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Price Discrimination in International Grain Trade: The Case of Canadian Wheat Board Feed Barley Exports

By

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Abstract: This manuscript discusses the ongoing debate surrounding the involvement of the Canadian Wheat Board (CWB) in international trade. The paper outlines a simple test of the ability of the CWB to price discriminate among export markets for the 1980/81 to 1994/95 period. The study finds evidence of the ability of the CWB to price discriminate. It also shows that the magnitude and significance of price discrimination increased during the operation of the U.S. Export Enhancement Program (EEP) from 1985/86 to 1994/95.

Key Words: State Trading Enterprises, CWB, price discrimination, feed barley.

I. Introduction

In September 1998, South Dakota Governor Bill Janklow ordered a state trade blockade of Canadian trucks moving farm commodities into the United States. The governors of Minnesota and North Dakota followed suit with orders to strictly enforce state requirements on Canadian trucks crossing the border into those states. This was followed by complaints filed by the Canadian government with the World Trade Organization. These actions forced trade negotiations among Canadian and U.S. agricultural trade representatives and eventually led to a "Record of Understanding" signed by both governments in December 1998. While a number of concessions were made as a result of these negotiations, many producers on both sides of the border feel that the agreement did not contain much substance.

Despite this agreement, an informal group of grain producers from Montana, North Dakota, South Dakota, and Minnesota are involved in organizing further protests against the high volume of Canadian grain shipments into the U.S. As of February 1999, any further action potentially taken by U.S. grain producers has not been sanctioned by the U.S. government. U.S. agricultural trade representatives are reluctant to call for further action against Canadian imports because it may be in violation of the U.S.-Canada Free Trade Agreement. As stated by North Dakota Senator Byron Dorgan, "… the central problem here is the increased volume of unfairly traded grain and livestock coming into the U.S. from Canada, cutting their price."[1] It seems likely that much of the underlying sentiment inherent in this statement is directed towards the perceived pricing strategies and other practices of the Canadian Wheat Board (CWB).

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[1] Maixner, Ed. "USTR announces concessions in U.S., Canada trade dispute". In Feedstuffs, the Weekly Newspaper for Agribusiness." 70(50:1,4)

The CWB is the single-desk seller of western Canadian wheat, feed barley, and malting barley for export destinations. In the domestic market, the CWB is the sole seller of western Canadian wheat and barley for human consumption, but operates alongside an open cash market for feed barley and feed wheat in Western Canada. The CWB is a form of collective action by western Canadian grain producers that attempts to maximize returns by jointly providing marketing services and countervailing power against large multinational grain trading companies. The existence of the CWB is a direct result of public policy. It requires federal legislation through the Canadian Wheat Board Act. The CWB is set up to operate as a producer marketing agency and has adopted as its objective the maximization of returns from sales of wheat and barley. The CWB acts as the producer's agent through which all sales and payments are made.

Supporters of the CWB argue that the CWB benefits Canadian producers in several different ways. One perceived benefit is the additional producer revenue generated by the Canadian Wheat Board's ability to price discriminate in international markets. By exercising a certain degree of market power in international markets, the CWB can potentially earn larger returns for Canadian producers than would be possible under pure competition. As economic theory would dictate, this can be accomplished by holding back sales to certain price insensitive markets (such as Japan) and expanding sales in certain price sensitive markets (such as Saudi Arabia). Proponents of the CWB believe that excessive administrative, handling and other costs accrued by the CWB, if indeed such additional costs even exist, are outweighed by the increase in revenue that the CWB can secure for Canadian producers.

Critics from within Canada argue that the CWB is not successful at increasing producer revenue. They believe that the increase in returns from price discrimination captured by the CWB in international markets, if indeed such additional returns even exist, are outweighed by the excess administrative, handling and other costs accrued by the CWB. In addition, these Canadian producers protest vehemently against the restrictions placed on their ability to directly market their own wheat and barley into the U.S. without intervention from the CWB. Indeed, as of February 1999, if a Canadian producer attempts to deliver wheat or barley across the border without first buying it back from the CWB (usually at a higher price than can be achieved at a U.S. elevator), he or she can be arrested upon re-entry into Canada. Many Canadian producers, especially larger market-oriented producers and those located in geographic proximity to the U.S. border, believe that it is their basic right under a democracy to be able to freely market their grain anywhere that they desire. These producers are, in principle, opposed to any form of mandatory marketing agency regardless of economic considerations.[2]

