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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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.

Mainly as a result of the Uruguay round of the GATT, since the late 1980s there has been a marked increase in the literature pertaining to the effects produced by liberalizing agricultural trade (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 Devadoss; 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
$_{PC/t}$, and B's is P_B
$_{PC/t}$. 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] $[dq/dt]_{PC} = 1 / [X_A' - X_B'] < 0$,

[4] $[dP_A/dt]_{PC} = X_A' \, dq/dt > 0$, and

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

where P_i is the equilibrium price in country i.

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

[6] $W_A = W_A{}_{AUT} + \int_0^q X_A(z) \, dz - q \, [X_A(q) - t]$,

[7] $W_B = W_B{}_{AUT} + q \, X_B(q) - \int_0^q X_B(z) \, dz$,

where $W_A{}_{AUT}$ and $W_B{}_{AUT}$ 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] $[dW_A/dt]_{PC} = [t - q \, X_A'] \, dq/dt + q$, and

[9] $[dW_B/dt]_{PC} = q \, X_B' \, dq/dt < 0$.

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:

[10] $\max_{q} W_B = W_B{}_{AUT} + q \, [X_A(q) - t] - \int_0^q X_B(z) \, dz$,

where $W_B{}_{AUT}$
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 $P_A^{MS/t}$, and $P_B^{MS/t}$. 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^{MS} and P_B^{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^{MS} $P_B^{MS/t}$ is less than P_{PC} $P_B^{PC/t}$, and P_A^{MS} $P_A^{MS/t}$ is less than P_{PC} $P_A^{PC/t}$), 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] $[dq/dt]_{MS} = 1 / [2 X_A' - X_B'] < 0$,

and the following condition holds:

[14] $0 > [dq/dt]_{MS} > [dq/dt]_{PC}$,

from whence:

[15] $[dP_A/dt]_{PC} > [dP_A/dt]_{MS} > 0$, and

[16] $0 > [dP_B/dt]_{MS} > [dP_B/dt]_{PC}$.

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 $P_A^{PM/t}$ and $P_B^{PM/t}$, 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^{PM}, country B's P_B^{PM}, 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] $[dq/dt]_{PM} = 1/[2(X_A' - X_B')] < 0$, and

[20] $0 > [dq/dt]_{PM} > [dq/dt]_{MS} > [dq/dt]_{PC}$, 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] $[dW_B/dt]_{PM} = q\, X_B'\, dq/dt < 0$, 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 $P_M NHI$

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

$P_{M/t}$). 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 $P_M DEp_B$

$P_{M/t}$ and less than P_A $P_M NHI$ 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,[7]

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] $Q(q) = S_{-1}$ $_B [X_B(q)]$, with

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

[31] $\max_q \ \Gamma = q [X_A(q) - t - X_B(q)] + X_B(q) Q(q) - \int_0^{Q(q)} S_B(z) \, dz - FC$.

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[2] 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^{**}

[1] 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.

[2] 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.[3] 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^{MB} and P_B^{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] $[dq/dt]_{MB} = 1/ [2 (X_A' - X_B') + X_B'Q'] < 0$, 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

[3] 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.

[4] 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.

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_B G

F

D

E

X_A^* X_A^{**}

price

X_A''

X_A

X_B

q_{PC}/t q_{PC}

quantity

Fig. 3 - The "pure middleman" case.

P_A

P_M/t

P_A

P_M

P_B

P_M/t

L

M

H

D

E

q_{PM}/t q_{PM}

X_A^* X_A^{**}

X_B^*

N

I

P_B

P_M

q_{MS}

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