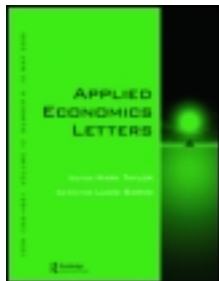


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Competitive structure of Canadian wheat exports in the world market

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This article re-examines competitive structure of Canadian wheat exporters for evidence of pricing-to-market by the Canadian Wheat Board (CWB), and extends the extant literature by utilizing a broader range of data over importing countries, which better facilitates the detection of pricing behaviour. Our analysis yields interesting empirical results that contrast with other recent arguments. In particular, we find that the CWB exercises mixed practices having market power in a limited extent, getting premiums with better quality of its wheat in some markets and providing wheat at discounted prices in some other destination countries.

I. Introduction

Wheat is one of the most commonly traded agricultural commodities because a few countries produce most of the world's wheat (Gómez-Plana and Devadoss, 2004). The market shares of wheat exporting countries, mainly Argentina, Australia, Canada, European Union, and the United States, in the world market have been fluctuating.¹ In particular, Canada has maintained its market shares under increased competitiveness of the world wheat market, by utilizing its state trading agency, the Canadian Wheat Board (CWB), to effectively market wheat produced in the territory.²

Together with US dollar appreciation, the state trading agency has been an important issue in the world wheat market (e.g. Jin *et al.*, 2004) since wheat producers in the United States claimed that the state trading agency has an unfair advantage over the US

exporters in the world market because it receives hidden subsidies from its government. Inquiries into the market power or pricing-to-market (PTM) behaviour of the CWB in the international wheat market have been numerous, and much has been written on empirical sides of this question. Hitherto, there are mixed empirical results for the issue and there is therefore no real consensus about the CWB's behaviour.

This study revisits the issue of the CWB in the world wheat market with data of a comprehensive list of destination markets of Canadian wheat. This study will add another layer of empirical finding of the imperfect competition in the world trade market. There is no single direct matrix to test whether an exporting country has competitive power in the world market. However, the approach of observing PTM behaviour provides information about imperfect competition between exporting countries in a destination market. It tests whether an exporting country

¹ Figures for market shares of major wheat exporting countries from 1960/1961 to 2004/2005 by marketing year are available from the author upon request.

² The CWB is one of the largest and longest standing public export-marketing agencies of wheat and barley in the world. It is a mandatory pool, as producers are required to sell their grain to the CWB. Three pillars provide the basis of CWB operations: single-desk selling, price pooling and government guarantees.

can differentiate export prices according to each destination market condition. In particular, the Knetter (1989) model is used to test for the pricing behaviour of the CWB.

II. Literature Review

Lavoie (2002) finds that the CWB charges different prices to different countries for wheat of the same grade and protein content because Canadian wheat is recognized to be of higher quality than US wheat and different markets may have different willingness to pay for a higher quality. Wilson *et al.* (1999) analyse the effect of the US Export Enhancement Program (EEP) subsidy³ on the CWB's price discrimination for wheat. They conclude that it created a large price gap between the price paid for US exports to EEP recipient countries and the price to nonrecipient countries and the CWB reacted strategically to the EEP by charging a higher price to nonrecipient countries.⁴ Brooks and Schmitz (1999) remark that the CWB was able to price discriminate prior to EEP, although the magnitude was smaller. Schmitz and Furtan (2000, p. 73) also claim that the single-desk seller can price discriminate even without EEP. Kraft *et al.* (1996) indicate that the CWB has been able to extract a premium of about \$C13/metric ton for wheat, which they attribute to the discriminatory powers as a single seller, taking advantage of markets in countries such as Brazil and China. Schmitz and Gray (2000) suggest that the CWB can manipulate the market to the benefit of Canadian producers.