The Canadian Wheat Board is often cast as a villain in the ongoing trade dispute between producers in the upper mid-western United States and producers in Canada. U.S. protesters believe that the CWB purposefully dumps grain into the U.S. market below cost, depressing U.S. prices. These same critics also argue that the CWB can extract monopoly rents through price discrimination across international markets, thereby unfairly increasing the returns to Canadian wheat and barley producers at the expense of U.S. and other global competitors. Upon further examination, these two lines of

[2] For more information regarding the perpetual internal debate among Canadian producers regarding the CWB, refer to Schmitz and Gray (1993), Carter (1993a and 1993b), Carter and Loyns (1996), Schmitz (1996a and 1996b), Schmitz, Gray, Schmitz, and Storey (1997), and Schmitz, Furtan, Brooks, and Gray (1997).

reasoning are not compatible. Specifically, if the CWB were actually dumping grain into the U.S. below cost, Canadian producers would actually realize lower returns due to the pricing practices of the CWB, as opposed to increasing returns. Indeed, some analysts argue just the opposite. That is, the existence of the CWB may actually decrease the volume of exports to the United States below the levels that would exist if the CWB did not control Canadian wheat and barley exports.[3]

While portions of this debate will never be resolved through empirical explication, the answers to at least three major questions can be analyzed within an economic framework. These three questions are:

1. Has the CWB been able to achieve price discrimination across different international markets, and how do export subsidies in other countries, such as the U.S. Export Enhancement Program (EEP), affect the ability of the CWB to price discriminate?
2. If there is significant evidence that the CWB has been able to price discriminate among importers, does this imply that the CWB has been able to achieve market power in international markets? If so, what is the magnitude of the benefits accruing to Canadian producers as a direct result of this market power?
3. Are the administrative, handling, and other costs of marketing grain in Canada higher or lower than those incurred by large grain marketing organizations in other countries, such as Cargill? If so, what portion of this inefficiency can be attributed to the CWB, and how much can be attributed to inefficiencies in

[3] See, for example, Johnson and Wilson (1994), Wilson and Johnson (1995), and Schmitz and Koo (1996).

other aspects of the Canadian marketing system that are not directly controlled by the CWB?

The answer to the first question was explored by Carter (1993b), Goodwin and Smith (1995), and Kraft, Furtan, and Tyrchniewicz (1996). The ability of the CWB to maintain price differences between markets for feed barley was first tested by Carter using a Knetter equations test performed on data compiled by Statistics Canada. Carter concluded that there was no evidence of market power by the CWB in the feed barley market. Unfortunately, Carter was forced to use export revenue data provided by Statistics Canada. This data reflected CWB posted prices for the time period in question, but did not reflect actual contract prices. The "sticker" prices posted by the CWB generally reflect the highest price that can be received at a certain point in time. While these prices are good estimates for price insensitive markets such as Japan, they do not accurately reflect prices in price sensitive markets such as Saudi Arabia. The price series used by Carter was the same regardless of destination, implying that the test could not truly be used to measure differences in the price received by the CWB across different markets at the same point in time.

Goodwin and Smith performed a Granger causality test on weekly wheat price data. They concluded that the CWB acts as a price leader in the international wheat market, while the United States, Australia, and Argentina behave as followers. However, their analysis does not directly show that the CWB actually practices price discrimination among different markets. The data set they used consisted of four price series, each series representing a proxy for either the average or the "sticker" price of exports from each of the four major exporting countries. Again, this data can not be used to measure

potential price discrimination by the same exporter among different importing countries because, in essence, Goodwin and Smith assumed that a given exporter charged the same price across all import markets within a given week.

Kraft, Furtan, and Tyrchniewicz compared the price of every CWB contract agreed upon by a particular importing country, with a "benchmark" price of similar wheat sold by its competitors to that same market within a particular time frame. They concluded that, from 1980/81 through 1993/94, the CWB received an average premium of $13.35 per tonne for wheat sold to both commercial and EEP-eligible markets. Moreover, they found that this average premium increased to anywhere between $28.39 and $36.39 per tonne once the EEP bonuses from 1985/86 through 1993/94 were taken into consideration.

The answer to the second question with respect to international feed and barley markets has been explored by Schmitz, Gray, Schmitz, and Storey (1997), and Schmitz and Gray (1999). The authors developed an economic simulation model that estimated import demand parameters by examining the actual contracts containing the prices and volumes of every barley sale made by the CWB from 1985/86 through 1994/95. They compared Canadian producer returns realized by the CWB to the returns that producers would have received under an environment in which multiple grain companies competed for the right to export Canadian barley. The study estimated that Canadian barley producers received an average of $72 million a year more in revenue under the CWB from 1985/86 through 1994/95 than they would have under competition. The majority of these benefits were attributed to gains in producer returns from international malting barley sales.

