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**Will the ‘BRICs Decade’ continue? – Prospects for trade and growth”**  
**23-24 June 2011 | Halle (Saale), Germany**

**Wheat Trade – Does Russia Price Discriminate across Export Destinations?**

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**Abstract**

Significant changes have taken place on the world wheat market over the last decade. Russia, a former net wheat importer has become a leading exporter with a world market share of 13.8 percent in 2009/2010. Though there are several studies on the pricing behaviour of Canadian and US wheat exporters, there is none on the pricing behaviour of Russian wheat exporters. The present paper tries to fill this lack of research by providing a quantitative analysis of the pricing behaviour of Russian wheat exporters. We employ a pricing-to-market (PTM) model on annual Russian wheat export data, covering the period 2002-2009 and 22 export destinations. Our findings indicate that Russian wheat exporters behave rather competitively and exercise pricing to market behaviour only in five export destinations.

**Keywords:** Russia, wheat export, international trade, pricing to market

JEL codes: L13, Q17

## 1. Introduction

Significant changes have taken place on the world wheat market during the last decade. Russia, a former net-importer of grain has become the fourth-largest grain exporter in 2008/2009, whereby wheat export increased more than tenfold. While in the marketing year 1999/2000 Russia's market share was only 0.5%, it increased by 13.3 percentage points to 13.8 % in 2009/2010. Other post-Soviet countries such as Ukraine and Kazakhstan were also able to recover from the tremendous decline in agricultural production after the break down of the Soviet Union and entered the wheat world market as important exporters (FAO 2009 p. 19, USDA 2010). As a result, total wheat exports from Kazakhstan, Russia and Ukraine (KRU) increased more than threefold and accounted for about 34.2 million tons, which corresponds to 26.9 % of world wheat exports. It is expected that the market share of these countries in world trade will increase further, since there is still significant production potential in terms of both area and yield (FAO 2009 p. 19, USDA 2010). At the same time, the market share of both the top-five and the top-ten wheat exporters declined from 97 % (1999/2000) to 95 % (2009/2010) and 87 % to 74 %, respectively.

In general, all these changes indicate that in the near future the global wheat market will become much more competitive. However, two recent incidents have drawn a lot of media attention and caused concerns about collusive behaviour and the exercise of market power. The first one is Russia's creation of a state trader for grain, the United Grain Company (UCG). The UCG was established by Presidential Decree in March 2009 and started operating in June 2009. The UCG is supposed to increase purchases and sales of grain on the domestic market, modernize the storage and shipment of wheat and increase exports (USDA 2009). The second incident is the announcement of the creation of a grain pool by the Black Sea countries, Russia, the Ukraine, and Kazakhstan, sometimes also referred to as 'grain-OPEC' (World Bank 2009). This grain pool is supposed to increase the region's competitiveness by the creation of a single infrastructural platform and a reduced price volatility of wheat prices (RIA NOVOSTI 2009).

All these current developments raise a number of research questions with respect to the future structure of the world wheat market, among others questions surrounding competition and consequences for price setting in export markets. While on one hand, there are concerns that the world wheat market will become less competitive due to the above mentioned incidents, others are claiming that these concerns are arbitrary due to the low market share the UCG or the grain

pool would represent and the fact that all three countries produce quite distinct wheat qualities (World Bank 2009).

Though these aspects have been controversially discussed by policy makers and the media, there is only little scientific literature on these issues. There is particularly no empirical evidence with respect to the pricing strategies of Russian wheat exporters and the competition they face in their major export markets. This is also of interest against the background of highly volatile agricultural prices and the rather strong dependency of certain countries on food imports. Hence, the present paper wants to fill this lack of research by providing a quantitative analysis of the pricing strategies of Russian wheat exporters in the last decade. It will be especially elaborated whether Russian exporters are able to exercise pricing-to-market (PTM) behaviour. PTM refers to a situation in which an exporter is able to price discriminate across export markets induced by changes in the bilateral exchange rate. Put in other words, if PTM is present, fluctuations in the markup of prices over marginal costs are destination-specific (Krugman 1986, Knetter 1989). Consequently, it will be investigated (i) whether there is price discrimination across destinations and (ii) which factors might explain the existing export pricing pattern.

The paper is organized as follows. Section 2 provides an overview of previous studies on price discrimination and export pricing in international wheat trade. In section 3 the modelling approach is presented, followed by a description of the data and summary statistics. Section 5 discusses the results and the final section concludes.

## **2. Conceptual background**

Neoclassical trade theory relies on the assumptions of perfect competition and integrated markets, whereas the new trade theory suggests that international trade is often characterized by imperfect competition and oligopolistic market structures. Such conditions can induce price discrimination as the optimal decision of a profit maximizing exporter. Generally, the ability to price discriminate depends on the residual demand elasticity. If the residual demand is elastic, price discrimination is not possible. However, in case of an inelastic residual demand, (as a result of the lack of alternative supply or inelastic market demand) price discriminatory behaviour may exist. Thus the possibility of price discrimination is a function of the demand characteristics and the competitive environment of the respective market (Goldberg and Knetter 1997 and 1999).

