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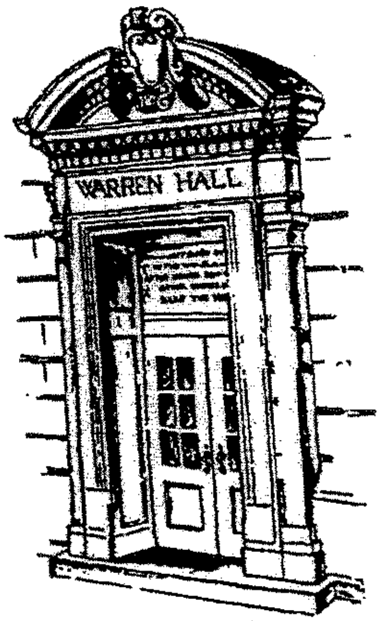

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Measuring the Degree of Price Discrimination for Export Subsidies Generated by State Trading Enterprises

by

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Abstract

In this paper, we develop a theoretical and practical measurement of the degree of market distortion due to price discrimination for export subsidies by state trading enterprises (STEs). The model is applied to existing STEs in Canada, New Zealand, and Australia. Based on FAO price data and U.S. Department of Agriculture elasticity estimates, the empirical results indicate that the exporting STEs exert some market power for subsidized exports in Australia, New Zealand, and Canada. However, the degree of market power is far from the extreme monopoly case. The degree of distortion is highest for Canadian dairy exports, but the export subsidy equivalents (ESEs) are larger in Australia and New Zealand due to significantly higher export volume in these two countries relative to Canada. The results suggest that these exporting STEs play a significant role in providing effective export subsidies. While Canada's "special" milk class system that prices milk substantially lower for export has already been judged to be an export subsidy by the WTO court, our results indicate that other exporting STEs should also be examined. However, in order to have more accurate estimates of the distortions caused by STEs, price data from the exporting STEs is required.

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Several state trading enterprises (STEs) currently exist in the world, which act as export monopolies. Examples include the Canadian Dairy Commission (CDC), Canadian Wheat Board (CWB), Australian Dairy Corporation (ADC), Australian Wheat Board (AWB), and the New Zealand Dairy Board (NZDB). One of the most important roles of these enterprises is the implementation of price discrimination between domestic and export markets to maximize the total sales values. When there are higher domestic prices, lower export prices, and pooled revenues distributed to farmers, the system is equivalent to an export subsidy. Indeed, the CDC's "special" milk class system, which creates substantially lower prices for milk used for exporting products, was already judged to be an export subsidy by the WTO court. Legal questions still remain as to whether other exporting STEs such as the CWB, ADC, AWB, and NZDB are exempted from rules for eliminating export subsidy schemes under the WTO agreements.

In examining the issue of whether existing STEs violate the WTO agreement, it is useful to have a theoretical and empirical measurement of the degree of market distortion caused by price discrimination practices of the STEs. Several studies have analyzed price discrimination by STEs, such as Alston and Gray, and Brooks and Schmitz. However, a practical measure of market distortion caused by these enterprises has not yet been developed.

Suzuki et al. and Suzuki and Kaiser proposed an imperfect competition model for price-discriminated oligopolistic markets. In this paper, a similar basic framework is used to develop a measure for the degree of market distortion caused by STEs' price discrimination between export and domestic markets. The model is applied to existing STEs in Canada, Australia, and New Zealand to measure the degree of distortions created by STEs.

Conceptual Framework

Figure 1 presents a simple basic framework for a country with an exporting STE and the rest of world. The STE's role is to allocate the county's supply of a commodity to domestic and export markets so as to maximize total sales revenues as the consignment seller of the commodity collected from farmers. The necessary condition is to equate marginal revenues from domestic and export markets.

Procedurally, the STE then distributes the proceeds back to farmers by paying a weighted average (blend) price from sales to the domestic and export markets. In this model, farmers are assumed to be price-takers, so they produce at a point where their marginal production cost is equal to the blend price they receive.

The export price is determined by equating total world supply and demand. It is assumed that the export price is given for the STE. Here the focus is on the price-discriminating power of STEs for subsidized exports, and hence there is no consideration of oligopolistic pricing in the world market.

Based on these assumptions, the mathematical model is derived as follows. Consider the following inverse domestic demand function for the product:

(1) $P_d = f(Q_d)$,

where P_d is the domestic price and Q_d is quantity sold at the domestic market. To maximize profit, marginal revenues from sales to the domestic market are equated to sales to the export market. Accordingly, the optimality condition for this "marketing monopoly" is:

(2) $P_d + (\partial P_d/\partial Q_d)Q_d = P_w$, or

(3) $P_d(1-1/e)=P_w$,

where P_w is the world price and e is the absolute value of the price elasticity of demand. Note that the phrase "marketing monopoly" means that the STE has power to control marketing allocations, but has no ability to control supply, which differs from the typical definition of monopoly.