While many studies agree that the CWB has the ability to engage in some degree of price discrimination, there is disagreement about the evidence of market power. Carter *et al.* (1998) argue that the CWB is essentially a price taker in the wheat market. They point out that there is a high degree of substitutability among wheat from various exporters and that 75–80% of the wheat is imported by developing countries whose main consideration is price. Carter and Loyns (1998) argue that the world grain market is competitive, given the large number of exporters and importers and freedom of entry. They also comment that price differences are not necessarily evidence of market power and that price

differences may exist between markets for many reasons – such as the US EEP subsidies, EU export restitution, quality differences, and particular services provided – and more than a claimed price premium is required to produce evidence of market power. Young (1999) also notes that since a large percentage of world markets are classified as price sensitive bulk markets for wheat, the ability to price discriminate in the world grain markets is limited.

The inconclusive debates suggest a need for an analysis regarding the CWB's price adjustment in destination markets beyond charging different prices to different countries. If we see both price discrimination for different export markets and price adjustment with changing elasticity of demand, this could be used to support the argument that the CWB has the discriminatory power as a single seller. If we see only the price discrimination, this may support the argument of Carter and Loyns (1998) that price differences are not necessarily evidence of market power. If neither are found, it might suggest that the world wheat market is competitive and the state trading agency has no price discriminatory power.

III. Methodology for Analysing PTM

Exporters may exercise price discrimination by adjusting prices to different export destinations. This PTM behaviour pertains to decisions by exporters to maintain or even increase export prices when facing currency depreciation relative to the importer's currency (Pareja, 2001). Krugman (1987) named the PTM behaviour after the phenomenon that exchange rate difference induces price discrimination in international markets. PTM is generally involved in multiple markets and is connected to the notion of markup-pricing over marginal cost and, thus, imperfect competition. Knetter (1989, 1993) suggests a method to measure potential markup of exporters in specific destination markets with a firm's PTM behaviour in response to exchange rate movements.

Using his idea, after separating time varying marginal cost of an exporting firm, one can estimate destination-specific markup of the firm. His method is intuitively plausible and easy to apply to empirical

³The EEP was initiated under Food Security Act of 1985. This program allows exporters to sell US products in targeted markets at prices below their costs by providing cash bonuses. According to the data set of *Foreign Agricultural Trade of the United States* provided by Foreign Agricultural Service of the USDA, among various commodities, wheat accounts for more than 80% of the total value of all EEP-assisted sales. Until 1994, EEP was applied to an average of 50 to 70% of US wheat exports.

⁴Wilson *et al.* state that price discrimination has continued even after the elimination of EEP, but at a lesser magnitude, and that it exists to the extent that the CWB can exploit market power and differentiate their product from those of competitors.

works, so the model has become popular to estimate potential markup and imperfect competition in international trade. Knetter's method uses the following cross-sectional time-series equation:

$$\ln p_{it} = \theta_t + \lambda_i + \beta_i \ln s_{it} + u_{it} \quad (1)$$

where p_{it} is destination specific export price; θ_t is the time effect; λ_i is the country effect; s_{it} is currency value of an exporting country versus importing countries' currency value; β_i is the coefficient for the exchange rate variable, which is specific for each destination market; and u_{it} is the error term. Equation 1 can be used to distinguish between the following three models of market structure.

The first model pertains to the competitive market structure, in which export prices will be the same for all destinations because there is no country effect, i.e. $\lambda=0$. In this case, changes in the bilateral exchange rates do not affect bilateral export prices, implying $\beta=0$. The time effects represented by θ_t measures the common price for all destinations.

The second model assumes constant elasticity of demand with respect to the price in domestic currency terms in each of the importing countries, a reasonable approximation for slight movements along the demand curve. In such a model, the markup over marginal cost as given is constant but may vary over time and across destinations, implying $\lambda \neq 0$. Shifts in bilateral exchange rates do not influence export prices to various destinations, implying $\beta=0$.