Krugman (1987) introduced a special form of third degree price discrimination, which he called pricing to market (PTM). PTM is price discrimination which is induced by changes in bilateral exchange rates. The line of argument is that that when the US Dollar depreciates import prices do not always rise proportionally and as a result international relative prices change. This is evidence of imperfect competition, because if the exchange rate pass through is not complete, the price can not always equal marginal cost. Therefore the price contains a destination specific markup over marginal cost meaning that exporters price their products according to the characteristics of the different importing countries.

Numerous empirical studies have been conducted based on the PTM concept. They include for example Knetter (1989, 1993), Gagnon and Knetter (1995) Marston (1990) and Falk and Falk (2000). Furthermore pricing to market has been used in the field of agricultural economics, and several articles investigate the competitive structure of different agricultural export sectors. The next section provides a brief review of relevant articles along with their motivation.

### **3. Relevant previous empirical studies**

Competition and spatial price discrimination in international markets has been addressed in numerous studies using various methodological approaches. Reimer and Stiegert (2006) provide an overview about imperfect competition in international food and agricultural markets. The general conclusion from the empirical evidence is that most international markets are characterized by oligopoly whereby price-cost markups tend to be small.

The world wheat market is a quite extensively studied market, since several countries possess state-trading enterprises (STEs) for wheat.<sup>1</sup> In Canada, this is the Canadian Wheat Board (CWB) which is responsible for all Canadian wheat exports. A similar institution can be found in Australia. The Australian Wheat Board (AWB) was a government body until 1999, and since then it is a privately owned company. In Japan, the Japanese Food Agency (JFA) controls wheat imports. These institutions have drawn a lot of scientific interest and have been analyzed in several studies. The following table provides an overview about selected previous empirical studies on the wheat market.

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<sup>1</sup>The WTO defines state-trading enterprises (STEs) as "...governmental and nongovernmental enterprises, including marketing board, which has been granted exclusive or special rights or privileges, including statutory or constitutional powers, in the exercise of which they influence through their purchases or sales the level of direction of imports or exports (Ackerman and Dixit 1999, p.2)."

**Table 1: Studies on wheat export pricing**

<b>Authors</b>	<b>Considered Data</b>	<b>Methodological Approach</b>	<b>Results</b>
Pick and Park (1991)	U.S. wheat exports, Quarterly data, 1978-88 8 destination markets	PTM	The results indicate that the U.S. price discriminates across destinations; China and the Soviet Union seem to exercise monopsony power.
Patterson and Abott (1994)	Firm-level data set on US grain exports, Annual data, 1979-1989 98 destination markets	Generalized Cournot model	Evidence of discriminatory export pricing behaviour which is significantly related to export seller concentration, US market share, total export volume, and import market size
Pick and Carter (1994)	U.S. and Canadian wheat exports, Quarterly data, 1978-88 8 destination markets	PTM with two exchange rates: (i) importer/exporter (ii) Canadian/U.S. dollar	Evidence of PTM for US (Canadian) exporters in six (three) of seven (four) wheat importing countries; Canadian/U.S. exchange rate influences export pricing decisions of both exporters
Carew and Florkowski (2003)	Canadian and U.S. wheat exports, Annual data, 1980-1998	PTM with two exchange rates: (i) importer/exporter (ii) Canadian/U.S. dollar	Canadian pricing strategy tends to amplify exchange rate effects, whereas U.S. exporters tend to stabilize foreign currency prices.
Lavoie (2005)	Canadian wheat exports, Monthly confidential price data, 1982-1994 Four destination markets	Sort of PTM model	CWB has market power emerging from product differentiation and discriminates across destinations.
Jin and Miljkovic (2008)	U.S. wheat exports, Quarterly data, 1989-2004 22 destination markets	PTM	Relative exchange-rate movements influence U.S. wheat export prices in 9 of 22 export destinations.

Source: Own compilation.

The derived results on wheat exports indicate that there seems to be price discrimination across different destinations exercised by US and Canadian exporters. However, the price markup seems to be rather small. Anania, Bohman and Carter (1992) pointed out that excess profits are not present on the international wheat market. This result still seems to be valid as the FAO (2009, p. 22) characterizes the wheat business as a high-volume low-margins business. Nevertheless, there are incidences of price discrimination in wheat trade and there are also few studies not only trying to detect PTM behaviour but also to identify the underlying reasons.

As Knetter (1993) highlighted, price discrimination in international trade can be caused by numerous factors such as incomplete information, transportation costs,

and/or trade barriers. Patterson and Abott (1994) derive in their analysis on the export pricing behaviour of U.S. wheat exporters that the export market structure has a significant even though small impact on the export price markup. Their results show that the price markup is positively related to the U.S. seller concentration, measured by the Herfindahl-Hirschman index (HHI), in the destination market. In contrast, large importers, which account for a large share of US grain exports, were found to receive lower export prices. These results indicate that systematic price discrimination is closely related to the export market structure. The export market structure is also explicitly taken up in a study by Feenstra et al. (1996) on automobile exports from four source countries to 12 destination markets. Their results indicate that the relationship between exchange rate pass-through and market share is significantly nonlinear. In their empirical analysis which is based on a Bertrand differentiated products model the pass-through is lowest when the export country's market share is around 40 percent and highest when the market share approaches 100 percent.<sup>2</sup>

