Kazakh wheat export prices. However, an increase in Georgian GDP does not have significant effects on demand for Kazakh wheat. The second demand shifter, time trend, is statistically negative in the case of Azerbaijan, meaning that as time passes the Azerbaijani population decreases its consumption of Kazakh wheat little by little, which in turn shifts Kazakh wheat export prices downward.

The 3SLS results show that the R-squared values are quite high, ranging from 0.9237 to 0.9291, respectively, for Azerbaijan and Georgia. The sample results of both 3SLS and SUR show that the Durbin Watson statistics are close to 2, indicating that serial correlation is not a problem. More precisely, the Durbin–Watson statistics from the 3SLS estimation range from 1.8879 for Azerbaijan to 1.9117 for Georgia (SUR results: 1.8892 and 1.8610, respectively).

Table 3. Summary of the results

Kazakh exports of wheat			
	RDE coefficient	Russian share	Ukrainian share
Azerbaijan	-0.0122	48.66%	1.13%
Georgia	-0.0131	68.33%	5.50%
Russian exports of wheat			
	RDE coefficient	Kazakh share	Ukrainian share
Armenia	-0.1510***	0.40%	3.72%
Azerbaijan	-0.0045	49.79%	1.13%
Georgia	-0.0267*	23.43%	5.50%

Source: Own compilation based on Tables 1-2 and the UN Comtrade data.

Table 3 summarizes the results achieved from the 3SLS estimation for the systems of simultaneous equations method and compares the market situation in Armenia, Azerbaijan and Georgia. The general conclusion is that there is an inverse relationship between the RDE coefficient and market shares of the competitor countries from 2004 - 2014. As the competitor countries achieve a higher market share, the exporting country maintains only small market power. Russian exporters have the highest market share in the Armenian wheat market, and they achieve the strongest market power. Kazakh and Russian exporters almost share the Azerbaijani wheat market; they are not able to exercise market power. Russia has 3 times the market share compared to Kazakhstan in the Georgian wheat market, and this leads to significant market powers of Russian exporters in Georgia.

The results achieved in this study are partially consistent with a previous study by Pall et al. (2014). We find that Russian wheat exporters are able to exercise market power both in

Azerbaijan and Georgia. However, we conclude that Russian market power in the Azerbaijani wheat market (-0.17**) is much stronger than in the Georgian wheat market (-0.06***). Pall et al. (2014) use single-equation estimation for their analysis, which creates doubt over the efficiency of the results. Our results thus contradict the results by Glauben et al. (2014) since they argue that Kazakhstan, Russia and Ukraine are not able to exercise market power and they face perfect competition in the South Caucasus region.

6 Conclusions and Policy Implications

The results of the 3SLS and SUR methods confirm that the Armenian and Georgian wheat markets are imperfectly competitive, while the Azerbaijani wheat market is perfectly competitive. More precisely, the 3SLS results show that, Russian exporters are able to exercise market power in the Armenian and Georgian wheat markets, but not in the Azerbaijani wheat market. However Kazakh exporters are not able to exercise market power in either the Azerbaijani or Georgian wheat markets. That is explained by dominance of Russian wheat exporters over Kazakh wheat exporters in the South Caucasus region. The SUR results coincide with 3SLS results in the case of Russian exports to all three South Caucasus countries, and Kazakh exports to Azerbaijan. However, in the case of Kazakh exports to Georgia, the SUR results demonstrate that both Kazakh and Russian exporters equally exercise market power in the Georgian wheat market. The most expected result of both methods was that Russia achieves the highest market power in the Armenian wheat market because of its leading position there.

The results of both methods indicate that both exporting countries significantly interfere with each other's market powers in the Azerbaijani and Georgian wheat markets. In the same way, Ukraine constrains Kazakh and Russian exporters' market powers in the Azerbaijani and Georgian markets. However, neither Kazakh nor Ukrainian exporters are able to restrict Russian exporters' market powers in Armenian market. Kazakh exporters' market powers are constrained more effectively by Russian exporters in Azerbaijan, while they are constrained by Ukrainian exporters in Georgia. Similarly, Russian exporters' market powers are constrained more effectively by Kazakh exporters in Azerbaijan, while they are constrained by Ukrainian exporters in Georgia. In other words, Ukrainian wheat exporters constrain both Kazakh and Russian exporters' market powers more strongly in Georgia than in Azerbaijan.

