PRICE DISCRIMINATION AND PRICING TO MARKET BEHAVIOR OF BLACK SEA REGION WHEAT EXPORTERS

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1. Abstract

As a result of some important changes in the international wheat market, market shares of leading exporters have recently altered. The Black Sea region countries – Kazakhstan, Russia and Ukraine have become important wheat exporters. Consequently, the pricing behavior of these countries has become a key issue. By applying the pricing-to-market model to annual wheat exports, this study analyses price discriminating behavior of the KRU exporters in foreign markets during 1996-2012. The results demonstrate that even though the KRU countries are able to exercise price discrimination in some importing countries, they usually face perfect competition in most destinations.

Keywords: fixed-effects model, mark-up, price discrimination, pricing-to-market, wheat export

2. Introduction

As one of the world's important food staples, wheat plays a large role in fulfilling an increasing population's demand for foodstuffs. The major wheat suppliers – Argentina, Australia, Canada, the United States, the European Union (EU) and the Black Sea region - Kazakhstan, Russia and Ukraine (KRU) determine world wheat prices and significantly affect global food security. Since the breakdown of the Soviet Union, Kazakhstan and Ukraine have achieved high improvements in the agricultural production and together with Russia provided world market with 34.2 million tons of wheat (Pall et al., 2013). More precisely, because of two reasons – moving to open market economies in the 1990s; and the massive increase in grain production during the 2000s, the KRU countries became main grain exporting countries (Liefert et al., 2013). Although Russia was a former net wheat importer, it became a wheat exporter in 2002 and then was ranked the fourth biggest wheat exporter in the world in 2008 (Pall et al., 2013). Currently Kazakhstan is a leading country in wheat production (especially, spring wheat) in Central Asia, and behind Russia and Ukraine, it is the third biggest wheat producer in the CIS economies (OECD-FAO, 2012, p. 129). Ukraine has locational advantages, since it is close to the EU and the Middle East and North Africa (MENA[1]) countries. According to Burkitbayeva and Kerr, (2013), almost one-fourth of the world's wheat export is provided by the KRU countries alone. It is expected that their role will increase further, since they have enough potential to expand their grain area and increase wheat yields (Tothova et al., 2013). Additionally, due to their geographical locations – e.g. being close to the EU and MENA countries, steady domestic markets, and close relationships between domestic and world prices, the KRU countries have more chances to be important players in the international grain market in the future (Lioubimtseva, 2010). Moreover, an agreement on the creation of a grain pool (so called Grain-OPEC) by the Black Sea countries would increase the competitiveness of the region and strengthen the future position of KRU in the world wheat market (Pall et al., 2013).

Figure 1 shows how the wheat export switched from traditional exporters to the Black Sea region countries during 1996-2012. The KRU countries started to be important players in the world wheat market in 2002. Although the export share of KRU was 4% in 1996, it increased to

[1] The Middle East and North Africa (MENA) region refers to the following countries and territories: Algeria, Bahrain, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, United Arab Emirates, West Bank and Gaza, and Yemen.

20% in 2012, which was higher than the share of most other exporters, including the USA, but slightly smaller than the share of the EU-122. It is predicted that KRU will be responsible for 30% of world wheat exports by 2021 (USDA, 2012: 28).

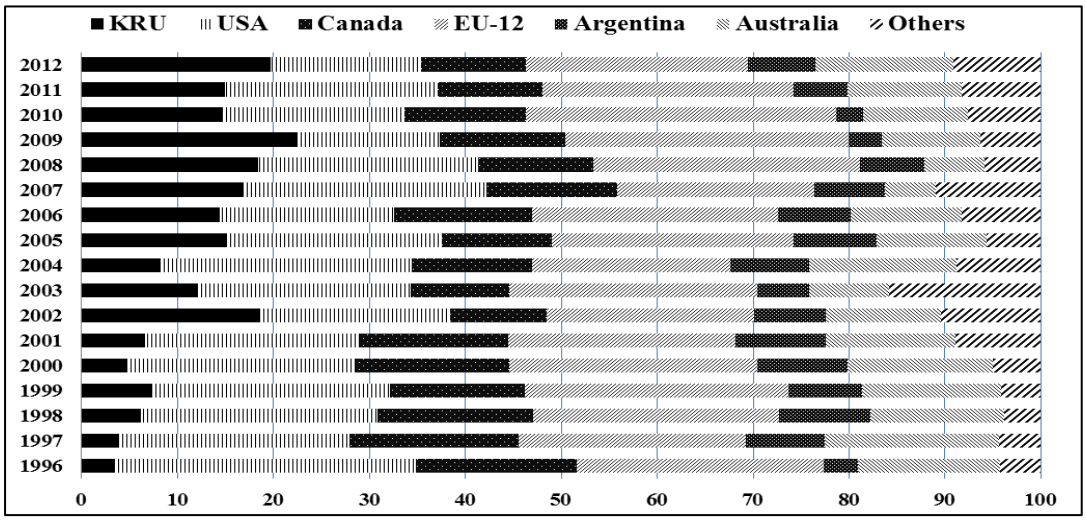

Figure 1. Market shares of major wheat exporting countries, 1996-2012
Source: Own calculations based on the FAOSTAT data from 1996 to 2011 and UN COMTRADE data for 2012

Although Russia and Ukraine have got direct access to world wheat market through the Black Sea, Kazakhstan does not have this advantage, since it is landlocked country. Additionally, transportation and logistics problems, scarcities of inputs and a lack of managerial abilities are still the major problems for them (Burkitbayeva and Kerr, 2013).