#### 4. Modelling Approach

We adopt the cross-sectional time-series model proposed by Knetter (1989) to test econometrically for alternative market structures:

$$\ln p_{it} = \beta_i \ln e_{it} + \lambda_i + \theta_t + u_{it}, \quad \forall i = 1, \dots, N \text{ and } t = 1, \dots, T. \quad (1)$$

where  $p_{it}$  is the wheat export price in Russian rouble to importing country  $i$  in period  $t$ ,  $e_{it}$  is the destination-specific exchange rate expressed as units of the domestic currency in Russian Rouble,  $\beta_i$  denotes the parameter on the exchange rate variable,  $\lambda_i$  represents the country effect,  $\theta_t$  represents the time effect, and  $u_{it}$  is an i.i.d. error term with zero mean and variance  $\sigma_u^2$ . Since the model is estimated in logarithmic terms,  $\beta_i$  represents the elasticity of the domestic currency export price with respect to the exchange rate.

The estimated parameters  $\beta_i$  and  $\lambda_i$  can be used to distinguish between different scenarios of export pricing behaviour (Knetter 1993). The first scenario refers to the competitive market structure (see table 2). In this scenario, movements in the

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<sup>2</sup> In this study market share is defined as the export's country share in total market sales. Total market sales are derived by adding up total production and total imports and subtracting total exports.

bilateral exchange rates do not affect bilateral export prices and export prices are the same across all destinations, i.e.  $\lambda_i = 0$  and  $\beta_i = 0$ . However these results are also consistent with imperfect competition with common markup. In this case both country and exchange rate effects are zero, but the price contains a common markup over marginal cost.

However, if the estimated parameters  $\beta_i$  and  $\lambda_i$  are statistically significant different from zero, imperfect competition and price discrimination across destination countries exists. Two different scenarios of price discrimination can be distinguished. The first one assumes a constant elasticity of demand with respect to the domestic currency price in each importing country leading to constant markup over marginal cost, i.e.  $\beta_i = 0$ . This markup can differ across destination countries, which implies  $\lambda_i \neq 0$ . However the country effect captures the constant quality differences. Therefore a significant estimate of the country effect does not necessarily indicate imperfect competition.

The other imperfect competition scenario is based on price discrimination with varying price elasticity of demand. In this scenario, the demand elasticity may vary with changes in the exchange rate. Let us consider a depreciation of an importer's currency relative to the exporter's currency. Due to this depreciation the price faced by consumers in the importing country increases. If the demand elasticity changes, the optimal markup over marginal cost will change, too. Thus, export prices will depend on exchange rates. This is pricing-to-market (PTM) behaviour, since the optimal markup by a price-discriminating firm will vary across destinations ( $\lambda_i \neq 0$ ) and with changes in bilateral exchange rates ( $\beta_i \neq 0$ ). Knetter (1993) further distinguishes the situations of a positive versus a negative sign for  $\beta_i$ . A negative  $\beta_i$  implies, that exporters do not pursue a constant markup policy, but rather stabilize prices in the buyer' currency. Knetter (1993) termed such behaviour local-currency price stability (LCPS). In contrast, a positive  $\beta_i$  signals that exporters amplify the effect of destination-specific exchange-rate changes through destination-specific changes in the markup. Table 2 provides an overview of the relationship between the model parameters and the different market structures.



**Table 2: Overview of the relationship between the estimated parameters and different market scenarios**

$\lambda$	$\beta$	Market Scenarios
Not significant	Not significant	Perfect competition, imperfect competition with common markup
Significant	Not significant	Constant elasticity of demand > constant markup, which can differ across countries
Significant	Significant	Varying elasticity of demand > varying markup, which can differ across countries
	<ul style="list-style-type: none"> <li>• Positive</li> <li>• Negative</li> </ul>	Amplification of exchange-rate effects Local-currency price stability (LCPS) > PTM

Source: Own compilation based on Knetter (1993).

A very closely related concept to PTM is exchange rate pass-through (ERPT). Though both concepts are quite similar, they are not identical. Exchange rate pass-through refers to changes in marginal cost and the elasticity of import demand induced by a change in the bilateral exchange rate. In contrast, PTM refers only to the change in the elasticity of import demand. Under the assumption of constant marginal costs, this means that in the case of  $\beta = 1$  there is complete PTM and no ERPT, whereas in the case of  $\beta = 0$  there is no PTM and complete ERPT (Gagnon and Knetter 1995). In the latter case, exporters maintain their own-currency prices and there is no adjustment induced by changes in the exchange rate. Incomplete ERPT can be caused among others by a non constant elasticity of demand in the importing country and adjustment costs (Pick and Carter 1994).