The answer to the third question has been investigated by Schmitz (1996), Carter and Loyns (1996), Schmitz, Gray, Schmitz, and Storey (1997), Schmitz, Furtan, Brooks, and Gray (1997), and Carter, Loyns, and Berwald (1998). The studies by Carter et al. contend that the CWB is inefficient in marketing Canadian wheat and barley when compared to competitive firms. Specifically, Carter and Loyns conclude that the CWB increases the costs of marketing wheat by approximately $20 per tonne and increases the costs of marketing barley by $37 per tonne beyond the costs incurred by competitive grain companies in other countries. Carter, Loyns, and Berwald argue further that the marketing costs attributed to the CWB are higher because CWB employees seek to maximize their own personal wealth.

The studies by Schmitz et al. contend that the cost of marketing Canadian wheat and barley is much lower than those reported by Carter et al. Moreover, they argue that most of the remaining additional costs can be attributed to other parts of the Canadian marketing system that are not controlled directly by the CWB. While the costs that Carter et al. present may or may not approximate the true costs incurred by the CWB, it is not clear how they arrive at their results. Unfortunately, Carter et al. were forced to use secondary data sources because they did not have access to the actual marketing costs incurred by the CWB. Furthermore, they did not have access to primary data regarding the marketing costs incurred by other large grain companies to use for comparison purposes.

Despite the sometimes overwhelming complexities inherent in analyses of the effects of the CWB in international grain markets, we offer a series of simple tests that are used to show that from 1980/81 through 1994/95, the CWB was able to achieve price

discrimination across different export markets for feed barley. We also show that, regardless of the U.S. Export Enhancement Program, there is still statistically significant evidence that the CWB has been able to price discriminate across different export market. This is achieved through a series of 12 different two-tailed t-tests for uncorrelated means with unknown variance. The empirical analysis is performed using actual contracts obtained from the CWB. These contracts provide accurate information on the price, volume, time, and destination of every sale of feed barley negotiated by the CWB from 1980/81 through 1994/95.[4]

II. Several Tests of Feed Barley Price Discrimination by the CWB

The theoretical potential for price discrimination by the CWB in international feed barley markets is made possible by the fact that the CWB is the only exporter of wheat, feed barley, and malting barley produced in western Canada. As such, the CWB controls a significant portion of the export supply sought by importers. As a single-desk seller, the CWB may maintain export price differences among markets, and therefore effect sales volumes by market, in an attempt to raise total sales revenue. The potential for arbitrage among markets trading with the CWB is minimized due to the repeated nature of negotiations and stipulations contained in the sales contract itself that specify that the grain purchased must not be re-exported to other destinations.

In order to test for price discrimination, all CWB feed barley sales contract prices were brought to a common basis point, free-on-board (f.o.b.) at West Coast ports.[5] Daily

[4] This data was obtained under a strict confidentially agreement between the authors and the Canadian Wheat Board. As such, it can be disseminated in aggregate form only.
[5] All sales were evaluated in Canadian dollars, using the exchange rate on the day of the sale.
[6] The aggregate results approximate the actual annual CWB pool return for feed barley. Any small discrepancies are due to differences between the contract date of sales and the allocation of that sales revenue to a particular pool account year.

sales data were aggregated into three distinct markets categorized as follows: (1) the Japanese feed barley market; (2) the U.S. feed barley market; and (3) all other offshore feed barley markets (ROW). The monthly quantity sold into a particular market was computed as the simple sum of all sales into that market during that month. The monthly price received from each market was computed as the weighted average of all sales into that market over the entire month.[6]

Once the data were processed following the above procedure, three time series were constructed. The first series was computed by subtracting the average monthly price in the U.S. market from the average monthly price in the Japanese market. The second series was constructed by subtracting the average monthly price in the rest of the world (ROW) from the average monthly price in Japan. The third series was calculated by subtracting the average monthly price in the ROW from the average monthly price in the U.S. Monthly observations for each of these series were only included when both markets had at least one sales contract in a given month. For example, if the CWB sold feed barley to the U.S. market in a certain month, but did not make a sale to Japan in that month, then the price difference was not computed, and that particular month was not included in the U.S./Japan time series. This procedure resulted in a different number of monthly observations for each of the three time series under consideration.

Once these three time series were constructed, a mean difference test was conducted on each of the three series to determine whether the differences between market prices was, from a statistical standpoint, significantly different from zero. A simple two-tailed t-test for differences in means with an unknown variance was performed. The null hypothesis for each of the three tests was that the “law of one price”

held between these market segments, while the alternative hypothesis was that the "law of one price" did not hold between markets.