The third model is based on price discrimination with varying elasticity of demand. Under this situation, the demand elasticity may vary with changes in the exchange rate. Consider a depreciation of an importer's currency relative to the exporter's currency. The price faced by consumers in the importing country then increases. If the demand elasticity remains constant, then the exporters are faced with a constant elasticity demand schedule. However, if demand elasticity changes, then the optimal markup over marginal cost will change and export price will thus depend on exchange rates.

This is pricing-to-market because the optimal markup by a price-discriminating firm will vary across destinations and with changes in bilateral exchange rates. This case implies $\lambda \neq 0$ and $\beta \neq 0$.

A nonzero coefficient of β is inconsistent with both competition and price discrimination with constant elasticity of demand. Exchange rate changes drive a wedge between the price paid by the buyer and the price received by the seller in their respective currencies. At a given price in the exporter's currency, a depreciation of the importer's currency raises the local currency price paid by the importer. If demand has constant elasticity with respect to price, the optimal markup charged by the exporter will not change as change in exchange rate increases the price paid by the importer. If, however, demand elasticity changes with variation in the local currency price, then export prices will depend on exchange rates.

IV. Analysis of PTM Behaviours of the Canadian Wheat Board

Data

The data used in this study consist of the unit values of Canadian wheat in each destination market and nominal exchange rates between the Canadian dollar and importing countries' currency values. The importing countries are 19 major grain importing countries.⁵ The unit value data were obtained from the OECD bilateral trade data set, Trade in Commodities, and the CWB. Exchange rate data were obtained from the International Financial Statistics database of the International Monetary Fund. The frequency of the sample data is annual and ranges from 1988 to 2003. Wheat prices are expressed in Canadian dollars per metric ton (MT) for durum and nondurum wheat unmilled. Summary statistics of the unit values of wheat for each destination market and the exchange rates are displayed in Table 1.⁶

⁵The importing countries are Algeria, Belgium–Luxembourg, Brazil, China, Colombia, Ghana, Indonesia, Italy, Japan, Malaysia, Morocco, Mozambique, Pakistan, the Philippines, South Korea, Thailand, the United Kingdom, the United States and Venezuela.

⁶The OECD data set for the unit values of Canadian wheat in destination markets is available until 1997, so samples from 1998 to 2003 were obtained from the CWB. We compared the two data sets and found that earlier observations of the CWB sample coincide with the observations of the OECD sample for the same years. When splicing two different series from different sources into a series, in some cases, there could be a jump or kink in the final time series at the point of splicing. To ascertain whether there were jumps or kinks in the data, we plotted each time series of the panel data, but did not find evidence of any jump or kink during the sample period.

Table 1. Summary statistics of Canadian wheat prices and Canadian dollar values vs. importing countries' currency values

Importing country	Wheat prices				Exchange rates			
	Mean	SD	Max	Min	Mean	SD	Max	Min
Algeria	170.15	27.02	229.74	131.68	67.734	40.964	125.09	9.000
Belgium–Luxembourg	160.52	39.87	224.18	83.02	49.915	10.501	69.925	39.017
Brazil	156.80	26.24	213.71	113.85	1.647	1.606	4.586	0.000
China	155.68	25.86	202.70	112.04	10.074	2.974	12.994	4.552
Colombia	159.35	27.29	212.20	112.21	1913.20	1242.22	4002.60	457.14
Ghana	147.61	20.59	192.47	115.17	4112.52	4496.69	12453.54	319.38
Indonesia	160.71	25.39	207.37	114.88	7151.23	5569.33	16028.27	2100.61
Italy	160.58	26.19	209.47	116.37	2283.08	638.68	3356.34	1398.71
Japan	162.63	26.39	207.52	113.24	162.66	19.561	196.84	128.73
Malaysia	152.26	23.31	197.12	116.45	4.313	1.205	5.966	3.083
Morocco	163.74	36.37	223.12	104.52	12.949	2.554	17.529	9.623
Mozambique	153.47	29.64	223.39	113.33	15179.15	12136.06	37172.01	898.65
Pakistan	145.15	24.36	206.85	121.37	55.176	25.068	96.209	24.410
Philippines	147.29	29.90	204.94	103.89	48.233	19.852	81.288	25.823
South Korea	139.28	31.50	197.22	86.41	1348.69	457.49	2020.51	794.37
Thailand	154.74	26.82	210.86	112.48	44.874	15.091	69.025	29.244
UK	160.84	25.71	209.10	114.34	0.855	0.129	1.077	0.652
USA	149.93	21.76	195.74	119.93	0.740	0.078	0.873	0.637
Venezuela	160.45	24.08	209.71	125.22	671.15	683.19	2253.07	41.489