An increase in Azerbaijani GDP causes an upward shift in wheat exports from Kazakhstan, while an increase in Armenian and Georgian GDPs stimulates wheat exports from Russia. The highest shift in GDP is observed in Armenia, meaning that the Armenian population increase their demand for cheaper Russian wheat as their incomes increase.

This study clarifies that imperfect competition exists in the Armenian and Georgian wheat markets, but not in the Azerbaijani wheat market. These results are plausible and consistent with market structures of the importing countries (number of firms, market concentration, market shares, government intervention and regulation). Therefore, the policy implication of this study is to address trade negotiations between the South Caucasus countries and non-KRU wheat exporting countries in order to avoid the growing market powers of Kazakh and Russian exporters in the domestic market through diversification policies. Moreover, in order to improve the competitiveness of the domestic market, domestic wheat production should be stimulated in all South Caucasus countries, especially in Armenia since in terms of food security the self-sufficiency of wheat is very crucial.

Further empirical analysis is required to extend this research in terms of the number of importing countries since Kazakhstan and Russia own strong positions not only in the South Caucasus, but also in other destinations, like Central Asian countries, Egypt, Turkey and etc.

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Appendix

Table A.1. Overview of empirical studies on the residual demand elasticity model

Authors	Journal[a] (year)	Exporter	Importer	Product	Period	Data[b]	Model[c]	Method[d]	Result[e]
Baker & Bresnahan	IJIO (1988)	Anheuser-Busch Coors Pabst	n/a	Beer	1962-1982	A	M	3SLS	-0.31*** -0.75*** -0.06
Carter, MacLaren & Yilmaz	WP (1999)	Australia Canada USA	Japan	Wheat	1970-1991	Q	S	2SLS	-0.08 -0.49 -0.93***
Goldberg & Knetter	JIE (1999)	Germany	Canada France UK USA	Beer	1975-1993	A	S M M	IV/ SUR/ 3SLS	-0.17/-0.06***/-0.14*** -0.39***/-0.33***/-0.44*** -0.22***/-0.08/-0.21*** -0.09***/-0.06***/-0.07***
		USA	Australia Canada Germany Japan Italy UK	Kraft linerboard paper	1973-1987		M M	SUR/ 3SLS	-0.23***/-0.31*** -0.21***/-0.25* 0.12***/0.07** -0.06 /-0.10 0.02/0.01 0.28***/0.34***
Yang & Lee	CP for AAEA (2001)	Australia Canada USA	South Korea	Wheat	1993-1999	Q	S	IDM	-0.14** -0.15*** -0.38**
		China USA		Corn	1991-1999				-0.05 -0.03

Table A.1. (continued)

Authors	Journal[a] (year)	Exporter	Importer	Product	Period	Data[b]	Model[c]	Method[d]	Result[e]
Cho, Jin & Koo	CP for AAEA (2002)	USA	Indonesia	Wheat	1973-1994	A	M	SUR	-0.01
			Japan						-0.11
			Korea						-0.61***
			Malaysia						-0.12***
			Philippines						-0.84***
			Singapore						-0.16***
Glauben & Loy	JAFIO (2003)	Germany	Canada	Beer	1991-1998	M	S	IV	0.28
			France						-0.71**
			UK						0.58***
			USA						0.19*
			Belgium	Cocoa					1.41
			France						0.02
			Italy						-1.30*
			USA						15.10*
			France	Chocolate					-0.32
			UK						2.80*
			USA						-0.08
			France	Sugar confect.					0.52
			UK						-0.26
			USA						0.29**
Reed & Saghaian	JAAE (2004)	Australia	Japan	Beef Meat: Chilled Chuck	1992-2000	M	M	ISUR	-0.12
		Canada							-0.01
		New Zealand							-0.17***
		USA							0.01

Table A.1. (continued)