To address the issue of comparability of sales made across all three market segments at the same time, three additional restricted time series were constructed. Monthly observations for each of these series were included only when all three markets had at least one sales contract in a given month. For example, if the CWB sold feed barley to the U.S. and Japan in a certain month, but did not make a sale to the ROW, then monthly observations for the price difference between the U.S. and Japan, the price difference between the U.S. and the ROW, and the price difference between Japan and the ROW were not included. This procedure resulted in the same number of monthly observations for each of the three restricted time series under consideration. Additional statistical tests were performed on these three restricted time series that are similar in nature to the tests performed on the unrestricted series.

Of additional interest was whether the presence of the Export Enhancement Program (EEP) from 1985/86 through 1994/95 had an impact on the ability of the CWB to price discriminate. For this reason, each of the three unrestricted time series was further split into two. That is, data for 1980/81-1984/95 was separated from 1985/86-1994/95. Similar statistical tests were performed on all six spliced time series, along with the original unrestricted three unspliced series, and the additional three restricted unspliced series, for a total of 12 statistical tests.

III. Empirical Results

The results provided in Table 1 indicate that in 10 out of the 12 cases tested, statistically significant differences existed among the f.o.b. contract prices for the

different market segments. In the remaining two cases, there were not enough observations (three observations in each case) to find statistically significant differences among markets.

The results for the price difference test performed on the series that contains only those months with sales to both markets (indicated by the column headings), are provided in first four rows of Table 1. The average price difference of $25.29/mt between CWB contract prices for Japan and the United States over the 1980/81 through 1994/95 period was significant at the 5% level. The average difference of $20.73/mt between CWB contract prices for Japan and the ROW was also significant, as was the $4.46/mt difference between the United States and ROW. This evidence clearly indicates that the CWB was able to price discriminate among feed barley export markets and that the law of one price did not hold for Canadian feed barley export markets from 1980/81 through 1994/95.

The results for the price difference test performed on the series that contains only those months with sales to all three markets are also provided in Table 1. The time series was limited to between 1985/86 through 1994/95 because there were only three observations from 1980/81 through 1984/85 during which the CWB contracted sales to Japan, the United States, and the ROW. This reflects that fact that the CWB did not export much feed barley to the United States prior to 1985. The average price differences for each of the three market pairs was significantly different from zero as indicated in Table 1. There was an average price difference of $23.86/mt between CWB sales to Japan and the U.S., $28.33/mt between CWB sales to Japan and the rest of the world, and

a $4.47/mt price difference between CWB sales to the United States and the rest of the world.

The Export Enhancement Program was introduced by the United States during the 1985/86 crop year. U.S. feed barley exporters continued to receive export subsidies through EEP on most feed barley shipments to ROW markets until 1994/95. Essentially, EEP subsidies led to significant differences between the (lower) import price of feed barley in ROW markets, when compared to U.S. and Japanese markets. This had a direct affect on the ability of the CWB to price discriminate among markets. In order to ascertain whether price discrimination in international markets was simply a result of EEP, or if the CWB actually influenced the degree of price discrimination, the data were separated into the pre-EEP period (1980/81 through 1984/85) and the EEP period (1985/86 through 1994/95).

The results of the mean difference tests for months with sales to both markets, performed on the pre-EEP and EEP periods separately, are provided in Table 1. Unfortunately, the limited number of observation months with sales to both Japan and the U.S. (three months only) and months with sales to both the U.S. and ROW (three months only) limits any statistical analysis of the pre-EEP period for those two market pairs. However, the test performed on the 37 months in which the CWB made sales to both Japan and ROW prior to EEP shows significant statistical evidence that the CWB was able to price discriminate between those markets, even prior to EEP. Specifically, the CWB was able to achieve a $13.99/mt premium on feed barley exports to Japan when compared to the rest of the world.

The Export Enhancement Program did have a significant impact on the ability of the CWB to price discriminate between Japan and the rest of the world as shown in Table 1. The average price difference between CWB sales to Japan and the ROW increased from $13.99/mt prior to EEP, to $23.70/mt during the export subsidy period. The average price difference realized by the CWB on feed barley exports to Japan and the United States was also substantial, rising from $1.46/mt prior to EEP to $26.84 during EEP. This indicates that the export subsidies of the United States had an impact on CWB export pricing of Canadian feed barley, but that the CWB was still able to price discriminate among markets (although to a lesser degree) even in the absence of EEP.