Figure 2 illustrates that, due to their substantial production potential, the importance of the KRU countries in the international wheat market increased after 2002. However, because of severe winter in Ukraine and Russia in 2003, and harsh drought in Kazakhstan in 2004, KRU faced significant decline in grain production (Lioubimtseva, 2010). More precisely, Ukraine had a bad harvest in 2003, and could only produce 4.3 mln tons of wheat. After 2003, due to favorable weather conditions and new wheat stocks, Ukraine could improve its wheat exports and to reach the highest level (12.9 mln tons) in 2009 (FAO/EBRD, 2010: 4-15). Similarly to weather effect, export restrictions limited the wheat trade and changed the market shares of the KRU countries[3]. As a result of export restrictions, Ukrainian wheat export decreased by 77.4% between 2006-07, whereas Kazakh and Russian wheat export increased by 53.4% and 47.9%, respectively, since Ukrainian main trading partners (Egypt, Israel, Italy, Tunisia and Yemen) switched to import from other exporters, particularly, from Kazakhstan and Russia (Dollive, 2008). Except for the years 2003 (bad harvest year) and 2007 (export restrictions), the Ukrainian exports to the world market were increasing after 2000, and reached its highest level in 2009 (12.9 mln tons) and in 2012 (8.7 mln tons) (cf. Figure 2).

[2] Although the EU countries are 28, we focus only on 12 main wheat export countries: Belgium, Bulgaria, Czech Republic, Denmark, France, Germany, Hungary, Latvia, Lithuania, Poland, Romania and the United Kingdom.
[3] To secure the domestic market with enough wheat supplies during the high price peaks in 2007-08 and 2010-11, KRU implemented export restrictions. Russia introduced export taxes on wheat in 2007/08 and, due to the small wheat crop, completely banned wheat exports in 2010-11 (Goetz et al., 2013a). Ukraine set export quotas within a governmental license system during 2006-2008 (FAO/EBRD, 2010). Similarly, Kazakhstan applied export restraints in 2008 (Kim, 2010).

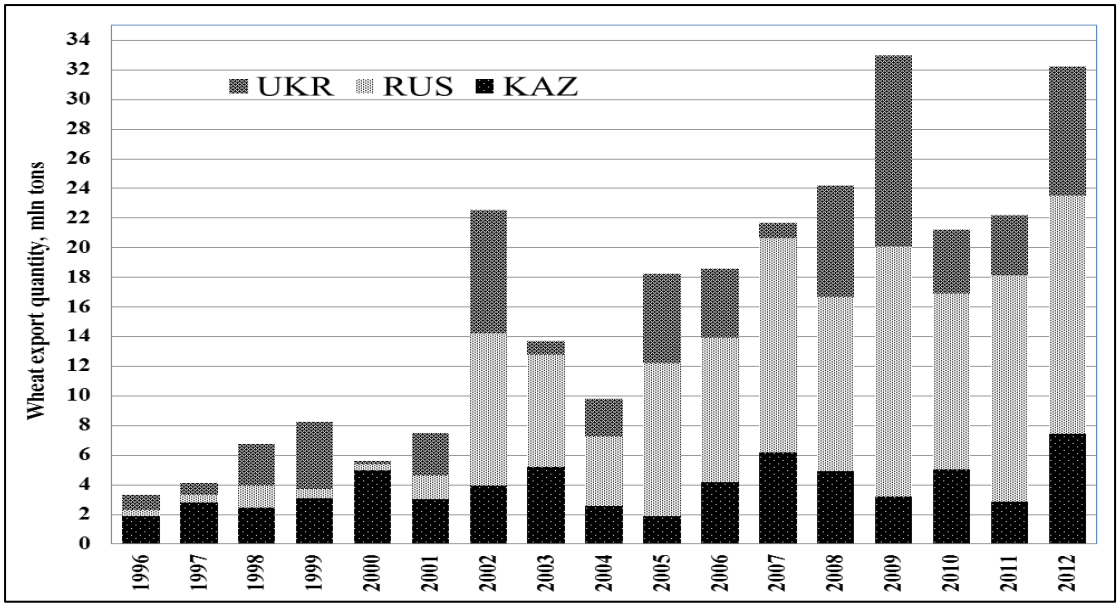

Figure 2. KRU annual wheat export quantity, 1996-2012 (mln tons)
Source: Own calculations based on the FAOSTAT data from 1996 to 2011 and UN COMTRADE data for 2012

The remaining content of this paper is organized as follows: Section 2 describes the background of the study and summarizes previous literatures. Section 3 presents the empirical model and designs an econometric analysis to test the exporters' behavior. Data analysis and panel unit root test results are dealt with Section 4. Section 5 presents the estimation results from the fixed-effects model. And, the final section of the paper provides general conclusions.

3. Background of study and relevant literature review

One of the characteristics of the new trade theory is imperfect competition. Under this condition, a profit-maximizing exporter has a chance to exercise price discrimination in an import market only when the importer's residual demand elasticity is inelastic (due to the absence of other suppliers or inelastic demand). Otherwise, i.e. in the case of elastic residual demand, price discrimination cannot occur (Pall et al., 2013). Hence, Carew and Florkowski (2003) argue that the ability to price discriminate depends both on the elasticity of demand that the exporting country faces in the importing countries, as well as its connection to the common marginal cost. Moreover, Lavoie and Liu (2007) point out that exchange rate movement affect the pricing behavior of an exporter in an imperfect competitive market and causes price discrimination, since it creates large gaps between the prices set by seller and paid by buyer. Therefore, exporters gain opportunities to set different mark-ups across destinations to adjust to exchange rate changes.

Krugman (1987) was the first who introduced a special type of price discrimination, pricing-to-market (PTM), and claimed that in the case of imperfect competition prices are not always equal to marginal cost. More precisely, if the exporting country's currency depreciates, import prices do not change proportionally and it affects relative world prices. As a result, export price implicitly contains mark-up over marginal cost that is destination specific, and it means that exporters charge the importing countries based on their demand characteristics (Pall et al., 2013).