Notes: The sample starts from 1988 and ends in 2003. Wheat prices are expressed by Canadian dollar per MT for durum and nondurum wheat unmilled.

Empirical results

Empirical estimation of Equation 1 is performed using a two-way fixed panel approach, based on the results from Breusch and Pagan (1980) LM and Hausman tests.^{7,8} The results from the panel estimation show relatively high fitness of the model to the data set. Estimation results are presented in Table 2. With respect to the three categories explained in the methodology section, the results show as follows. First, for ten countries out of 19 – Algeria, China, Ghana, Indonesia, Japan, Pakistan, the Philippines, Thailand, the United Kingdom and Venezuela – the results show that $\lambda = 0$ and $\beta = 0$. This means that the CWB behaves as a competitive supplier in these countries; i.e. the CWB does not overcharge or undercharge (of its marginal cost) for the destination markets and bilateral exchange rates do not affect destination-specific export prices. Secondly, in Belgium–Luxembourg, Brazil, Colombia, Malaysia, (Morocco), $\lambda \neq 0$ and $\beta = 0$, implying that the CWB overcharges (undercharges) a markup over the marginal cost as given across destinations.

The disparity is statistically significant at the 5% level, but shifts in bilateral exchange rates do not influence export prices to various destinations.

Thirdly, the CWB exercises pricing-to-market in Belgium–Luxembourg, Italy, Mozambique, South Korea and the United States. That is, either $\lambda \neq 0$ and $\beta \neq 0$ or $\lambda = 0$ and $\beta \neq 0$. This suggests that the optimal markup charged by the CWB depends on the demand schedule of the five importing countries faced by the exporter. That is, for these importing countries, the demand elasticity for Canadian wheat may vary with changes in the exchange rate, and the optimal markup over marginal cost will change and export price will thus depend on exchange rates. At a given level of wheat price in terms of Canadian dollars, a depreciation (appreciation) of the Canadian dollar raises (lowers) wheat price in the local currency paid by the importers and import demand depends on the local currency price in the importing country.

The results from this study highlight the following notable points. First, the CWB charges different prices, but constant with respect to exchange rate changes, for five importing countries, and it adjusts

⁷ The Breusch and Pagan LM test was performed and the test statistic is larger than the critical value of χ^2 distribution with 2 degrees of freedom at the 5% level (5.99). That is, the null hypothesis of no time and cross effect was rejected, indicating that inclusion of country and time-specific effects is reasonable.

⁸ The Hausman (1978) test was performed, and the result showed that the test statistic is larger than the critical value of χ^2 distribution at the 5% level. Therefore, the null hypothesis of no correlation between the effect variables and the regressors was rejected and thus the country and time effects are treated as fixed.

