

# **Gains from Trade Liberalization with Imperfectly Competitive World Markets. A Note.**

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## **Abstract**

The paper shows how analyses assuming perfect competition can yield a distorted estimation of the

expected effects of a trade liberalization when market imperfections exist. The analytical framework adopted is very simple and three extreme imperfect market structures are considered.

In

the first case, the exporting country maximizes its producer and consumer surplus by intervening in

the world market. The second market imperfection considered is the existence of a private firm playing the role of “pure middleman” in the world market. Then the case of a producer-owned marketing board which is granted exclusive export authority is addressed. It is shown that under all

three scenarios, if perfect competition is assumed when market imperfections exist, the impact of a

tariff reduction on prices and volume traded is overestimated. A ranking of the size of such distortions in the three cases analyzed is provided. Finally, it is proved that when a private firm exerts monopoly and monopsony power in the world market, both the importing and the exporting

countries may well be better off if, rather than making a move towards trade liberalization, the importing country “compensates” the exporting country by means of a direct transfer.

*Keywords: trade liberalization; imperfect markets; monopoly; monopsony; marketing board.*

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(Anania). Most analyses are empirical and assume perfect competition in both domestic and international markets. However, international agricultural trading occurs in markets where the holders of market power are particularly active.

This paper investigates the effects of a trade liberalization assuming imperfect competition in world markets and compares the results with those obtained under the hypothesis that perfect competition occurs. Three extreme imperfect market structures are analyzed in a very simple analytical framework. Though the aim of the paper is clearly explorative, its findings do in fact provide some useful indications regarding the distortions which result from assuming perfect competition in cases where this hypothesis does not hold.

In the first section, the relevance of market imperfections in agricultural world trade is briefly discussed. The two-country model described in the second section combines both a graphical and algebraic approach in assessing the impact of a trade liberalization in three imperfect

world market scenarios: (i) when the exporting country intervenes in world markets in order to maximize its consumer and producer surplus; (ii) when a firm exists in the international market acting as a “pure middleman” which maximizes its own profits; and (iii) when a producer-owned marketing board is granted exclusive authority to export. The last section gives a summary of the principal results obtained.

### **Agricultural Trade and Imperfect Markets**

Almost all countries, and in particular the major traders, do, in one way or another, intervene in international markets. In many countries, whether importing or exporting, developed or developing, effective marketing boards and State Trading Enterprises (STEs) exist (Ackerman and

Dixit; Veeman, Fulton and Larue). Examples include the Canadian Wheat Board, the Australian Wheat Board, the Japanese Food Agency, the New Zealand Dairy Board, as well as many STEs

3 active in developing countries.

Around about the beginning of the 1990s, 80% of world cereals exports was controlled by just six multinational firms, while four firms controlled 80% of the trade in oilseeds; if commodities exported by developing countries are also considered, there is no significant change in

the scenario: four firms controlled 60% of the trade in sugar; three 75% of the trade in cocoa; three

80% of that in tea (Scoppola, p. 64).

The effects of different market imperfections on international agricultural trade have been analysed both from theoretical and empirical points of view. Theoretical analyses include those by

Bieri and Schmitz; Dixit and Josling; Just, Schmitz and Zilbermann; McCalla; McCalla and Josling; McCorriston and MacLaren; Sarris and Schmitz; Schmitz, McCalla, Mitchell and Carter; and Veeman, Fulton and Larue. Empirical analyses, involving a wide range of market imperfections, have been carried out, among the others, by Abbott; Alaouze, Watson and Sturgess;

Carter and Schmitz; Francois, McDonald and Nordstrom; Hertel, Brockmeier and Swaminathan; Karp and McCalla; Kawaguchi, Suzuki and Kaiser; Kolstad and Burris; Lanclos, Hertel and Devados; McCorriston; Paarlberg and Abbott; Schmitz, McCalla, Mitchell and Carter; Swaminathan, Hertel and Brockmeier; and Thursby and Thursby.

Market imperfections can affect the impact of a trade liberalization on prices, volume traded and welfares. Since current WTO negotiations could bring about a significant reduction in the barriers to agricultural trading, it is of interest to ascertain whether or not the attempts to evaluate the effects of an agricultural trade liberalization are biased, and the direction of such bias.