There are some empirical studies that apply PTM model to agricultural products to examine the exporters' pricing behavior. By investigating mainly the pricing strategies of U.S., Canadian, Australian and some European agricultural food (especially, grain) exporters in different time periods, most studies (Knetter, 1989, 1993; Carew, 2000; Brown, 2001; Griffith and Mullen, 2001; Carew and Florkowski, 2003; Glauben and Loy, 2003; Lavoie, 2005) argue that grain exporters exercise PTM behavior, meaning that they implement price discrimination (set different prices) to achieve a different mark-up of prices over marginal cost in some destination countries due to exchange rate volatility. Indeed, by applying the PTM framework on quarterly data, Pick and Park (1991), Pick and Carter (1994) conclude that the U.S. and Canadian wheat exporters exercise price discrimination in some destinations during the 1980s and 1990s. However, Jin and Miljkovic (2008) argue that those exporting countries achieve relatively less market power in wheat markets than soybean markets. The study by Carew and Florkowski (2003) differentiates the pricing strategies between U.S. and Canadian wheat exporters, and concludes that even though the U.S. stabilizes local currency prices, Canada amplifies the effect of ER in the destination markets. Market power may not also have a large role in the export pricing of the U.S. wheat exporters, admit Patterson and Abbott (1994).

Apart from Pall et al. (2013), who consider the PTM model for the first time only for the Russian wheat exporters, no study had analyzed the pricing behavior of the Black Sea region in the world wheat market. Pall et al. (2013) concludes that even though Russia exports wheat to many destinations in a large scale, it can exercise PTM behavior only in few of them, and it means Russia does not exert market power in the world wheat market, since it faces perfect competition in most importing countries.

4. Modelling approach

To test the relationship between export prices and destination specific exchange rates, the PTM model, which was introduced by Krugman (1987) for the first time and developed later by Knetter (1989) to determine the presence of price discrimination in international trade, will be extended in this study. The PTM model is estimated by using a fixed-effects model for each of the exporting countries separately:

$$\mathbf{ln}\boldsymbol{p_{it}} = \boldsymbol{\lambda_i} + \boldsymbol{\theta_t} + \boldsymbol{\beta_i}\mathbf{ln}\boldsymbol{e_{it}} + \boldsymbol{u_{it}}, \forall \mathbf{i} = \mathbf{1}, \dots, \mathbf{N} \textbf{ and } \forall \mathbf{t} = \mathbf{1}, \dots, \mathbf{T} \qquad \textbf{(1)}$$

where, p_{it} is a wheat export price measured in the exporting country's currency to importing country i in period t; λ_i and θ_t represent country and time effects, respectively; e_{it} is destination-specific exchange rate expressed as foreign (local) currency per unit of the exporting country's currency in period t. As the export price and destination-specific exchange-rate variables are in logarithmic term, the changes in exchange rate variable will be explained as the percentage changes in export prices. Consequently, the parameter β_i denotes the elasticity of the domestic currency export price with respect to the exchange rate. Significant negative β means that the exporter stabilizes local currency prices, while positive β shows that the exporter amplifies the effect of exchange rate changes. Specifically, positive coefficients of the exchange rate variable show that the demand for wheat imports gets more inelastic as export prices increase in response to the depreciation of the importing country's currency relative to the exporting

country's currency. On the contrary, negative coefficients of the exchange rate variable indicate that demand for wheat imports gets less inelastic as export prices decrease because of the depreciation of the importing country's currency relative to the exporting country's currency (Jin and Miljkovic, 2008). And finally, u_{it} is an i.i.d. error term $N(0, \sigma_u^2)$.

With respect to the model parameters, Knetter (1989) distinguished three alternative model scenarios: first, the competitive market, where export prices are the same across destinations, since there is no country effect ($\lambda = 0$). Also, changes in exchange rate will not influence export prices ($\beta = 0$). Hence, θ_t (where, $\theta \neq 0$) will be the common price for all destinations. The second model is called the price discrimination with constant elasticity of demand with respect to the domestic currency price in each of the importing countries. In this model the mark-up over marginal cost is constant but can change over time and across destinations ($\lambda \neq 0$ and $\theta \neq 0$). Hence, the time effects capture the changes in marginal cost and the country effect measures the mark-ups to different destinations. Also, shifts in bilateral exchange rate do not affect export prices across destinations ($\beta = 0$). The third model can be described as the price discrimination with varying elasticity of demand with respect to the domestic currency price in each of the importing countries. More precisely, fluctuations in the exchange rate vary the demand elasticity, which in turn also affect optimal mark-up (by a price-discriminating monopolist) over marginal cost across destination markets ($\lambda \neq 0$). Hence, export prices depend on the exchange rate ($\beta \neq 0$) and this situation is called "pricing to market".

In summary, "…how exchange rates affect commodity export prices depends on how changes in currency values are transmitted to foreign currency prices" (Carew and Florkowski, 2003: 139). Depending on the elasticity of demand, changes in the exchange rate have different effects on export prices. If the elasticity of demand with respect to price is constant, then changes in exchange rate will not have any effects on the optimal mark-up charged by the exporter, but it will change the price paid by the importing country. However, if the elasticity of demand with respect to price is not constant, then shifts in the exchange rate will change the optimal mark-up charged by the exporter, i.e. the local currency price paid by the importing country will change.

5. Data analysis and descriptive statistics

The model in equation (1) is applied to the wheat market to test for noncompetitive market structures in the wheat exports of Kazakhstan, Russia and Ukraine. Three panel data sets for Kazakhstan, Russia and Ukraine cover the period 1996-2012, and consist of average annual exchange rates and annual export unit values for wheat. The harmonized code description for wheat is categorized as "wheat and meslin" (HS code: 1001).

The quantity and value data are provided by the United Nations Commodity Trade Statistics Database (UN COMTRADE), and used to generate the export unit value (export price) variable expressed in units of a currency per metric ton: $UV_{x(i,j)} = \frac{V_{x(i,j)}}{Q_{x(i,j)}}$, where i and j are the exporting and importing countries, respectively. The disadvantage of using export unit value as export price is that it usually aggregates data on products employed for different uses, meaning that unit values do not include quality issue, and assumes the qualities of the products shipped to different destinations are the same and do not change over time (Lavoie and Liu, 2007). Hence, significant PTM results might be a signal of product differentiation, but not price discrimination. On the

contrary, Knetter (1989) argues that as different qualities of wheat are shipped to various countries, country dummies would include quality issue in itself. In the same way, quality changes are common across countries and included in time effects (Lavoie and Liu, 2007).