IV. Conclusion

In summary, this analysis in this paper used actual CWB contract data to illustrate that the Canadian Wheat Board was able to price discriminate among international feed barley markets as a result of its status as the single-desk exporter of Canadian feed barley. For example, the CWB realized an average price difference of $20.73/tonne between Japan and the rest of the world over the 1980/81 through 1994/95 period. The CWB was not only able to price discriminate during the period of the U.S. Export Enhancement Program from 1985/86 through 1994/95, it was also able to price discriminate among feed barley export markets prior to EEP (1980/81 through 1984/85). However, the magnitude of the differences in prices between markets increased as a result of EEP. For example, the CWB maintained a $13.99/tonne difference between Japan and the rest of the world prior to EEP (1980/81 through 1984/85). This price difference increased to an average of $23.70/tonne during the EEP period (1985/86 through 1994/95).

The ability of the CWB to price discriminate in international feed barley markets by itself does not lead to the conclusion that producers in Canada have benefited from higher revenues as a result of its monopoly on Canadian feed barley exporters. The link between price discrimination and market power in international barley markets has been discussed by other authors (e.g., Schmitz et al., 1997) and is still the subject of intense debate in Canada and in the United States. While current agricultural trade friction between Canada and the U.S. stems mostly from low commodity prices in 1998/99, U.S. critics focus on the unique nature of the CWB and uncertainty regarding its operations. Much of this debate may be political rhetoric aimed at simply reducing the volume of trade flows by using the CWB as a lightning rod.

Interestingly, many U.S. policy makers argued for years that the Canadian Western Grain Transportation Act (WGTA) subsidy provided for grain shipments from the Canadian prairies to the western and eastern Canadian ports was an "unfair" government subsidy because it resulted in increased exports of Canadian grain to the United States. However, when this subsidy was removed in 1995, Canadian grain exports to the United States actually increased. The U.S. became a relatively more attractive market because the cost of rail transportation over land to the United States did not change, but transportation costs to the western and eastern ports for overseas exports actually increased. The U.S. experience with the elimination of the WGTA subsidy should be kept firmly in mind when attempting to determine the effect that the removal of a certain agricultural policy in another country will have on U.S. trade flows.

Discussions and debate regarding the influence of the Canadian Wheat Board on international trade flows and on net returns to Canadian producers is contentious in both

international and domestic Canadian forums. Several studies have examined the operations of the CWB to analyze whether it is has "traded fairly" with respect to the U.S. (International Trade Commission, 1990 and 1994, U.S. General Accounting Office, 1990 and 1996) and with respect to international markets (Goodwin and Smith, 1995). Limiting, or clarifying, the operations of state trading enterprises (STEs) in international trade is stated as a prime objective of the U.S. Trade Representative for the next round of World Trade Organization negotiations. One of the key questions in these discussions is whether the CWB is able to achieve price premiums for western Canadian producers through the use of price discrimination in international markets. Another important question is whether the CWB has been dumping grain into the U.S. below costs. This study verifies that the CWB has maintained price discrimination in feed barley export markets and that the U.S. has not been the lowest market of marginal return for the CWB over the 1980/81 to 1994/95 period. Therefore, the removal of the CWB from control of Canadian feed barley exports might well lead to an increase in the volume of Canadian grain, as opposed to the decrease that several analysts would suggest.

Table 1: Mean Difference Test of Price Discrimination on CWB Export Sales of Feed Barley*

	JAPAN - U.S.	JAPAN - ROW	U.S. - ROW
	Months with Sales to Both Markets 1980/81 through 1994/95		
Fob price difference ($/MT)	25.29	20.73	4.46
Standard error ($/MT)	1.56	1.63	1.95
t-statistic	16.19**	12.70**	2.28**
Number of observations	49	121	36
	Months with Sales to all Three Markets 1985/86 through 1994/95		
Fob price difference ($/MT)	23.86	28.33	4.47
Standard error ($/MT)	1.23	1.86	2.12
t-statistic	19.45**	15.23**	2.10**
Number of observations	33	33	33
	Months with Sales to Both Markets 1980/81 through 1984/85		
Fob price difference ($/MT)	1.46	13.99	4.32
Standard error ($/MT)	2.05	2.81	1.83
t-statistic	0.71	4.97**	2.36
Number of observations	3	37	3
	Months with Sales to Both Markets 1985/86 through 1994/95		
Fob price difference ($/MT)	26.84	23.70	4.47
Standard error ($/MT)	1.37	1.92	2.12
t-statistic	19.57**	12.34**	2.10**
Number of observations	46	84	33

Source: Compiled and aggregated by authors (see text)
*All prices are given in Canadian dollars per metric tonne.
**Statistically significantly different from zero with a probability of greater than 95%.

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