### **The analytical framework**

A very simple partial equilibrium framework with one commodity, two large countries, fixed exchange rates, zero transportation costs and linear supply and demand curves has been used

in developing the analysis. It is assumed, moreover, that perfect competition holds on the domestic markets.

Country A is a tariff-imposing importing country and country B the exporting country.

Let  $X_A(q)$  and  $X_B(q)$  be the inverse excess demand and supply functions of countries A and B respectively, with  $\partial X_A/\partial q = X_A' < 0$ ,  $\partial X_B/\partial q = X_B' > 0$ , and  $q$  the volume of trade.

Let us first derive the effects produced by a trade liberalization in the “reference” scenario, i.e. where perfect competition prevails in all markets. This particular case is shown in Figure 1, where  $X_A$  is the inverse excess demand of A,  $X_B$  is the inverse excess supply of B, and  $t = AB$  is the per unit import tariff.  $X_A''$  is the tariff-inclusive excess demand of A expressed as function of the price in the exporting country. When A imposes the tariff, the volume of trade is  $q_{PC/t}$ , A's domestic price is  $P_A$

$P_{C/t}$ , and B's is  $P_B$

$P_{C/t}$ . The shaded areas represent the “gains from trade” of A

and B, i.e. the increases in the closed-economy producer and consumer surplus due to international

trading (assuming that the tariff revenue is redistributed to producers and consumers in country A as a lump sum transfer). If a trade liberalization takes place, the volume of trade increases to  $q_{PC}$  and the price in the two countries equals  $P_{PC}$ .

The market equilibrium condition under perfect competition is given by:

$$[1] X_A(q) - t - X_B(q) = 0 .$$

By taking the total differential of [1] we obtain:

$$[2] X_A' dq - dt - X_B' dq = 0 .$$

The impact on prices and volume traded of a tariff change can be described as follows:

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$$[3] \left[ \frac{dq}{dt} \right]_{PC} = 1 / [X_A' - X_B'] < 0 ,$$

$$[4] \left[ \frac{dP_A}{dt} \right]_{PC} = X_A' \frac{dq}{dt} > 0 , \text{ and}$$

$$[5] \left[ \frac{dP_B}{dt} \right]_{PC} = X_B' \frac{dq}{dt} < 0 ,$$

where  $P_i$  is the equilibrium price in country  $i$ .

The producer and consumer surplus of A and B are given by:

$q$

$$[6] W_A = W_A$$

$$A_{UT} + \int_0^q X_A(z) dz - q [X_A(q) - t] ,$$

$0$

$q$

$$[7] W_B = W_B$$

$$A_{UT} + q X_B(q) - \int_0^q X_B(z) dz ,$$

$0$

where  $W_A$

$A_{UT}$  and  $W_B$

$A_{UT}$  are the closed-economy consumer and producer surpluses of countries A and B, respectively, and the remaining terms in [6] and [7] are the “gains from trade”. The welfare

effects of a tariff change are given by:

$$[8] \left[ \frac{dW_A}{dt} \right]_{PC} = [t - q X_A'] \frac{dq}{dt} + q , \text{ and}$$

$$[9] \left[ \frac{dW_B}{dt} \right]_{PC} = q X_B' \frac{dq}{dt} < 0 .$$

While the welfare of the tariff-imposing country will, in general, either increase or decrease as the tariff decreases, the welfare of the exporting country will definitely increase.

### **Case I: the exporting country maximizing its producer and consumer surplus**

The first case of market imperfection to be discussed is where the exporting country (country B) intervenes in order to maximize its consumer and producer surplus, which is assumed to include the export tax revenue, redistributed to consumers and producers as a lump sum transfer.