## 5. Data and descriptive statistics

We use annual data on Russian wheat export values and quantities which are provided by the Main Interregional Centre of Processing and Dissemination of Statistical Information of the Federal State Statistics Service (GMC Rosstat) and refer to trade classification at the 4-digit level of Harmonized System Codes (HS Code) for wheat and meslin (code 1001). The official exchange rates of foreign currencies against the rouble were obtained from the Central Bank of the Russian Federation (Bank of Russia). The data set includes 176 annually cross-section time-series observations from 2002 to 2009 for 22 wheat importing countries. The sample was chosen because of the following reasons: First, Russia became a significant wheat exporter in 2002. Second, during this period the Russian government had only short-term restrictions for wheat exports. However, Russia banned wheat exports in 2010 completely; therefore we end our analysis with

2009. Third, taking into account the volume and geography of exports, we selected 22 countries importing wheat from Russia throughout the study period (2002-2009) continuously. These countries account together for 73% of all Russian wheat exports in the considered period. Consequently, the data set is a balanced panel with contiguous cross section and time series. Major destinations for Russian wheat are North Africa and the Middle East.

**Table 3: Summary statistics of export unit values and currency exchange rate**

Countries	Export unit values (Thousand Russian roubles per tone )				Exchange rate (Foreign currency per unit of Russian roubles)			
	Min	Max	Mean	Std	Min	Max	Mean	Std
Albania	2460.08	6160.20	4111.96	1408.89	2.9209	4.4023	3.6033	0.4396
Algeria	2464.54	4233.29	3375.63	692.21	2.3062	2.7859	2.5738	0.1503
Armenia	2465.03	6617.59	4849.95	1455.33	11.9411	19.0538	15.2450	2.6818
Azerbaijan	2606.93	5976.74	4188.53	1427.00	0.0155	0.0332	0.0237	0.0084
Belarus	2807.86	7431.22	5057.38	1763.07	58.7296	88.7571	76.9663	9.9101
Cyprus	1965.30	5875.61	3846.35	1550.08	0.0220	0.0322	0.0283	0.0029
Egypt	2493.41	6386.61	4103.18	1376.22	0.1492	0.2207	0.1995	0.0250
Georgia	2650.23	6384.36	4495.87	1395.39	0.0533	0.0694	0.0630	0.0056
Greece	2306.22	6363.14	3924.42	1483.00	0.0220	0.0322	0.0283	0.0029
Israel	2182.56	6103.37	3904.69	1532.80	0.1205	0.1643	0.1502	0.0139
Italy	2202.47	6008.94	3592.17	1374.03	0.0220	0.0322	0.0283	0.0029
Kazakhstan	2443.93	12645.32	5475.85	3337.56	4.6615	4.9309	4.7943	0.1003
Lebanon	2605.88	6306.29	4101.14	1399.78	47.5946	61.2771	53.3236	5.1472
Libya	1957.17	6720.41	3982.06	1791.59	0.0391	0.0500	0.0449	0.0044
Mongolia	3229.83	8502.87	4754.86	1794.50	35.1684	46.8000	42.0959	4.2776
Morocco	2469.54	7546.01	4382.03	1948.58	0.2516	0.3387	0.3126	0.0260
Syria	2824.95	5522.55	3924.12	1145.73	1.4587	2.0772	1.8058	0.2070
Tajikistan	1251.28	10558.15	5069.51	3135.15	0.0882	0.1391	0.1166	0.0181
Tunisia	2689.01	6562.27	4332.66	1561.35	0.0419	0.0499	0.0461	0.0033
Turkey	2620.24	6086.03	4249.96	1373.81	0.0462	0.0549	0.0499	0.0030
Ukraine	2108.31	22286.10	6680.50	6496.42	0.1703	0.2655	0.1933	0.0304
Uzbekistan	11719.37	25253.84	20568.12	4462.66	24.7124	53.4419	40.9866	9.8161

Source: Authors' calculation based on data from the Main Interregional Center of Processing and Dissemination of Statistical Information of the Federal State Statistics Service (GMC Rosstat) and the Central Bank of the Russian Federation (Bank of Russia).

Tables 3 and 4 present the summary statistics of wheat exports of the 22 selected importing countries. The former presents information on the variables included in the model, namely, export unit values and bilateral exchange rates for the considered export destinations. The latter provides additional information on Russian wheat exports: the country importance as an export destination for

Russian wheat exports, the importance of Russian wheat imports in the domestic wheat markets as well as the wheat market share of Russia and other major wheat exporting countries in the selected 22 destination countries.

The data in table 3 indicate that there is a high variation in export unit values across countries importing wheat from Russia, for example the mean unit value is 3376 roubles in the case of Algeria and 20568 roubles in the case of Uzbekistan. These differences might be explained either by price discrimination, quality differences or a combination of both. In the case of Uzbekistan and Ukraine the export prices are much higher than those of other importing countries. This might be related to quality differences, since it is expected that they import also wheat seed and wheat seed is more expensive than milling wheat. The standard deviations in export unit values are quite large suggesting significant variations between the different years.

Table 4 shows the average share of the considered importing countries in total Russian wheat exports between 2002 and 2009. The data indicate that Russian wheat exports are quite evenly distributed among the importing countries with no country having a large share. An exception is Egypt to which one-fifth of all Russian wheat exports are shipped. Therefore we hypothesize that Egypt might be able to receive better prices than other importers. However, Egypt pays modest unit values and there are countries which pay significantly lower prices (for instance Algeria).