Table 2. Estimation results

Variables	β_i (<i>t</i> -stat.)		Variables	λ_i (<i>t</i> -stat.)		Variables	θ_i (<i>t</i> -stat.)	
Algeria	0.031	(0.96)	CS1	-0.250	(-0.85)	TS1	0.114	(2.59)**
Belgium–Luxembourg	-0.745	(-5.34)**	–			TS2	-0.168	(-3.82)**
Brazil	0.001	(0.09)	CS2	3.039	(-5.77)**	TS3	-0.226	(-5.29)**
China	-0.156	(-1.95)	CS3	0.159	(-1.20)	TS4	-0.140	(-3.45)**
Colombia	0.055	(1.34)	CS4	0.481	(-2.49)**	TS5	-0.320	(-8.86)**
Ghana	0.017	(0.75)	CS5	0.137	(-0.98)	TS6	-0.332	(-9.92)**
Indonesia	0.031	(0.89)	CS6	-0.047	(-0.26)	TS7	0.0001	(0.00)
Italy	0.201	(2.03)**	CS7	-0.101	(-0.35)	TS8	0.180	(5.50)**
Japan	0.305	(1.40)	CS8	-1.385	(-1.88)	TS9	-0.040	(-1.300)
Malaysia	-0.026	(-0.25)	CS9	0.545	(-2.56)**	TS10	-0.105	(-3.55)**
Morocco	0.256	(1.73)	CS10	-2.207	(-3.82)**	TS11	-0.194	(-6.56)**
Mozambique	-0.048	(-2.09)**	CS11	-0.480	(-1.32)	TS12	-0.255	(-8.56)**
Pakistan	0.065	(1.09)	CS12	0.147	(-0.87)	TS13	-0.204	(-6.62)**
Philippines	0.063	(0.88)	CS13	-0.195	(-0.83)	TS14	-0.123	(-3.99)**
South Korea	0.309	(3.70)**	CS14	-1.376	(-1.25)			
Thailand	-0.120	(-1.39)	CS15	-0.170	(-0.64)			
UK	-0.157	(-0.86)	CS16	0.098	(-0.63)			
USA	-0.586	(-2.11)**	CS17	0.573	(-1.82)			
Venezuela	0.028	(1.31)	CS18	-0.084	(-0.63)			
Number of cross section			18					
Length of time series			15					
<i>F</i> -test			24.93 (0.0001)					
<i>R</i> ²			0.79					

Notes: The equation is $\ln p_{it} = \theta_t + \lambda_i + \beta_j \ln s_{it} + u_{it}$, where p_{it} is destination specific export prices; θ_t is the time effect; λ_i is the country effect; s_{it} is exchange rates. Values in the parenthesis are *t*-statistics. Estimated parameters in bold indicate statistically significant values. The superscript ** denotes statistical significance of *t*-statistic at the 5% level. For the cross-sectional specification, Belgium–Luxembourg is treated as the intercept so that CS1 denotes Algeria, CS2 denotes Brazil, and so on.

price for five other countries according to exchange rate movements. Secondly, with respect to the export by the CWB to the United States, the CWB exhibits pricing-to-market behaviour. This may be due to limited competition in the US market in which the CWB and the US private companies compete but other countries do not export wheat to the US market because the CWB and US companies have advantages in terms of transportation costs. Another possible explanation for the PTM behaviour by the CWB in the US market is a difference in quality between Canadian and US wheat perceived by consumers (Uri and Beach, 1996).

As discussed in the literature review, some studies argue that the single seller prestige gives the CWB some market power with which it exerts price discrimination, but others maintain that different prices charged by the CWB in different markets may be because of different quality of Canadian wheat compared to that of other exporting countries. However, the empirical results of this article suggest that the two arguments do not necessarily contradict each other, i.e. the CWB's behaviour cannot be described within a category. It appears that the CWB exercises market power in, some markets in a limited

extent and it charges different prices for some other markets because of different quality of its wheat compared to that of competitors. The CWB also undercharges the wheat price with a discount in some importing countries, i.e. the CWB gives away protein by over-delivering on contract specifications. In short, the implications of the results are mixed with indications of market power in a limited extent, of premiums with different quality, and of discounted sale for some markets.