The volume of trade is obtained by solving the problem faced by country B:

$q$

$$[10] \max W_B = W_B$$

$$A_{UT} + q [X_A(q) - t] - \int_0^q X_B(z) dz ,$$

$q$   $0$

where  $W_B$

$A_{UT}$

is country B's closed economy producer and consumer surplus. Hence, the volume traded which maximizes  $W_B$  is such that

$$[11] \partial W_B / \partial q = X_A(q) - t + q X_A' - X_B(q) = 0 .$$

As a result, the optimal export tax is given by

$$[12] \tau = - q X_A' .$$

B maximizes its consumer and producer surplus by exporting up to the point where its marginal export revenue  $[X_A(q) - t + q X_A']$  equals its marginal export social cost  $[X_B(q)]$ . The

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marginal export social cost is defined as the sum of the domestic consumer welfare losses and the increase in producer costs which result from a marginal increase in exports. In Figure 2 the

marginal export revenue curve of B when A imposes an import tariff is given by  $X_A$

\*\*; the

equilibrium condition [11] is satisfied in point E. The volume of trade is  $q_{MS/t}$ , the prices in countries A and B are respectively given by  $P_A$

$P_{MS/t}$ , and  $P_B$

$P_{MS/t}$ . The import tariff of A is GH and

the export tariff of B is equal to HE.

If A unilaterally eliminates its import tariff, the marginal export revenue curve of country B becomes  $X_A$

\*; the equilibrium condition is now satisfied in D. The volume traded increases to  $q_{MS}$ ,

the export tax is now equal to FD and the prices in the two countries are  $P_A$

$P_{MS}$  and  $P_B$

$P_{MS}$ ,

respectively.

When the exporting country exercises market power to maximize its producer and consumer surplus, an elimination of the tariff by the importing country has a smaller impact in terms of the changes both in prices ( $P_B$

$P_{MS}$   $P_B$

$P_{MS/t}$  is less than  $P_{PC}$   $P_B$

$P_{PC/t}$ , and  $P_A$

$P_{MS}$   $P_A$

$P_{MS/t}$  is less than  $P_{PC}$   $P_A$

$P_{PC/t}$ ),

and in the volume of trade ( $q_{MS/t}$   $q_{MS}$  is less than  $q_{PC/t}$   $q_{PC}$ ). This is because the marginal export revenue curves of country B ( $X_A$

\*

and  $X_A$

\*\*) are steeper than the excess demand curves of country A

in the two scenarios ( $X_A$  and  $X_A'$ ).

The same result can be proved by taking the total differential of [11]. By doing so, under the assumption that the excess demand and supply functions are linear, we obtain:

$$[13] \left[ \frac{dq}{dt} \right]_{MS} = 1 / [2 X_A' - X_B'] < 0,$$

and the following condition holds:

$$[14] 0 > \left[ \frac{dq}{dt} \right]_{MS} > \left[ \frac{dq}{dt} \right]_{PC},$$

from whence:

$$[15] \left[ \frac{dP_A}{dt} \right]_{PC} > \left[ \frac{dP_A}{dt} \right]_{MS} > 0, \text{ and}$$

$$[16] 0 > \left[ \frac{dP_B}{dt} \right]_{MS} > \left[ \frac{dP_B}{dt} \right]_{PC}.$$

Hence, when the exporting country exerts market power to maximize its producer and consumer surplus, a movement toward trade liberalization by the importing country has a smaller impact on prices and volume traded than it would do when perfect competition obtains.

### Case II: the "pure middleman" case

The second imperfect market structure involves the case where a private firm acts as an international intermediary between the two countries and exerts both monopoly and monopsony power in the world market (while domestic markets remain perfectly competitive).

Assuming that transaction costs are nil, the profit maximization problem of the firm can be stated as follows:

$$[17] \max \pi = q [X_A(q) - t - X_B(q)].$$

q

The volume traded will be such that

$$[18] \partial\pi/\partial q = X_A(q) - t - X_B(q) + q X_A' - q X_B' = 0 .$$

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The firm maximizes its profits by buying from B and selling to A a quantity such that its marginal revenue equals its marginal cost. This case is shown in Figure 3, where  $X^{**}$

A is the firm

marginal revenue and  $X^*$

B is its marginal cost. Equilibrium condition [18] is satisfied in C; the

volume traded is now equal to  $q_{PM/t}$ , prices in A and B equal  $P_A$

$P_{M/t}$  and  $P_B$

$P_{M/t}$ , and the firm per unit

profit equals HE. If A eliminates the tariff, the firm's marginal cost becomes  $X^*$

A and the

equilibrium condition is satisfied in point F; the volume of trade increases to  $q_{PM}$ , country A's price

becomes  $P_A$

$P_M$ , country B's  $P_B$

$P_M$ , and the firm per unit profit DM, which is greater than HE, the per unit profit under the tariff.