To illustrate the importance of Russian wheat exports for each destination market the share of Russian wheat imports in total domestic demand is calculated and presented. Domestic demand is defined as domestic production plus imports minus exports. The market share of Russian wheat ranges between between 0.11% and 50%. Russian wheat imports are most important in terms of market share in Albania, Cyprus, Georgia and Lebanon. These are the countries where Russia might be able to exercise market power.

Table 4, furthermore, presents information on the share of Russian wheat imports and wheat from its main competitors in total wheat imports for each of the considered importing country. We consider each exporting country with a market share of 3% and above as potential competitor for Russia. The 3% value is chosen arbitrarily and could be any other value. However, this relatively small threshold value prevents us to overlook any potential rival. We expect that Russia is able to exercise price discrimination whenever it possesses a rather large market share in the respective import market and just faces few competitors. Therefore, the main candidates for price discrimination are Armenia and Kazakhstan.

**Table 4: Market structure of export destinations: Importance of different wheat suppliers, Number of Competitors and the importance of each export destination for Russia**

Country <sup>a)</sup>	Russia	USA	Ukraine	Canada	France	Germany	Kazakhstan	RoW <sup>b)</sup>	Competitors <sup>c)</sup>	Domestic Consumption <sup>d)</sup>	Export share <sup>e)</sup>	Russian Export Quantity <sup>f)</sup>
Reporter	%	%	%	%	%	%	%	%	N	%	%	1000 t
Albania	<b>63.0</b>	2.0	<b>8.4</b>	0.0	<b>3.8</b>	0.3	1.1	21.4	3	31.09	1.96	177.9
Algeria	<b>8.6</b>	<b>5.3</b>	<b>3.4</b>	<b>12.4</b>	<b>36.8</b>	<b>6.7</b>	0.0	26.7	6	4.06	3.51	278.0
<b>Armenia</b>	<b>50.1</b>	0.4	2.0	0.0	0.2	0.0	2.6	44.6	<b>1</b>	15.47	0.76	122.9
Azerbaijan	<b>47.0</b>	0.7	0.0	0.0	0.0	0.0	<b>49.4</b>	2.9	<b>2</b>	19.14	5.63	528.8
Belarus	<b>35.8</b>	0.3	<b>12.0</b>	0.0	0.0	0.0	<b>20.1</b>	31.8	3	7.25	1.13	89.5
Cyprus	<b>19.0</b>	<b>14.7</b>	<b>8.2</b>	<b>6.0</b>	<b>16.4</b>	2.2	<b>5.8</b>	27.8	6	35.82	0.54	39.7
Egypt	<b>29.2</b>	<b>26.9</b>	<b>3.5</b>	1.0	<b>10.9</b>	0.6	1.2	26.7	4	16.11	<b>21.51</b>	2525.6
Georgia	<b>65.8</b>	<b>6.9</b>	1.8	0.0	0.1	0.0	<b>20.4</b>	5.1	3	49.67	4.62	391.5
Greece	<b>33.8</b>	0.0	<b>6.3</b>	<b>8.0</b>	<b>15.4</b>	<b>6.2</b>	<b>5.0</b>	25.2	6	13.33	3.93	319.9
Israel	<b>6.0</b>	<b>35.4</b>	2.5	0.0	<b>5.4</b>	<b>3.3</b>	0.2	47.3	4	21.18	3.62	350.5
Italy	<b>10.3</b>	<b>11.4</b>	<b>5.2</b>	<b>11.2</b>	<b>28.8</b>	<b>7.0</b>	1.3	24.8	6	4.42	6.62	572.2
<b>Kazakhstan</b>	<b>85.7</b>	0.0	1.2	0.2	0.2	0.0	0.0	12.7	<b>1</b>	0.11	0.09	17.7
Lebanon	<b>53.4</b>	<b>13.1</b>	2.0	0.0	0.7	0.8	<b>9.2</b>	21.0	3	40.04	2.34	222.5
Libya	<b>12.5</b>	<b>11.1</b>	<b>6.8</b>	<b>29.5</b>	0.0	<b>17.5</b>	0.0	22.7	5	20.43	1.28	225.6
Mongolia	<b>27.9</b>	<b>26.3</b>	0.0	0.1	2.0	0.0	<b>42.0</b>	1.8	3	19.92	0.51	58.9
Morocco	<b>10.4</b>	<b>11.7</b>	<b>7.1</b>	<b>18.4</b>	<b>31.2</b>	<b>5.4</b>	1.2	14.6	6	3.66	2.72	216.0
Syrian	<b>27.7</b>	0.0	<b>34.1</b>	0.0	0.0	0.0	2.8	35.3	<b>2</b>	6.04	1.84	333.5
Tajikistan	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.49	0.04	5.3
Tunisia	<b>16.3</b>	<b>5.2</b>	<b>19.8</b>	<b>12.9</b>	<b>13.2</b>	0.5	<b>3.6</b>	28.5	6	9.18	2.56	243.4
Turkey	<b>16.6</b>	<b>4.7</b>	1.5	<b>4.4</b>	1.0	<b>12.6</b>	<b>13.4</b>	45.9	5	2.66	5.16	753.9
Ukraine	<b>27.8</b>	0.8	0.0	<b>5.1</b>	1.1	<b>3.2</b>	<b>51.7</b>	10.3	4	3.28	2.87	212.2
Uzbekistan	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.06	0.03	3.7