The export value data from UN COMTRADE[4] are FOB (Free on Board), it includes cost of transaction and any other services performed to deliver goods to the border of exporting country[5]. Hence, significant variations in export prices for different destinations cannot be explained by various transportation costs. The export prices for Kazakh, Russian and Ukrainian samples are defined, in Kazakhstani Tenge[6], Russian Ruble[7] and Ukrainian Hryvnia[8] per ton, respectively.

The average annual nominal exchange rate data (buyer's currency per unit of seller's currency) are available from the International Financial Statistics of the International Monetary Fund (IMF), the online exchange rate source OANDA, and the Russian Federal State Statistics Service (ROSSTAT). As the national accounts of the exporting countries do not provide the average annual nominal exchange rate data for all importing countries (they usually offer the exchange rate data for the end of the period), most average exchange rate data are taken from the IMF. The exchange rate data for Tajikistan[9], Turkmenistan[10] and Uzbekistan[11] are calculated by adjusting the old currencies to the new ones. Similarly, the exchange rate data for those EU countries which accepted the euro in 1999 is fixed to the euro for the 1996-1998 periods.

There are $T * N$ observations in the model, $T - 1$ time dummies (θ_t) and $N - 1$ country dummies (λ_i) are included in a pooled cross-sectional–time-series model, in order to avoid singularity problems. As intercept countries we choose countries that both have seaports and highly competitive wheat markets: Turkey for Kazakhstan, and Israel for Russia and Ukraine. Importing countries are selected based on data availability, number of observations (more than 3 observations), geographical locations and its importance for the exporting country. The number of destination countries varies across the exporting countries: 48, 71 and 65 for Kazakhstan, Russia and Ukraine, respectively[12]. However, the data are unbalanced panel, meaning that not every selected importing country buy wheat from Kazakhstan, Russia and Ukraine each year.

6. Estimation results and discussion

A significant relationship between export prices and nominal exchange rate in any importing country means that the null hypothesis of constant elasticity model is rejected. Nonzero coefficients of the exchange rate variable show violations of the constant elasticity model, which in turn confirms the case of price discrimination.

As this study is based on panel data, we have to check for nonstationarity. Table 1 summarizes Augmented Dickey-Fuller (ADF) panel unit root test that applied for Kazakh,

[4] Please check: http://comtrade.un.org/pb/IntroITSY2012VolI.aspx
[5] For statistical values of exported goods and terms of goods delivery see IMTS (2011: p. 39-41, 97-99).
[6] Kazakhstan- Kazakhstani Tenge: Nov 15, 1993-now (1 Tenge=500 Soviet Ruble).
[7] Russia- Russian new Ruble (redenominated): Jan 1, 1998-now (1 new Ruble=1000 old Ruble).
[8] Ukraine- Ukrainian Hryvnia: Sep 2, 1996-now.
[9] Tajikistan- Tajikistani ruble: May 10, 1995 - Oct 29, 2000 (1 Tajikistani Ruble=100 Russian Rubles); Tajikistani Somoni: Oct 30, 2000-now (1 Tajikistani Somoni=1000 Tajikistani Ruble).
[10] Turkmenistan: old Manat (TMM): Nov 1, 1993-Dec 31, 2008 (1 TMM=500 RUB); new Manat (TMT): Jan 1, 2009-now (1 TMT=5000 TMM).
[11] Uzbekistan: old Som: Nov 15, 1993-Jul 1, 1994; new Som: Jul 1, 1994-now (1 new Som=1000 old Som).
[12] Because of page limit, the summary statistics tables are not reported here, but are available by the authors upon request.

Russian and Ukrainian wheat export prices and nominal exchange rates, separately. As the data is unbalanced, Fisher-type panel unit root test is used in this study. Panel unit root test checks the null hypothesis of nonstationarity [I(1)] against the alternative of stationarity [I(0)]. The tests results with a drift, demean, and demeaned with drift indicate the rejection of null hypothesis of nonstationarity, meaning that none of the panels contains a unit root. Hence, it might be concluded that there exists a linear long-run relationship between wheat export prices and destination-specific exchange rates. Similarly, it confirms the existence of "pricing-to-market". As the unit-root process is rejected, we can apply the fixed-effects model to the panel data.

Table 1. Fisher-type Augmented Dickey-Fuller panel unit root tests

Test specification	Inverse normal statistics					
	Kazakhstan		Russia		Ukraine	
	Export price	Exchange rate	Export price	Exchange rate	Export price	Exchange rate
Drift (0)	-5.935***	-7.867***	-6.330***	-13.025***	-5.320***	-8.999***
Demean (0)	-9.817***	-4.136***	-10.948***	-3.297***	-11.437***	-3.627***
Demeaned with drift (0)	-11.313***	-8.902***	-14.013***	-10.933***	-13.351***	-9.882***
Trend (0)	-4.425***	-0.448	-0.645	-2.918**	-2.573**	-2.805**
Demeaned with trend (0)	-9.280***	-4.079***	-12.034***	-2.440*	-6.265***	1.565

Notes: Number in parenthesis denotes lag length. Asterisks ***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively. *Source:* Own calculations using STATA software (version 13).