The price and volume of trade changes due to a trade liberalization in this case are smaller than those occurring under perfect competition, and are also smaller than those occurring when the

exporting country exerts market power to maximize its producer and consumer surplus. This is because (i) the marginal revenue curve of the firm is steeper than the excess demand curve of A, and (ii) the marginal cost curve is steeper than the excess supply curve of B.

These results can be easily proved by using some algebra. By taking the total differential of [18] we obtain:

$$[19] [dq/dt]_{PM} = 1 / [2 (X_A' - X_B')] < 0 , \text{ and}$$

$$[20] 0 > [dq/dt]_{PM} > [dq/dt]_{MS} > [dq/dt]_{PC} , \text{ from whence}$$

$$[21] [dP_A/dt]_{PC} > [dP_A/dt]_{MS} > [dP_A/dt]_{PM} > 0 ,$$

$$[22] 0 > [dP_B/dt]_{PM} > [dP_B/dt]_{MS} > [dP_B/dt]_{PC} .$$

Not only we find that the impact of a trade liberalization on volume traded and equilibrium prices is in this case smaller than that occurring under perfect competition, but it is also smaller than that taking place in the market imperfection structure considered above.

As one can expect, the profits of the firm acting as a "pure middleman" in the market will always increase as the importing country reduces the tariff:

$$[23] [d\pi/dt] = [X_A(q) - t - X_B(q)] dq/dt - 1/2 < 0 .$$

The impact of a tariff reduction on the welfare of country B is given by:

$$[24] [dW_B/dt]_{PM} = q X_B' dq/dt < 0 , \text{ with}$$

$$[25] 0 > [dW_B/dt]_{PM} > [dW_B/dt]_{PC} .$$

Hence, when a firm acting as a "pure middleman" in the world market exists, a trade liberalization has an impact on the exporting country's welfare smaller than that which would occur

in a perfect competition scenario.

Finally, both countries might well be better off if, rather than abolishing the tariff, A were to

compensate B through a direct welfare transfer. This is the case, for example, of the specific market

represented in Figure 3, where country A's losses due to the trade liberalization (area  $P_A$   $P_MNHI$

minus area LMN) are in fact greater than country B's gains (area  $P_B$

$P_MDEp_B$

$P_M/t$ ). Hence, both

countries would be better off if A, rather than eliminating the tariff, were to compensate B with a direct welfare transfer greater than  $P_B$

$P_MDEp_B$

$P_M/t$  and less than  $P_A$

$P_MNHI$  minus LMN.

The necessary and sufficient condition whereby the two countries are both better off when A, rather than eliminating the tariff, directly compensates B by means of a proper welfare transfer,

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is given by:

[26]  $d[W_A + W_B] / dt > 0$ , or

[27]  $q > [X_A(q) - X_B(q)] / [2(X_B' - X_A')]$ .

### Case III: a producer-owned marketing board with exclusive export authority

The third imperfect market structure considered is that where in the exporting country a producer-owned marketing board has been granted exclusive export authority; this allows the marketing board to exert market power in the world market (while domestic markets remain perfectly competitive).

Let  $Q$  be the quantity produced in country B and  $S_B(Q)$  the inverse domestic supply

function, with  $\partial S_B / \partial Q = S_B' > 0$ . In equilibrium,

[28]  $P_B = X_B(q) = S_B(Q)$ .

From [28] the quantity produced in country B as a function of the quantity exported can be derived:

[29]  $Q(q) = S^{-1}$

$[X_B(q)]$ , with

[30]  $0 \leq Q' = \partial Q / \partial q \leq 1$ .