Note: <sup>a)</sup> Average market share of wheat export countries in the wheat market of destination countries for 2002 -2007, <sup>b)</sup> Rest of World, <sup>c)</sup> Number of Competitors (wheat export countries) with an average market share of 3 % and above for 2002 -2007, <sup>d)</sup> Average share of Russian wheat imports in domestic wheat consumption for 2002 -2008, <sup>e)</sup> Average share of wheat exports shipped to the respective destination in total Russian wheat exports for 2002 -2008, <sup>f)</sup> Average quantity of Russian wheat exports in 1000 t for 2002 -2009.

Source: Authors' calculation based on data from the Comtrade, FAOSTAT and ROSSTAT and Global Trade Atlas.

Finally, table 4 shows that Kazakhstan, Tajikistan and Uzbekistan import only very small quantities from Russia, which therefore, makes it difficult to interpret the estimates. If the quantity is small, some factors have unusual big influence. These factors can be e.g. quality, interfirm relationships, regional characteristics and the results cannot be generalized at the country level. It might be the case that Uzbekistan imports only wheat seed and thus it is difficult to compare it with other countries. Thus, we have to treat the results for these three countries with caution. If e.g. the results would show that the Russian companies price discriminate for less than 1% of the total export, we could not argue that generally the Russian wheat export is imperfectly competitive. However, despite of these concerns we will leave these countries in the first estimation of our model.

## 6. Estimation results and discussion

The time-series–cross-section model (equation 1) is estimated by a two-way fixed-effects estimation method (Greene, 557-589). Table 5 presents the estimation results for market structure and pricing behaviour of Russian wheat exporters. With respect to the statistical inference the results indicate a good model fit reflected in rather high values of the R-squared. The model has 22 cross section and 8 time series. For the test of no cross sectional and time series effects we apply the Breusch-Pagan test for two-way random effects. According, to the Breusch-Pagan test we can reject the null hypothesis at a significance level of 1%. Furthermore, the F-statistic rejects the null hypothesis of no fixed effects at the 1 % level. Thus there are no correlation between the effects variables and regressors. Five of out seven time dummies are statistically significant at the 1% level.

With respect to the parameters  $\beta_i$  and  $\lambda_i$  our results suggest that we can identify two of the different pricing scenarios which we discussed in section 3. In 17 out of 22 countries, the results indicate that Russian wheat exporters behaves as competitive suppliers, i.e. in Albania, Algeria, Azerbaijan, Belarus, Cyprus, Egypt, Georgia, Greece, Israel, Italy, Lebanon, Libya, Mongolia, Morocco, Syria, Tunisia, and Turkey. For these countries we cannot reject the null hypotheses of  $\beta_i = 0$  and  $\lambda_i = 0$ , meaning that the bilateral exchange rate of Russian roubles do not affect the export price ( $\beta_i = 0$ ) and the Russian suppliers do not overcharge or undercharge the export price for these destination countries ( $\lambda_i = 0$ ). Based on the results of this model the wheat market structure is competitive. This may be due to the good access to the world market and the resulting competition in these countries.

**Table 5: Estimation results for Russian wheat exports**

Variable	Estimate $\beta_i$	t-stat	Variable	Estimate $\lambda_i$	t-stat	Variable	Estimate $\theta_i$	t-stat
Albania	0.2274	(0.34)	CS1	0.3203	(0.09)	<b>TS1</b>	<b>-0.7391</b>	<b>(-8.85) ***</b>
Algeria	0.0964	(0.07)	CS2	-0.2510	(-0.05)	<b>TS2</b>	<b>-0.6015</b>	<b>(-7.76) ***</b>
<b>Armenia</b>	<b>0.7865</b>	<b>(1.72)*</b>	CS3	3.0320	(0.95)	<b>TS3</b>	<b>-0.3521</b>	<b>(-4.82) ***</b>
Azerbaijan	0.0002	(0.00)	CS4	-0.4178	(-0.16)	<b>TS4</b>	<b>-0.4818</b>	<b>(-6.54) ***</b>
Belarus	0.1420	(0.24)	CS5	0.1295	(0.04)	<b>TS5</b>	<b>-0.3251</b>	<b>(-4.24) ***</b>
Cyprus	-0.6720	(-0.91)	CS6	-2.9251	(-0.81)	TS6	0.0990	(1.31)
Egypt	0.0672	(0.11)	CS7	-0.1733	(-0.05)	TS7	0.0731	(1.01)
Georgia	0.2375	(0.27)	CS8	0.3168	(0.09)	<b>Intercept</b>	<b>8.9997</b>	<b>(3.61) ***</b>
Greece	0.0805	(0.11)	CS9	-0.2061	(-0.06)			
Israel	0.1194	(0.15)	CS10	-0.0026	(0.00)			
Italy	0.3141	(0.42)	CS11	0.5398	(0.15)			
<b>Kazakhstan</b>	<b>-8.4962</b>	<b>(-2.22)**</b>	CS12	<b>-26.0467</b>	<b>(-2.19)**</b>			
Lebanon	0.1494	(0.18)	-					
Libya	1.1237	(1.37)	CS14	2.9816	(0.86)			
Mongolia	-1.1048	(-1.42)	CS15	-3.7990	(-1.11)			
Morocco	-0.1901	(-0.21)	CS16	-1.0667	(-0.27)			
Syria	-0.3284	(-0.48)	CS17	-1.7899	(-0.50)			
<b>Tajikistan</b>	<b>1.9004</b>	<b>(3.74)***</b>	CS18	<b>8.1014</b>	<b>(2.47)**</b>			
Tunisia	0.8442	(0.75)	CS19	2.2082	(0.53)			
Turkey	0.5164	(0.38)	CS20	1.1482	(0.24)			
<b>Ukraine</b>	<b>3.3290</b>	<b>(5.72) ***</b>	CS21	<b>13.0042</b>	<b>(3.82)***</b>			
<b>Uzbekistan</b>	<b>-1.8757</b>	<b>(-6.01) ***</b>	CS22	<b>-4.8468</b>	<b>(-1.84)*</b>			
Number of Cross Sections			22					
Time Series Length			8					
F-Test for No Fixed Effects			15.8***					
Breusch Pagan Test for Random Effects			649.6***					
$R^2$			0.8864					