Table 2. Estimation results for Kazakhstan

Destinations	λ	β	Destinations	λ	β
Afghanistan	0.11 [0.23]	-0.23 [-0.82]	Lithuania	1.24 [1.72]	**0.40*[1.98]**
Albania	**-2.34**[-2.15]**	**-7.93**[-2.60]**	Malaysia	0.00 [0.00]	-0.08 [-0.40]
Algeria	0.01 [0.01]	-1.84 [-0.93]	Moldova	-2.75 [-1.09]	-1.24 [-1.15]
Azerbaijan	1.92 [1.52]	0.40 [1.56]	Mongolia	0.92 [1.03]	-0.08 [-0.19]
Belarus	0.43 [1.23]	0.09 [1.62]	Morocco	4.71 [0.98]	1.73 [0.97]
Cyprus	1.48 [1.39]	0.28 [1.39]	Netherlands	-2.40 [-0.75]	-0.63 [-0.91]
China	3.25 [0.51]	0.95 [0.47]	Norway	0.68 [0.77]	0.19 [0.65]
Dominica	1.17 [1.33]	0.30 [1.36]	Pakistan	0.17 [0.39]	-0.27 [-0.62]
Egypt	-0.89 [-0.99]	-0.27 [-1.00]	Poland	-1.47 [-1.22]	-0.45 [-1.46]
Estonia	0.49 [0.73]	0.19 [0.70]	Portugal	-2.29 [-0.79]	-0.48 [-0.85]
Finland	1.16 [0.65]	0.21 [0.59]	Romania	0.90 [1.41]	0.20 [1.35]
Georgia	-1.03 [-0.54]	-0.24 [-0.55]	Spain	0.30 [0.31]	0.07 [0.37]
Germany	1.06 [0.78]	0.20 [0.75]	Sudan	**2.64**[2.74]**	**0.66**[2.61]**
Greece	**-1.83*[-1.84]**	**-0.37*[-1.85]**	Sweden	-0.42 [-0.52]	-0.24 [-0.96]
Indonesia	2.55 [1.19]	-0.43 [-0.84]	Switzerland	1.21 [0.76]	0.26 [0.74]
Iran	**1.06**[2.81]**	-0.09 [-1.01]	Tajikistan	**-0.50**[-2.21]**	**-0.12**[-2.29]**
Ireland	-2.40 [-1.05]	-0.49 [-1.04]	Tunisia	-0.20 [-0.06]	-0.04 [-0.05]
Israel	0.07 [0.03]	0.00 [0.00]	Turkey	-	-0.08 [-1.29]
Italy	-0.36 [-0.34]	-0.08 [-0.40]	Turkmenistan	0.34 [0.26]	0.04 [0.14]
Jordan	-9.15 [-1.68]	-1.70 [-1.64]	UAE	-2.38 [-1.01]	-0.68 [-1.05]
Kyrgyz Rep	-0.18 [-1.01]	-0.31 [-1.65]	UK	-11.27 [-1.33]	-2.18 [-1.32]
Latvia	0.17 [0.11]	0.02 [0.07]	USA	-0.39 [-0.24]	-0.10 [-0.29]
Lebanon	**1.97***[4.52]**	**-0.57**[-2.72]**	Uzbekistan	**-0.62**[-2.77]**	**-0.10**[-2.25]**
Libya	-9.86 [-0.76]	-2.08 [-0.76]	Venezuela	-17.62 [-0.85]	-3.54 [-0.87]
Constant	**9.41***[30.82]**				
Observations	446				
R-sq. (Adj. R-sq.)	0.45 (0.30)				

Notes: Values in parentheses are t-statistics. Asterisks ***, ** and * denote statistical significance at the 1, 5 and 10 percent levels, respectively. Turkey is treated as the intercept.

Additionally, Wooldridge test for autocorrelation in panel data (Wooldridge, 2002: 176) is conducted and results reject the null hypothesis of no serial correlation. It means the data has first-order autocorrelation. Afterwards, two types of F-tests are employed to check the joint significance of both country effects and exchange rate effects, separately. The null hypotheses of all country effects are equal and all exchange rate effects are zero are rejected at 1% level, meaning that the KRU wheat exporters set country specific mark-ups and exercise PTM behavior in at least one of the importing countries.

Tables 2-4 present the estimation results for Kazakhstan, Russia and Ukraine. According to the results, there is evidence of PTM in 7 out of 48; 20 out of 71; and 17 out of 65 countries that import wheat from Kazakhstan, Russia and Ukraine, respectively.