An aggregate inverse marginal cost function, or supply function, is given as:

(4) $Q_s = g(P_b)$,

where Q_s is total supply and P_b is the blend price paid by the STE. The formula for P_b is:

(5) $P_b = [P_dQ_d + P_w(Q_s - Q_d)]/Q_s$.

For the rest of world, the aggregate demand and supply functions are defined as:

(6) $QR_d = h(P_w)$, and

(7) $QR_s = k(P_w)$, respectively.

The export price, P_w, is determined so as to meet the following condition:

(8) $Q_d+QR_d = Q_s+QR_s$.

With seven equations and seven endogenous variables, the above system is complete. Although the model has only one STE with price-discriminating power and the rest of world with no market power, one can easily extend the above framework to n STEs. Because a Cournot type firm i considers only changes in market price caused by changes in its own supply, one can re-write condition (2) as:

(9) $P_d - (\partial P_d/\partial Q_d)\, q_i = P_w,$

where q_i is firm i's supply to the market. Therefore, in cases where there are n identical Cournot firms in the country instead of the only one STE, the following holds under the Cournot-Nash equilibrium:

(10) $P_d - (\partial P_d/\partial Q_d)\, Q_d/n = P_w,$

Even if there is only one STE in the country, the monopoly equilibrium expressed by equation (2) is not always realized. Using θ ($0 \leq \theta \leq 1$) as a degree-of-market-power parameter, an intermediate imperfect competition can be expressed as:

(11) $P_d - (\partial P_d/\partial Q_d)\theta Q_d = P_w$, or

(12) $P_d(1-\theta/e)=P_w$

This is a general representation of the optimality condition for any degree of market competition. Equation (11) or (12) becomes $P_d = P_w$ ($=P_b$) under perfect competition since $\theta = 0$ in this case. P_w^* in figure 1 indicates the perfectly competitive level. In the case of a marketing monopoly, $\theta = 1$, and equation (11) becomes equation (2).

Comparing (10) with (11), one obtains $\theta = 1/n$ for n identical Cournot firms. Therefore, $1/\theta$ can be interpreted as a Cournot-firm-number-equivalent, assuming that the market is composed of identical Cournot-type firms. A $1/\theta$ value closer to 1 indicates more market power.

To compare economic welfare between the current and competitive-monopoly situations, the entire simultaneous equation system must be solved. However, the concern here is on the degree of price discrimination for subsidized exports. If values for P_d, P_w, and e are given, a value for θ can be estimated for each STE using equation (12), or

(13) $\theta=e(1-P_w/P_d)$

Equation (13) provides a theoretical and practical measurement of the degree of market distortion caused by price discrimination (or export subsidies) by exporting STEs.

In addition, the export subsidy equivalent (ESE) created by exporting STEs can be defined as:

(14) $ESE=(P_d-P_w)Q_e$,

where Q_e is the quantity exported.

Data and Estimation

One can use the above model with price data and estimates of demand elasticities to measure the market distortions caused by existing STEs in Canada, Australia, and New Zealand. Export price (P_w) data for these countries is available from the FAOSTAT database. The domestic price (P_d) data is available for Canadian butter and skim milk powder because the CDC support price is announced. However, the CWB, ADC, AWB, and NZDB do not announce their selling prices to the domestic markets. As a proxy for the domestic price for the other STEs, import price data from FAOSTAT database is used. Data for the price elasticity of demand for each product comes from the estimates used by the U.S. Department of Agriculture's SWOPSIM model (Roningen and Dixit). These data are shown in table 1.

Table 1 also shows the estimated market-power-parameters (θs) for the selected exporting STEs, the Cournot-firm-number-equivalent (1/θ), and the export subsidy equivalent (ESE) created by exporting STEs. Estimated market power parameters indicate that none of the STEs has exerted pure monopoly power, which is reflected by the estimated values of θs being less than 1 (recall that θ=0 for perfect competition and θ=1 for monopoly). Indeed, the estimates range from 0 to 0.29, which is closer to the competitive range of the market structure spectrum than the case of monopoly. However, since the estimates of θ are non-zero for most STEs, there is empirical evidence that these enterprises are exerting some market power through their price discrimination schemes used to subsidise exports.