Being the marketing board owned by country B's producers, we assume that it acts with the goal of maximizing their profits. Hence, the problem faced by the marketing board can be stated as

follows:

$Q(q)$

[31]  $\max_{q \geq 0} \Gamma = q [X_A(q) - t - X_B(q)] + X_B(q) Q(q) - \int S_B(z) dz - FC$ .

$q \geq 0$

where the four addenda in [31] are, respectively: the profits made by the marketing board; producer

revenue; variable and fixed production costs. It is assumed that the marketing board pays producers

the domestic market equilibrium price and distributes its profits to its owners, producers in country

B.

The volume exported by the marketing board which will maximize producer profits will be such that

$$[32] \partial\Gamma/\partial q = X_A(q) - t - X_B(q) + q X_A' - q X_B' + X_B'Q(q) = 0 .$$

The marketing board maximizes producer profits by exporting to country A a quantity such that producer marginal revenue equals marginal cost. This case is shown in Figure 4, where gross producer profits<sup>2</sup> are given by the sum of the shaded areas. The equilibrium condition given in [32]

is satisfied in point D, where  $X_A$

\*\*

is  $[X_A(q) - t + qX_A']$  and  $X_B$

\*\* is  $[X_B(q) + q X_B' - X_B'Q(q)]$ .  $X_B$

\*\*

<sup>1</sup> A change of the volume exported is always associated to a smaller change, in the same direction, of the quantity produced; in fact, the change in the quantity exported is equal to the sum of the changes in domestic production and consumption, in absolute values.

<sup>2</sup> Gross producer profits are profits plus fixed production costs.

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intercept and slope are both smaller than those of  $X_B$

\*, the marginal revenue curve of the profit

maximizing private firm considered in the previous case.<sup>3</sup> In Figure 5 the market equilibrium when

A eliminates the tariff is represented. The equilibrium condition is satisfied in point C; volume of trade increases to  $q_{MB}$ , prices in the two countries become  $P_A$

$P_B$  and  $P_B$

$q_{MB}$ , production in country B

expands to  $Q_{MB}$  and the per unit profit of the marketing board to EC (from HD).

The price and volume of trade changes due to a trade liberalization are in this case smaller than those occurring under perfect competition or when the exporting country exerts market power

to maximize its producer and consumer surplus, and larger than those which occur when a private firm exists which is able to act as a "pure middleman" on the world market. In fact, by taking the total differential of [32], and recalling that  $Q'$  cannot exceed 1, we obtain:

$$[33] [dq/dt]_{MB} = 1 / [2 (X_A' - X_B') + X_B'Q'] < 0 , \text{ from whence}$$

$$[34] 0 > [dq/dt]_{PM} > [dq/dt]_{MB} > [dq/dt]_{MS} > [dq/dt]_{PC} ,$$

$$[35] [dP_A/dt]_{PC} > [dP_A/dt]_{MS} > [dP_A/dt]_{MB} > [dP_A/dt]_{PM} > 0 ,$$

$$[36] 0 > [dP_B/dt]_{PM} > [dP_B/dt]_{MB} > [dP_B/dt]_{MS} > [dP_B/dt]_{PC} .$$

Producer profits in the exporting country increase as the importing country reduces the tariff:

$$[37] [d\Gamma/dt] = dq/dt [X_A(q) - t - X_B(q)] + X_B' dq/dt [Q(q) - q] + q [X_A' dq/dt - 1] < 0 .^4$$

Finally, the welfare of country B always increases when a tariff reduction takes place:

$$[38] [dW_B/dt]_{MB} = dq/dt [X_A(q) - t - X_B(q)] + q [X_A' dq/dt - 1] < 0 .$$

## Conclusions

The aim of the paper was to investigate how the effects of an agricultural trade liberalization change when market imperfections are present. Three extreme cases have been considered within a

very simple analytical framework: the first involves an exporting country which intervenes to maximize its producer and consumer surplus, the second describes the situation where all international trading is controlled by one firm acting as a "pure middleman", whereas the third



considers the existence of a producer-owned marketing board which is given exclusive export authority.

The results reached suggest that the impact in terms of prices and volume traded of a trade liberalization obtained assuming perfect competition will overestimate that occurring when this postulate does not hold. In addition, it has been proved that, when there exists a firm exerting both

monopoly and monopsony power in the world market, it could well be that a system of direct transfers makes all countries better off with respect to a trade liberalization.