Table 3. Estimation results for Russia

Destinations	λ	β	Destinations	λ	β
Afghanistan	1.15 [1.36]	-1.26 [-1.06]	Malaysia	0.55 [0.44]	0.20 [0.32]
Albania	0.25 [0.51]	-0.14 [-0.33]	Malta	0.44 [1.10]	0.09 [0.81]
Algeria	0.33 [0.29]	-0.40 [-0.34]	Mauritania	3.03 [1.34]	-1.28 [-1.21]
Armenia	-0.79 [-1.65]	**0.37**[2.36]**	Moldova	-0.17 [-0.55]	**-0.98**[-2.20]**
Austria	-0.15 [-0.25]	-0.04 [-0.24]	Mongolia	-0.98 [-0.96]	0.35 [1.36]
Azerbaijan	**0.74**[2.88]**	**0.17*[2.00]**	Morocco	**0.29**[2.45]**	**0.15**[2.71]**
Bangladesh	-0.39 [-1.10]	0.49 [1.45]	Mozambique	0.18 [0.95]	0.28 [0.72]
Br. Virgin Isl.	0.05 [0.37]	-0.03 [-0.30]	Netherlands	-0.68 [-0.44]	-0.18 [-0.39]
Bulgaria	0.20 [0.97]	-0.03 [-0.28]	Nigeria	0.67 [0.57]	-0.47 [-0.66]
Cyprus	**0.65**[2.24]**	**0.16*[1.77]**	North Korea	**0.37*[1.75]**	0.12 [0.94]
Denmark	**0.53***[3.43]**	**0.31***[2.97]**	Norway	-0.58 [-0.55]	-0.37 [-0.56]
DR Congo	**2.67***[10.27]**	**-0.79***[-7.03]**	Oman	**3.57***[3.01]**	**0.78**[2.72]**
Egypt	0.37 [1.12]	0.16 [0.85]	Pakistan	-0.25 [-0.89]	**0.47***[6.03]**
Eritrea	-0.01 [-0.04]	-0.23 [-0.51]	Peru	**1.39***[4.59]**	**0.50***[3.46]**
Estonia	0.02 [0.17]	0.06 [0.56]	Poland	0.13 [0.78]	**-0.22*[-1.86]**
Ethiopia	**0.33*[1.81]**	**0.42***[3.64]**	Rep of Yemen	-0.66 [-0.62]	0.40 [0.76]
Finland	**3.05***[6.37]**	**0.81***[4.55]**	Romania	**4.55*[1.75]**	1.92 [1.66]
Georgia	0.66 [1.46]	0.18 [0.99]	Rwanda	0.75 [0.45]	-0.22 [-0.41]
Germany	**4.07**[2.53]**	**1.11**[2.48]**	Saudi Arabia	**2.59***[3.45]**	**1.29***[3.50]**
Greece	1.05 [1.56]	0.29 [1.42]	South Korea	0.07 [0.15]	-0.00 [-0.01]
Hungary	1.33 [1.61]	-0.49 [-1.67]	Spain	-1.19 [-0.63]	-0.32 [-0.59]
India	**-1.38*[-2.02]**	**3.06**[2.20]**	Sudan	0.49 [0.77]	0.14 [0.49]
Indonesia	1.51 [0.46]	-0.24 [-0.44]	Sweden	**0.78***[5.63]**	**0.58**[2.57]**
Iran	-2.07 [-1.48]	0.36 [1.55]	Switzerland	**0.46*[1.91]**	0.13 [1.14]
Iraq	**-0.74*[-2.00]**	0.26 [1.52]	Syria	-0.48 [-1.26]	-0.59 [-1.47]
Israel	-	-0.00 [-0.02]	Tajikistan	0.87 [0.86]	0.27 [0.66]
Italy	-0.19 [-0.29]	-0.05 [-0.31]	Tanzania	**1.62*[1.96]**	-0.39 [-1.47]
Japan	**-1.32***[-5.79]**	**1.48***[7.80]**	Thailand	-0.02 [-0.12]	0.28 [0.80]
Jordan	1.18 [0.58]	0.28 [0.51]	Tunisia	**2.54***[22.27]**	**0.78***[14.59]**
Kenya	0.40 [0.77]	-0.24 [-0.47]	Turkey	0.34 [0.63]	0.08 [0.39]
Kyrgyz Rep	0.72 [1.31]	-0.32 [-0.54]	Turkmenistan	-1.10 [-1.33]	**-0.82**[-2.83]**
Latvia	-0.30 [-0.41]	-0.13 [-0.66]	UAE	0.43 [0.50]	0.16 [0.38]
Lebanon	-0.30 [-0.84]	0.10 [1.38]	Uganda	1.13 [0.56]	-0.23 [-0.45]
Libya	0.95 [0.61]	0.29 [0.57]	UK	-6.42 [-1.70]	-1.76 [-1.71]
Lithuania	**0.43*[1.81]**	0.16 [1.32]	Uzbekistan	1.12 [1.31]	-0.14 [-0.53]
Constant	**8.07***[50.04]**		Vietnam	-0.53 [-0.16]	0.09 [0.18]
Observations	660				
R-sq. (Adj. R-sq.)	0.65 (0.55)				

Notes: See Table 2. Israel is treated as the intercept.

In most destination countries (5 out of 7) Kazakh wheat exporters are sensitive to exchange rate changes and stabilize local currency prices, while they amplify the effect of exchange rate

only in Lithuania and Sudan (cf. Table 2). Similarly, Ukrainian wheat exporters tend to adjust prices to stabilize the effect of exchange rate changes in 10 out of 17 countries, except in Algeria, Belgium, Bulgaria, Estonia, Latvia, Thailand and Uzbekistan (cf. Table 4). On the contrary, Russian exporters amplify the effect of exchange rate in 16 out of 20 countries, while they are sensitive to exchange rate fluctuations in the Democratic Republic of Congo, Moldova, Poland and Turkmenistan (cf. Table 3).

Table 4. Estimation results for Ukraine

Destinations	λ	β	Destinations	λ	β
Albania	0.78 [1.42]	-0.08 [-0.58]	Lithuania	**0.31*[1.84]**	0.02 [0.12]
Algeria	-0.13 [-0.24]	**0.18*[1.89]**	Malaysia	0.07 [0.88]	-0.10 [-0.99]
Armenia	0.57 [0.84]	0.06 [0.65]	Mauritania	**1.96**[2.17]**	**-0.40**[-2.33]**
Austria	-0.02 [-0.10]	0.05 [0.95]	Moldova	**1.52***[3.54]**	**-0.96*[-1.78]**
Azerbaijan	0.14 [0.50]	0.10 [0.73]	Morocco	**0.19*[1.82]**	-0.02 [-0.52]
Bangladesh	0.61 [1.24]	-0.10 [-0.90]	Myanmar	**0.24***[3.09]**	**-0.54**[-2.21]**
Belarus	-0.35 [-0.78]	0.22 [1.36]	Netherlands	-0.02 [-0.06]	0.01 [0.06]
Belgium	**0.39*[1.91]**	**0.34***[3.00]**	Nigeria	-0.43 [-0.33]	0.24 [0.70]
Bermuda	-0.12 [-0.84]	-0.01 [-0.10]	North Korea	0.06 [0.60]	0.13 [0.78]
Br. Virgin Isl.	-0.11 [-0.53]	-0.02 [-0.15]	Peru	-0.59 [-0.78]	-1.68 [-0.93]
Bulgaria	**0.81***[3.56]**	**0.43*[1.89]**	Philippines	0.01 [0.02]	0.10 [0.87]
Cyprus	-0.22 [-0.85]	0.00 [0.04]	Poland	**0.16**[2.30]**	**-0.14*[-2.03]**
Djibouti	**2.29***[3.20]**	**-0.54**[-2.22]**	Portugal	**-0.46**[-2.26]**	-0.10 [-1.10]
Egypt	**0.09**[2.29]**	**-0.34***[-3.01]**	Rep of Yemen	0.94 [0.68]	-0.10 [-0.35]
Eritrea	**1.06***[3.87]**	**-0.85*[-2.05]**	Saudi Arabia	**0.26*[1.89]**	0.24 [0.81]
Estonia	-0.22 [-0.77]	**0.35*[2.10]**	Slovak Rep	0.24 [0.46]	0.09 [0.49]
France	-0.28 [-1.04]	-0.09 [-0.74]	South Africa	0.19 [1.70]	-0.03 [-0.14]
Georgia	0.20 [1.05]	0.02 [0.16]	South Korea	0.31 [0.35]	0.07 [0.76]
Germany	0.22 [0.70]	0.18 [1.72]	Spain	**-0.42**[-2.18]**	-0.10 [-1.11]
Greece	**-0.45**[-2.27]**	**-0.18**[-2.48]**	Sri Lanka	-1.34 [-0.55]	0.69 [0.75]
Hungary	0.14 [0.23]	0.10 [1.05]	Sudan	-0.07 [-0.38]	-0.16 [-0.83]
India	0.55 [0.92]	-0.08 [-0.50]	Switzerland	-0.29 [-1.55]	**-0.24**[-2.51]**
Indonesia	**2.61*[1.83]**	-0.22 [-1.43]	Syria	0.23 [1.63]	-0.06 [-0.45]
Iraq	0.55 [0.87]	0.04 [0.47]	Tajikistan	0.38 [1.73]	0.09 [0.29]
Ireland	-0.17 [-0.70]	-0.13 [-0.74]	Thailand	**-1.66**[-2.55]**	**1.40**[2.92]**
Israel	-	-0.12 [-0.97]	Tunisia	-0.00 [-0.00]	0.02 [0.20]
Italy	-0.14 [-0.73]	0.05 [0.78]	Turkey	0.77 [1.46]	0.39 [1.12]
Jordan	0.37 [0.66]	0.20 [0.99]	Uganda	2.69 [1.13]	-0.31 [-0.93]
Kenya	1.21 [1.73]	-0.29 [-1.61]	UAE	0.02 [0.23]	-0.06 [-0.37]
Latvia	0.55 [1.33]	**0.36*[2.10]**	UK	-0.17 [-0.58]	-0.00 [-0.11]
Lebanon	0.74 [1.12]	0.03 [0.50]	USA	0.02 [0.05]	0.13 [0.85]
Libya	**-0.64**[-2.57]**	**-0.32**[-2.19]**	Uzbekistan	**1.45***[3.20]**	**0.44*[1.94]**
Constant	**6.44***[182.14]**		Vietnam	2.57 [0.99]	-0.18 [-0.81]
Observations	605				
R-sq. (Adj. R-sq.)	0.50 (0.36)				