Canadian dairy products have the largest estimated values of θ and the smallest Cournot-firm-number-equivalents. This means the degree of distortion is the highest for Canadian dairy products, which were already judged to be a hidden export subsidy in the WTO court. However, the estimated export subsidy equivalents (ESEs) are higher in Australia and New Zealand than in Canada. For instance, in Australia the export subsidy equivalent for all products is higher than in Canada. Similarly, in New Zealand, the export subsidy equivalent is higher for two of the three products relative to Canada. This result is due to the fact that the export quantities are much smaller in Canada than the other two countries.

A zero value for θ is given for butter in New Zealand and wheat in Canada. This result is due to the fact that the domestic price is lower than the export price for these products. It should be noted that import prices are used here as a proxy for domestic prices. This is a limitation in the data because most exporting STEs do not announce their price data for public. Hence, it would be desirable to obtain more accurate data on domestic prices and re-run the model in order to get more accurate estimates of the distortions for these STEs.

Conclusion

This paper proposed a theoretical and practical measurement of the degree of market distortion due to price discrimination for export subsidies by exporting STEs. The model was applied to existing STEs in Canada, New Zealand, and Australia.

Based on FAO price data and USDA elasticity estimates, the empirical results indicate that the exporting STEs exert some market power for subsidized exports in Australia, New Zealand, and Canada. However, the degree of market power is far from the extreme monopoly case. The degree of distortion is highest for Canadian dairy exports, but the export subsidy equivalents (ESEs) are larger in Australia and New Zealand due to significantly higher export volume in these two countries relative to Canada.

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Figure 1(a). An Export STE Dominating Market