Because of (a) the relevance of market imperfections in many internationally traded agricultural commodities, (b) the fact that perfect competition is assumed in most of the attempts to

measure the effects of a reduction in the barriers to agricultural trade, and (c) the significant impact

<sup>3</sup> While the intercept of  $X_B$

\*\*

is always smaller than that of  $X_B$ , the excess supply function of country B, no ranking of the slopes of the two functions is, in general, possible; this means that, differently from the case depicted in Figure 4,  $X_B$  and  $X_B$

\*\* could intersect. However, this does not affect the results derived in the paper.

<sup>4</sup> Note that  $X_A'$   $dq/dt$  is always smaller than 1.

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that such attempts may have on the on-going WTO negotiations, it would appear that the results of

this paper might be of some interest.

If a conclusion can be drawn, it is the need for further work involving a larger number of imperfect market structures, and a more realistic analytical setting. In spite of all the limitation of the present paper, its findings suggest caution at the bargaining table when evaluating the results of

the simulations which assume that perfect competition obtains.

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**price**

**$P_{PC}$**

**$P_A$**

**$PC / t$**

**$P_B$**

**$PC / t$**

**A**

**B**

**$X_A''$**

**$X_A$**

**$X_B$**

**$q_{PC} / t$   $q_{PC}$**

**quantity**

**Fig. 1 - Perfect competition.**

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**H**

**price**

**$P_{PC}$**

**$P_A$**

**$PC / t$**

**$P_B$**

**$PC / t$**

**$q_{PC} / t$   $q_{PC}$  quantity**

**Fig. 2 - The exporting country maximizing its producer and consumer surplus.**

**$P_A$**

**$MS / t$**

**$P_A$**

**MS**

**$P_B$**

**$MS / t$**

**$P_B$**

**MS**

**$q_{MS} / t$   $q_{MS}$**

**$X_A''$**

**$X_A$**

**X<sub>B</sub> G**

**F**

**D**

**E**

**X<sub>A</sub>\* X<sub>A</sub>**

**\*\***

13

**price**

**X<sub>A</sub>"**

**X<sub>A</sub>**

**X<sub>B</sub>**

**q<sub>PC</sub> / t q<sub>PC</sub>**

**quantity**

**Fig. 3 - The "pure middleman" case.**

**P<sub>A</sub>**

**PM / t**

**P<sub>A</sub>**

**PM**

**P<sub>B</sub>**

**PM / t**

**L**

**M**

**H**

**D**

**E**

**q<sub>PM</sub> / t q<sub>PM</sub>**

**X<sub>A</sub>**

**\* X<sub>A</sub>**

**\*\***

**X<sub>B</sub>**

**\***

**N**

**I**

**P<sub>B</sub>**

**PM**

**q<sub>MS</sub>**

**F**

**C**

14

**price**

$X_A''$

$X_A$

$X_B$

quantity traded

**L**

**H**

**D**

$Q_{MB/t}$

$X_A$

\*

$X_A$

\*\*

$X_B$

\*

**I**

$P_A$

$MB/t$

$P_B$

$MB/t$

$P_B$

$MB/t$

**t**

$X_B$

\*\*

$Q_{MB/t}$  quantity produced

**Fig. 4 - A producer-owned marketing board.**

**price**

$S_B$

15

**price**

$X_A''$

$X_A$

$X_B$

quantity traded

**L**

H  
D  
 $q_{MB} / t$   
 $X_A$   
\*  
 $X_A$   
\*\*  
 $X_B$   
\*  
I  
 $P_A$   
 $MB / t$   
 $P_B$   
 $MB / t$   
 $P_B$   
 $MB / t$   
**t**  
 $X_B$   
\*\*

$Q_{MB}$  quantity produced

**Fig. 5 - Trade liberalization in the presence of a producer-owned marketing board.**

price  
 $S_B$   
 $P_A$   
 $MB$   
 $q_{MB}$   
 $P_B$   
 $MB P_B$   
 $MB$   
E  
C  
 $Q_{MB} / t$