Notes: See Table 2. Israel is treated as the intercept.

Additionally, Kazakh exporters observe price discrimination with constant mark-up (significant λ, insignificant β) in Iran (charge higher price mark-ups than Turkey). Similarly, Russian exporters achieve price discrimination with constant mark-up in Iraq, Lithuania, North Korea, Romania, Switzerland and Tanzania, whereas Ukrainian exporters in Indonesia, Lithuania, Morocco, Portugal, Saudi Arabia and Spain. Russian wheat exporters charge higher prices (significant positive λ) in all destinations except in Iraq, while Ukrainian exporters in Portugal and Spain.

It can be concluded that Russia and Ukraine possess enough market power to charge higher prices in most destinations as is strongly evidences by the positive coefficients of the country dummy (Jin and Miljkovic, 2008). The explanation of significant country effects might be the quality of wheat shipped to importing countries. For example, the reason of higher Russian export prices in Denmark, Finland, Germany, Sweden and Switzerland might be higher quality of wheat exported to those destinations.

In the case of other countries, the null hypothesis of competitive pricing cannot be rejected (λ and β are insignificant), i.e. Kazakhstan in 40; Russia in 45 and Ukraine in 43 countries, which is 83.3%, 63.4% and 66.2%, respectively, of total destinations either face perfect competition, or get the common mark-up with their competitors in imperfect market.

All three data sets have a different number of observations (cf. Table 2-4). The panel data set ranges between a maximum number of 71 destinations for Russia and a minimum number of 48 destinations for Kazakhstan. The R-squared coefficients are ranging from 0.30 for Kazakhstan to 0.65 for Russia, indicating that country and time effects, as well as destination-specific exchange rates explain most of the variations in prices for Russia and Ukraine.

7. Concluding Remarks

The results of this study indicate the evidence of PTM behavior of the Black Sea region wheat exporting countries in some destinations. The differences in mark-ups set in different destinations might be due to several reasons, namely for pricing policy, quality differences and importance of world trade for the exporting countries (Carew and Florkowski, 2003). In order to defend their market share, Kazakhstan and Ukraine therefore stabilize their local currency prices in the destinations where they export large quantities (like, Egypt and Greece). Additionally, another reason for higher wheat export prices in high-income countries might result from the different quality of the exported wheat, as is observable for Russian and Ukrainian wheat exports to some European countries.

As the most important wheat exporter to Central Asian countries (with a market share of more than 90% of total wheat imports), Kazakhstan exercises price discrimination in this region, except in the Kyrgyz Republic and Turkmenistan. More precisely, Kazakhstan stabilizes its local currency prices in Tajikistan and Uzbekistan, but faces competition in the Kyrgyz Republic and Turkmenistan. In all Central Asian countries, except Turkmenistan, Kazakhstan charges relatively low prices for exported wheat.

Considering KRU wheat exports to the region of South Caucasus, the results are different from those of Central Asia: Kazakhstan faces perfect competition in Azerbaijan and Georgia, Ukraine even in the whole South Caucasus, so that both exporting countries fail to exercise price discrimination against importers of this region. In contrast, Russia price discriminates in the Armenian and Azerbaijani wheat market (also receives higher mark-up in Azerbaijan), but faces perfect competition in the Georgian wheat market. The reason why all KRU countries face perfect competition in the Georgian wheat market might be due to the diversification policy of the government that recently implemented.

One of the most interesting findings of this study is that the Black Sea region wheat exporters either compete with other wheat exporting countries, or tend to stabilize local currency prices in their most important countries like, Egypt, Italy, South Korea, Spain, the Netherlands,

Turkey, China, Republic of Yemen, USA, Vietnam and Nigeria; a behavior that is best evidences by Egypt, the world's biggest wheat importer. Egypt buys wheat in large quantities from Russia. However, Russia faces competition in this destination together with Kazakhstan, while Ukraine stabilizes its wheat export prices in Egyptian pound.