The superscript \*\*\*,\*\* and \* denotes statistical significance of t-statistic at the 1%, 5% and 10% levels, respectively.

Egypt, the most important destination market for Russian wheat exports, also belongs to this group. This is plausible as in the Egyptian wheat market there is a strong price competition between Australia, Russia, the United States and France, therefore Russia can not charge significant markup over marginal cost. Furthermore, Russia is building up its long term presence in Egypt, therefore it is interested to offer competitive prices near to marginal costs. Another reason is that Egypt buys high volumes and therefore it is a secure market every year for Russia and the transaction costs per unit decrease compared to other countries.

Surprisingly, in some countries where Russia has a rather high share (for example Albania, Georgia or Syria) the market is also competitive. The reason can be that the supply response of competitors is elastic, therefore Russia can not price discriminate. The results indicate that Russian wheat exporters exercise pricing to market in five countries, namely Armenia, Kazakhstan, Tajikistan, Ukraine and Uzbekistan. Both estimated parameters  $\beta$  and  $\lambda$  are statistically significant different from zero. Negative and positive signs for the coefficient  $\beta$  are consistent with the model of price discrimination. While a negative coefficient indicates that wheat exporters adjust export price downward to offset exchange rate movements, a positive sign indicates that exporters adjust export price upward as the local currency appreciates. Thus, in these countries, the bilateral exchange rate affects the export price and the Russian wheat suppliers adjust the markup over marginal cost across these destination countries.

The optimal markup charged by suppliers depends on the demand schedule present in these countries. The demand elasticity may vary with changes in the exchange rate. As a result the optimal markup over marginal cost does change and export prices depend on exchange rates. The appreciation or depreciation of the Russian roubles lowers or raises wheat export price in the local currency respectively. As a result of the corresponding movements in the exchange rate the wheat demand depends on the local currency price.

The exchange rate effects are negative for Kazakhstan and Uzbekistan. Therefore they indicate that the Russian exporters offset the exchange rate changes. In contrast the  $\beta$  is positive for Armenia, Tajikistan and Ukraine showing that the Russian traders amplify the effect of exchange rate changes.

However the PTM effects are not very pronounced since two of these countries, Kazakhstan and Ukraine, are also main wheat exporters and thus they do not depend strongly on Russian wheat imports. Besides, Russia has a minor market

share in Tajikistan. In Armenia the exchange rate effect is only significant at a 10 % and the country effect is not significant at all.

As noted above Russia exports only very small quantities to Kazakhstan, Tajikistan and Uzbekistan and thus some factors might have an unusually big influence. The high export prices, especially in the case of Uzbekistan suggest that the export to these countries consists of special qualities and therefore the Russian exporters have some market power. Furthermore, it is possible that only one or two firms (close to the border) import and they do not have other options (the import of these small quantities could be more expensive from more distanced source countries).

The model provides evidence on PTM behaviour, but it does not explain the source of it. Therefore we can not discuss in detail why Russian exporters price discriminate in these countries. To explain the source of the pricing behaviour of Russian exporters more profoundly we need more information. More specifically, we need information about the specific institutional environment of the international wheat market, and of the individual countries, about traded wheat qualities, the Russian wheat export structure and the conduct of Russian exporter firms as well as about the trade policies of the individual countries. Some of the information can be found and we will use them in the course of our further research. However other information, e.g. conduct of the Russian exporters, would be much more challenging to collect.