V. Summary and Conclusion

This study has analysed the pricing behaviour of the CWB in the major wheat importing countries using the Knetter (1989) model with broader range of data over cross-section. Empirical results show that the CWB exercises limited pricing-to-market behaviour in some destination markets. However, it does not necessarily suggest that such behaviours come from market power that the CWB has in the world wheat market. Rather, the results show mixed practices of the CWB, having market power in some markets,

getting premiums from the better quality of its wheat, and providing wheat at a discounted price.

This study has a limitation with respect to the data set. We used annual observations due to a limitation of data availability in higher frequencies. Annual observations may trim away some effects because they are obtained by averaging out a higher frequency data. Therefore, with a higher frequency data we may obtain both a higher clearer goodness of fit of the empirical estimation and information of pricing behaviour in each destination market.

References

- Breusch, T. S. and Pagan, A. R. (1980) The Lagrange multiplier test and its application to model specification in econometrics, *The Review of Economic Studies*, **47**, 239–53.
- Brooks, H. and Schmitz, T. G. (1999) Price discrimination in the international grain trade: the case of Canadian Wheat Board feed barley exports, *Agribusiness*, **15**, 313–22.
- Carter, C. A. and Loyns, R. M. A. (1998) The Canadian Wheat Board: its role in North American state trading, Paper prepared for the project on The Role of State Trading of Agricultural Products in North America, Institute of International Studies, Stanford University, October.
- Carter, C. A., Loyns, R. M. A. and Berwald, D. (1998) Domestic costs of statutory marketing authorities: the case of the Canadian Wheat Board, *American Journal of Agricultural Economics*, **80**, 313–24.
- Gómez-Plana, A. G. and Devadoss, S. (2004) A spatial equilibrium analysis of trade policy reforms on the world wheat market, *Applied Economics*, **36**, 1643–8.
- Hausman, J. A. (1978) Specification tests in econometrics, *Econometrica*, **46**, 1251–71.
- Jin, H. J., Cho, G. and Koo, W. W. (2004) The third country effect in the U.S. wheat trade shares in Asian countries, *Journal of Agricultural and Applied Economics*, **36**, 797–813.
- Knetter, M. M. (1989) Price discrimination by U.S. and German exporters, *American Economic Review*, **79**, 198–210.
- Knetter, M. M. (1993) International comparisons of pricing-to-market behavior, *American Economic Review*, **83**, 473–86.
- Kraft, D. F., Furtan, W. H. and Tyrchniewicz, E. W. (1996) *Performance Evaluation of the Canadian Wheat Board*, Canadian Wheat Board, Winnipeg.
- Krugman, P. (1987) Pricing to market when the exchange rate changes, in *Real-financial Linkages Among Open Economies* (Eds) S. W. Arndt and J. D. Richardson, MIT Press, Cambridge, pp. 49–70.
- Lavoie, N. (2002) An empirical evaluation of the Canadian Wheat Board's ability to price discriminate in bread wheat exports, paper presented at the AAEE Annual Meeting, Long Beach, CA, July 28–31.
- Pareja, S. G. (2001) Pricing to market in European automobile exports to OECD countries: a panel data approach, *Applied Economics*, **33**, 1845–56.
- Schmitz, A. and Furtan, H. (2000) The Canadian Wheat Board: marketing in the new millennium, Canadian Plains Research Center, University of Regina, Regina, Saskatchewan.
- Schmitz, T. G. and Gray, R. (2000) State trading enterprises and revenue gains from market power: the case of barley marketing and the Canadian Wheat Board, *Journal of Agricultural and Resource Economics*, **25**, 596–615.
- Uri, N. D. and Beach, E. D. (1996) The significance of quality differences for the United States and Canada wheat trade, *Applied Economics*, **28**, 985–97.
- Wilson, W. W., Johnson, D. D. and Dahl, B. L. (1999) Transparency and export subsidies in international wheat competition, Agricultural Economics Report No. 415, North Dakota State University.
- Young, L. M. (1999) Changing Canadian grain policies: implications for montanas grain industry, Policy Issues Paper No. 1, Montana State University, Bozeman, September 1996.