The results of this study confirm the findings of previous studies on pricing behavior in the international wheat market. In fact, many studies have found evidence of pricing-to-market behavior in wheat importing countries. Our findings are supported by the empirical study of Pall et al. (2013) who, by estimating a PTM model on the basis of quarterly time series data, could prove price discrimination of Russian wheat exporters only in a few importing countries. The general conclusion is that the KRU countries are able to exercise price-discriminating behavior in some destination markets, but in most destinations they face perfect competition.

References

Brown, J. (2001). Price discrimination and pricing to market behavior of Canadian Canola Exporters. *American Journal of Agricultural Economics* 83(5): 1343-1349.

Burkitbayeva, S. and Kerr, W. A. (2013). The Accession of Kazakhstan, Russia and Ukraine to the WTO: What will it mean for the world trade in wheat? Canadian Agricultural Trade Policy and Competitiveness Research Network (CATPRN) Commissioned Paper 2013-06.

Carew, R. (2000). Pricing to Market Behavior: Evidence from Selected Canadian and U.S. Agri-Food Exports. *Journal of Agricultural and Resource Economics* 25 (2): 578–595.

Carew, R. and Florkowski, W. J. (2003). Pricing to Market Behavior by Canadian and U.S. Agri-food Exporters: Evidence from Wheat, Pulse and Apples. *Canadian Journal of Agricultural Economics* 51 (2): 139–159.

Dollive, K. (2008). The impact of export restraints on rising grain prices. Working Paper No. 2008-09-A. Washington (DC): US International Trade Commission.

FAO/EBRD (2010). Ukraine: Grain Sector Review and Public Private Policy Dialogue. Report series – No. 15 – December 2010.

Glauben, T. and Loy, J. P. (2003). Pricing-to-Market versus Residual Demand Elasticity Analysis of Imperfect Competition in Food Exports: Evidence from Germany. *Journal of Agricultural & Food Industrial Organization* 1 (1): 1–19.

Goetz, L., Glauben, T. and Bruemmer, B. (2013). Wheat export restrictions and domestic market effects in Russia and Ukraine during the food crisis. *Food Policy* 38 (2013): 214–226.

Griffith, G. and Mullen, J. (2001). Pricing-to-Market in NSW rice export markets. *Australian Journal of Agricultural Economics* 45(3): 323-334.

IMF - International Monetary Fund, http://www.imf.org

IMTS (2011). International merchandise trade statistics: concepts and definitions 2010. United Nations: Department of Economic and Social Affairs, Statistics Division. Statistical Papers Series M No. 52.

Jin H. J., and Milijkovic, D. (2008). Competitive structure of U.S. Grain Exporters in the world market: A dynamic panel approach, *Journal of International Economic Studies* 12(1): 33-63.

Kim, J. (2010). Recent Trends in Export Restrictions. Organisation for Economic Co-operation and Development. OECD Trade Policy Papers, No. 101, OECD Publishing.

Knetter, M. M. (1989). Price discrimination by U.S. and German Exporters. *The American Economic Review* 79(1): 198-210.

Knetter, M. M. (1993). International Comparisons of Pricing-to-Market Behavior. *The American Economic Review* 83(3): 473-486.

Krugman, P. (1987). Pricing to market when exchange rate changes. In Arndt, S.W. and Richardson, J.D. (eds), *Real Financial Linkages Among Open Economies*. Cambridge, MA and London: MIT Press, 49-70.

Lavoie, N. (2005). Price discrimination in the Context of vertical differentiation: An application to Canadian Wheat Exports. *American Journal of Agricultural Economics* 87(4): 835-854.

Lavoie, N. and Liu, Q. (2007). Pricing-to-market: Price discrimination or Product Differentiation? *American Journal of Agricultural Economics* 89(3): 571–581.

Lioubimtseva, E. (2010). Global food security and grain production trends in Central Eurasia: Do Models Predict a New Window of Opportunity? *National Social Science Journal* 41 (1): 154–165.

Liefert, O., Liefert, W. and Luebehusen, E. (2013). Rising Grain Exports by the Former Soviet Union Region Causes and Outlook, ERS/USDA Outlook WHS-13A-01.

OANDA – Online Forex Trading and Currency Services, http://www.oanda.com/

OECD-FAO (2012), *OECD-FAO Agricultural Outlook 2012-2021*, OECD Publishing and FAO.

Pall, Z., Perekhozhuk, O., Teuber, R. and Glauben, T. (2013). Are Russian Wheat Exporters able to price discriminate? Empirical Evidence from the Last Decade. *Journal of Agricultural Economics* 64(1): 177-196.

Patterson, P. M. and Abbott, P. C. (1994). Further Evidence on Competition in the US Grain Export Trade. *Journal of Industrial Economics* 42 (4): 429–437.

Pick, D.H. and Carter, C.A. (1994). Pricing to Market with Transactions Denominated in a Common Currency. *American Journal of Agricultural Economics* 76(1): 55-60.

Pick, D. H. and Park, T. A. (1991). The competitive structure of U.S. Agricultural Exports. *American Journal of Agricultural Economics* 73 (1): 133–141.

ROSSTAT - Russian Federation Federal State Statistics Service: Russian Statistical Yearbook, (2001, 2007, 2013).

Tothova, M., Meyers, W. and Goychuk, K. (2013). Productivity growth and variability in KRU: evidence and prospects. International Agricultural Trade Research Consortium Symposium "Productivity and Its impacts on Global Trade". Seville, Spain.

UN COMTRADE - United Nations Commodity Trade Statistics Database, http://comtrade.un.org/

USDA. (2012). USDA Agricultural Projections to 2021. Office of the Chief Economist, World Agricultural Outlook Board, U.S. Department of Agriculture. Prepared by the Interagency Agricultural Projections Committee. Long-term Projections Report OCE-2012-1, 102 pp.

Wooldridge, J. M. (ed.) (2002). Econometric Analysis of Cross Section and Panel Data. Cambridge, MA: MIT Press