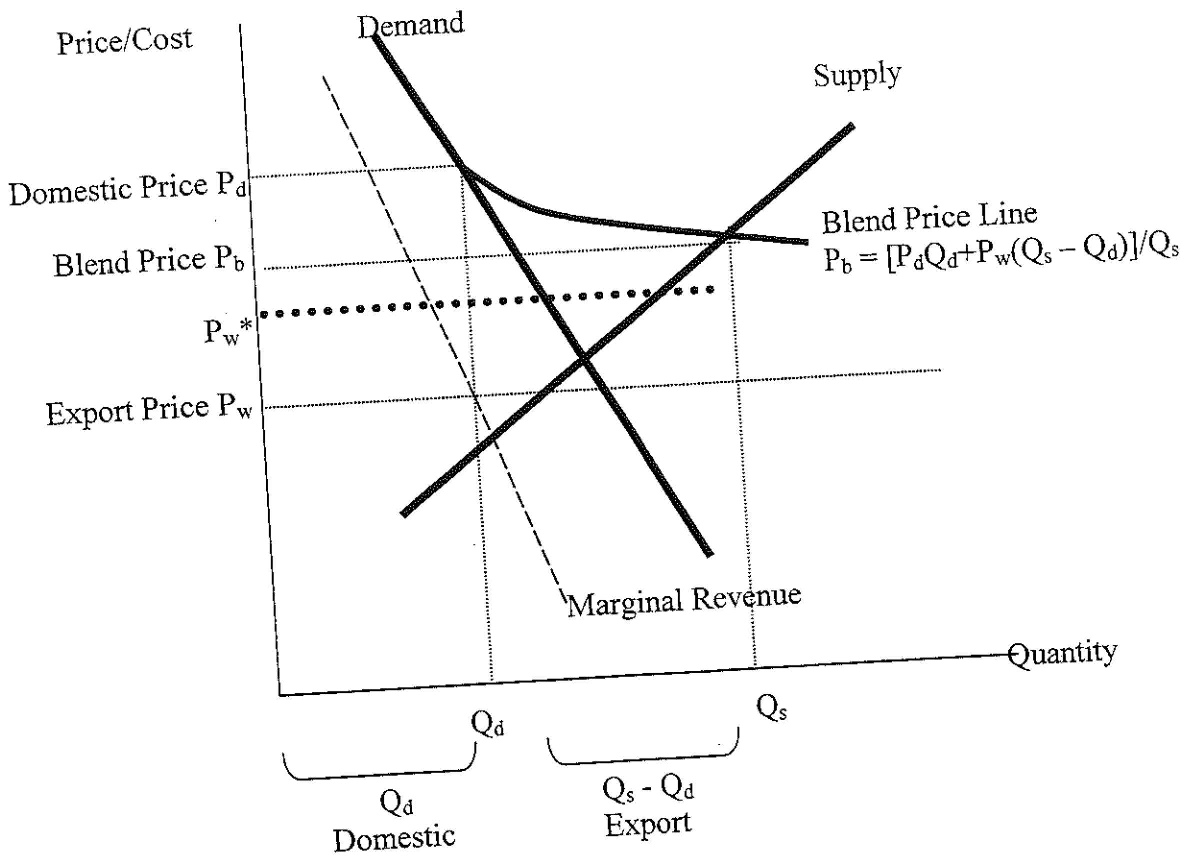

Figure 1(b). The Rest of World

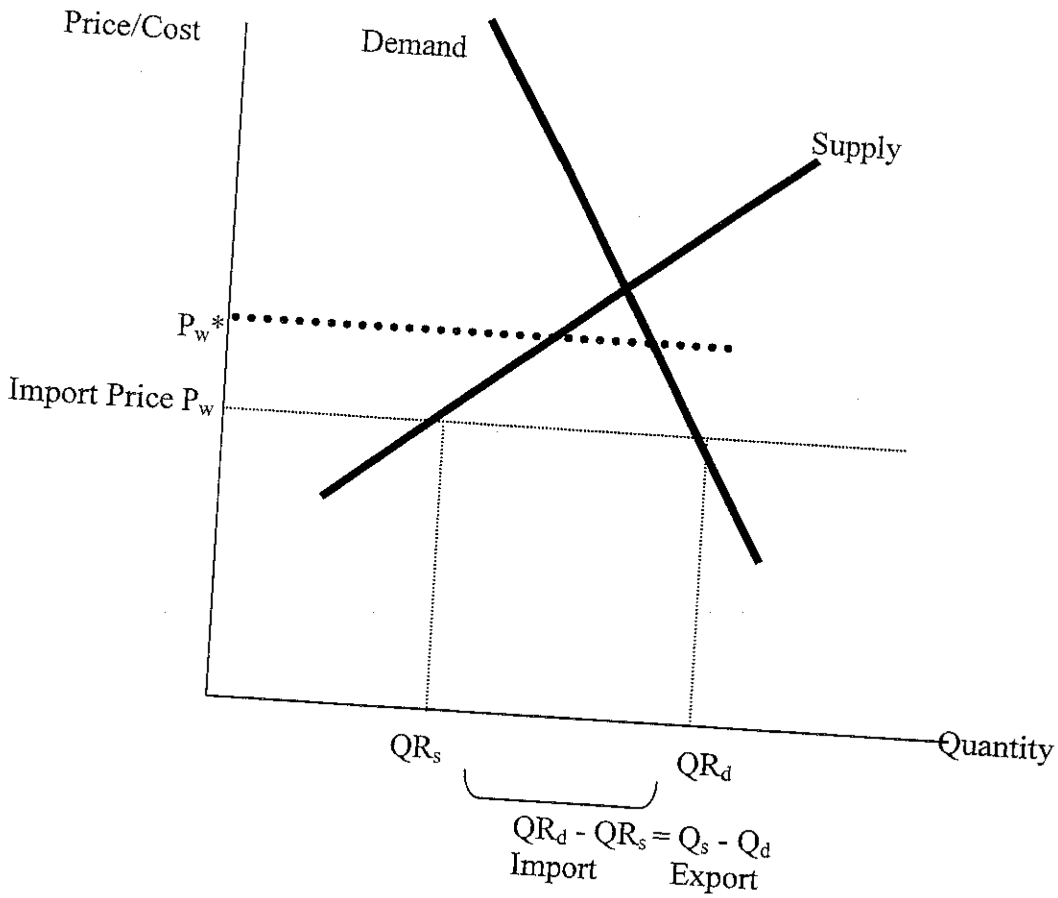

Table 1 Data and Estimated Degrees of Market Distortion by Selected STEs

Country	Commodity	Domestic Price (1998) A	Export Price (1998) B	Price Elasticity of Demand C	Market Power Parameter D=C(1-B/A)	Cournot Firm Number Equivalent 1/D	Export Subsidy Equivalent Million $
Australia	Butter	2418	1711	0.45	0.13	7.6	70
	SMP	1835	1503	0.45	0.08	12.3	70
	Cheese	3255	2356	0.40	0.11	9.0	164
	Wheat	410	146	0.24	0.15	6.5	4094
New Zealand	Butter	1552	1740	0.45	0		0
	SMP	2326	1570	0.45	0.15	6.8	125
	Cheese	3376	2054	0.40	0.16	6.4	308
Canada	Butter	3700	2145	0.70	0.29	3.4	19
	SMP	3063	1442	0.50	0.26	3.8	56
	Cheese	4922	3446	0.72	0.22	4.6	43
	Wheat	123	159	0.20	0		0

Sources: Prices (US$/t) from FAOSTAT Database and elasticities from USDA SWOPSIM Model.

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