Authors	Journal[a] (year)	Exporter	Importer	Product	Period	Data[b]	Model[c]	Method[d]	Result[e]
		Australia		Chilled Loin					-0.12*
		Canada							-0.10***
		New Zealand							-0.20***
		USA							-0.03
		Australia		Chilled Ribs					-0.09*
		Canada							0.02
		New Zealand							-0.16***
		USA							0.04
		Australia		Frozen Chuck					-0.12***
		Canada							-0.20
		New Zealand							-0.15***
		USA		Frozen Loin					-0.04
		Australia							-1.10***
		Canada							-0.01
		New Zealand							-0.22
		USA		Frozen Ribs					0.01
		Australia							-0.12**
		Canada							-0.17**
		New Zealand							-0.19***
		USA							-0.32***
Poosiripinyo & Reed	JIATD (2005)	Brazil	Japan	Chicken Meat: Whole Birds	1988-2002	M	S	GLS	-0.25***
		China							-0.11
		Thailand							0.10***
		USA							-0.11

Table A.1. (continued)

Authors	Journal[a] (year)	Exporter	Importer	Product	Period	Data[b]	Model[c]	Method[d]	Result[e]
		Brazil		Legs with Bone					-0.10***
		China							-0.05
		Thailand							-0.06
		USA							0.02
		Brazil		Other Cuts					-0.02
		China							-0.02
		Thailand							-0.08
		USA							-0.23***
Tasdogan, Tsakiridou & Mattas	SEEJE (2005)	Greece	European Union	Olive Oil	1970-2001	A	S	2SLS	-0.08**
		Italy							-0.36***
		Spain							-0.16***
Song, Marchant, Reed & Xu	IFAMR (2009)	USA	China	Soybean	1999-2005	M	M	FIML	-0.04***
Felt, Gervais & Larue	AB (2011)	Canada	Japan	Pork	1994-2006	M	S	GMM	-0.06*
		Denmark							-0.02*
		USA							-0.17*
Chang & Inoue	JAER (2013)	Canada	Japan	Log	1988-2010	A	M	ISUR	-0.08**
		USA							0.14
		Canada		Lumber					-0.21***
		USA							-0.17***
Pall, Perekhozhuk, Glauben, Prehn & Teuber	AE (2014)	Russia	Albania	Wheat	2002-2009	Q	S	IVPPML / GMM	-0.09* / -0.06*
			Azerbaijan				S		-0.17 / -0.17**
			Egypt						-0.01 / -0.02*
			Georgia						-0.07* / -0.06***
			Greece						-0.05** / -0.07***

Table A.1. (continued)

Authors	Journal[a] (year)	Exporter	Importer	Product	Period	Data[b]	Model[c]	Method[d]	Result[e]
			Lebanon						-0.06 / -0.07
			Mongolia						-0.25 / -0.07
			Syria						-0.05 / -0.03
Xie & Zhang	MRE (2014)	Canada	USA	Whole Salmon	1995-2012	M	S	GMM	-0.15**
		Chile							0.05
		Canada		Salmon Filet					-0.05
		Chile							-0.21***

[a] AAEA, American Agricultural Economics Association; AB, Agribusiness; AE, Agricultural Economics; CP, Conference Paper; IFAMR, International Food and Agribusiness Management Review; IJIO, International Journal of Industrial Organization; JAAE, Journal of Agricultural and Applied Economics; JAER, The Journal of Applied Economic Research; JAFIO, Journal of Agricultural and Food Industrial Organization; JIATD, Journal of International Agricultural Trade and Development; JIE, Journal of International Economics; MRE, Marine Resource Economics; SEEJE, South-Eastern Europe Journal of Economics; WP, Working Paper.

[b] A, annual; M, monthly; Q, quarterly.

[c] M, multiple-equation model; S, single-equation model.

[d] FIML, Full Information Maximum Likelihood; GLS, Generalized Least Squares; GMM, Generalized method of moments; IDM, Inverse Demand model; ISUR, Iterative Seemingly Unrelated Regression; IV, Instrumental variables; IVPPML, Instrumental variable Poisson pseudo maximum-likelihood estimator; SUR, Seemingly Unrelated Regression; 2SLS, Two-stage least squares; 3SLS, Three-stage least squares.

[e] The results are ordered by product type.

Asterisks ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively.

Source: Own compilation based on the articles cited.