The underlying reasons of the observed competitive behaviour can be the following. The major buyers of Russian wheat are countries with easy access to the world market. Therefore it is expected that there is price competition among the main exporters for these markets. Thus the residual demand is elastic, as a result Russia supplies wheat at least near to marginal costs. Furthermore, Russia is investing in export infrastructure. These investments can only be profitable if Russia faces adequate demand and can utilize its infrastructure. Therefore Russia is interested in building up long term relationships and stable market shares. This is only possible with competitive prices, since the quality is not good enough to use product differentiation. It might be expected that Russia uses price discrimination for the land locked CIS countries, which are not connected to the world market. However there is Kazakhstan, another leading wheat exporter, who is also land locked. Therefore the nearby CIS countries are main markets for Kazakhstan, inducing competition for Russia. A further issue is the changing production quantity, due to the weather conditions and the resulting trade restrictions. They make Russia an unreliable supplier and might decrease its export price, because the importers should be compensated for taking this risk. A final reason can be that there is a shortage of storage capacity and hence the



Russian exporters have to sell the wheat shortly after harvest, and they can not wait for higher market prices.

There are several reasons why the competitive structure of the Russian wheat export differs from its competitors, the US and Canada, reported by previous studies. Table 6 gives a short summary.

**Table 6: Comparison of the Russian, US and Canadian wheat export**

	<b>US</b>	<b>Canada</b>	<b>Russia</b>
Product characteristics	Differentiated high quality	Differentiated, very high quality	Undifferentiated, second class quality
Contract length	High share of long term	High share of long term	High share of Short term
Importing countries	Stable partners, developed and developing countries	Stable partners, developed and developing countries	High share of changing partners, mostly developing countries
Influence of trade policy	Minor	Minor	High
Export market structure	Oligopolistic	Monopolistic	Oligopolistic

Source: own compilation based on Pick and Park 1991, Pick and Carter 1994, Carew 2003, Lavoie 2005, Jin 2008, Jin and Milijkoic 2008, USDA 2010, World Bank (2009) own results.

First, the US and Canada produces also differentiated high quality wheat, therefore they have market power originating from product differentiation. The demand for high quality wheat is rather inelastic. Generally, the demand for more expensive products is more inelastic (Knetter 1989). This is because high quality, differentiated products have fewer direct substitutes and, thus, it is more difficult for the buyer to change the seller. Consequently, the demand for the differentiated products from a given source country is more inelastic as for the undifferentiated products. Also, there are special types of wheat for different uses (e.g. pizza, pasta or bread) which are not direct substitutes (Lavoie 2005). In contrast, Russia produces relatively undifferentiated wheat and it is, rather, second class quality. However, it also produces high quality but in small quantity (World Bank 2009). Therefore, Russia, in general, can not have market power from the product differentiation. Thus, the residual demand for second class quality is rather elastic. The undifferentiated goods have many direct substitutes and it is relatively easy for the buyer to choose other substitute. Thus there is less opportunity to use pricing to market. Looking at the export statistics we can discover that the US and

Canada have quite stable export partners, supplying quite similar quantities of wheat to those countries every year. Thus the US and Canada might have long term contracts with their buyers. In contrast, Russia changes its partners almost every year and there are only a few countries where Russia exports similar quantities over several years (e.g. Egypt, Italy). This indicates short term contracts. Furthermore, the US and Canada supplies both affluent and developing countries, while Russia ships its wheat mainly to poorer countries. A final issue is the influence of trade policy. In Russia the government policies have much bigger influence. This influence is shown by the export restrictions or even export ban applied in the last years. The US and Canada do not use such drastic tools. This influence creates an unsure environment for Russian exporters and their buyers and makes it hard to plan for long term and apply more diverse pricing practices.

## **7. Concluding remarks**

Over the last ten years, Russian wheat exporters have achieved a strong market position in the international wheat market. The Russian share has grown from 0.5 percent to 13.8 percent since 2000. It is expected that Russia will be the first wheat exporter of the world by 2019 (USDA 2010). Thus Russia has an increasing influence on the world market. This has increased attention on the Russian wheat export market.

Russia's plan to establish a grain pool with Ukraine and Kazakhstan has drawn some media attention. However, it seems unlikely that such a grain pool will be able to exercise significant market power. The world wheat market is characterized by low trade margins and high volumes. Moreover, wheat quality differs rather strongly across countries. Hence, it seems most likely that each country will search for the most profitable quality niche to compete on the world market.

Our study has found that Russia is able to exercise pricing to market in some wheat importing countries, but it does not immediately mean that Russia exerts market power in the world wheat market. The estimated parameters of the model reveal evidence for the existence of pricing to market behaviour of Russian exporters, first, in wheat importing countries where Russia has a large share in total import, and is the single supplier or has only one competitor (Armenia and Kazakhstan). Second, there is evidence for price discrimination in the wheat importing countries that are landlocked and have limited access to the world market (Armenia, Kazakhstan, Tajikistan and Uzbekistan). At the same time, Russia exports only very small quantities to Kazakhstan, Tajikistan and Uzbekistan and, therefore, the estimates are difficult to interpret. Since the traded

quantities are rather small, some factors might have an unusual big influence, e.g. wheat quality. The high export prices, especially in the case of Uzbekistan, suggest that the exports to these countries consist of special qualities and, this might be the reason for Russian exporters to be able to exercise some market power.

As discussed earlier, the model, applied in this paper, only gives evidence of price discrimination but does not provide the source of it. Hence, we need further information and model extension to explain the observed behaviour more precisely.

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