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# **Welfare Implications of a Preferential Tariff Reduction for Agricultural Exports from Less Developed Countries vs. a Generalized Tariff Reduction**

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## **Abstract**

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The paper presents the results of a theoretical study focusing on a comparative evaluation of the welfare effects of a preferential tariff reduction for agricultural exports from less developed countries versus a generalized tariff reduction. The results are derived using a diagrammatic approach. The analysis is developed within a partial equilibrium framework with one commodity, three large countries (importing developed country, exporting developed country, developing country), fixed exchange rates and zero transportation costs. The theoretical model makes provisions for a country to switch from being an exporter to being an importer, or vice versa, as the equilibrium price changes. Three alternative policy scenarios are analyzed: the imposition of a non-discriminatory tariff, a preferential tariff reduction, and a generalized tariff reduction. Two alternative definitions of the welfare functions are used. One is based on consumers' and producers' surplus, the other adds domestic income and changes in foreign exchange earnings/expenditure. Some methodological implications of the specific model used are discussed, along with the impact, in terms of welfare, of the policy scenarios considered.

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## **Introduction**

The debate developed in recent years about the impact of developed countries' agricultural trade policies on less-developed countries' economies has not yet converged to widely accepted results. Two divergent approaches seem to prevail. According to one, the existence of trade barriers is definitely harmful for less-developed countries' economies, and a *generalized* reduction of the level of protection of developed countries' agricultures is suggested as a powerful tool capable of stimulating less-developed countries' exports. Supporters of

this approach in developed countries are, in large part, traditional exporters of agricultural products. The United States' position in the United Nations Conference on Trade and Development (UNCTAD) (reluctant about the implementation of a preferential import tariff reduction for less-developed countries' exports), and in the General Agreement on Tariffs and Trade (GATT) meetings (in support of an extension of the Most Favored Nation principle to a much larger set of agricultural commodities) may be seen as representative of this first approach. The same position has been very firmly taken by the World Bank (1986).

A second alternative view does not see protectionist agricultural policies as necessarily harmful for less-developed countries, and rejects the idea of a generalized reduction of barriers to trade as an effective means for supporting the economic development of less-developed countries. According to this second approach, a *preferential* tariff reduction — one that increases market access for less-developed countries' exports without reducing the nominal level of the barriers faced by other developed countries' exports — is advocated as an effective instrument to help increase less-developed countries' exports. Among developed countries, this approach has in general been embraced by the traditional importers of agricultural commodities. The European Community is probably the most representative supporter of this point of view. Its approach has been opposite that of the United States', both in the UNCTAD and in the GATT rounds. The European Community has shown a relative openness (with an eye, of course, to the interests of its domestic producers) to the Generalized System of Preferences principle, and a strong resistance to a GATT round focusing on the barriers to agricultural trade.

In both cases it seems that developed countries tend to argue that the trade policy scenarios which are optimal for less-developed countries are those that they perceive as desirable for themselves.

This paper focuses on a comparative evaluation, on theoretical grounds, of the welfare impact of a preferential tariff reduction for agricultural exports from less-developed countries versus a generalized tariff reduction. The analysis is based on a diagrammatic approach. Algebraic proof of some of the results is provided in the Appendix.

From a methodological point of view, the main original feature of the paper is that, in the model used for the analysis, countries' positions on the world market are not set a priori. Instead, a country is allowed to switch from being an exporter to being an importer, and vice versa, as prices change.

It will be shown that an importing developed country, willing to help less-developed countries' growth, is *always* better off by doing so through a preferential tariff reduction than under a generalized tariff reduction. On the other hand, an exporting developed country is *always* better off if the importing developed country uniformly lowers its tariffs rather than if a preferential tariff reduction takes place. The results for the beneficiary country depend, at least in part, on the assumptions about its welfare function. Under relatively weak

postulates, the beneficiary country will definitely opt for a preferential tariff reduction rather than a generalized tariff reduction.

In addition, some other interesting results are discussed, such as the possible existence of multiple feasible equilibrium solutions, and the paradoxical case of an exporter made better off by the imposition of a tariff by an importer.

In the next section, the basic characteristics of the model are presented. Three alternative trade policies — the imposition of a non-discriminatory tariff, a preferential tariff reduction, and a generalized tariff reduction — are then compared. A classical definition of the welfare functions, mainly based on the concept of producers' and consumers' surplus, is used. In the second part of the paper, a more complex definition of the welfare functions is introduced. It involves producers' and consumers' surplus, foreign exchange earnings/expenditure, and domestic income. The new welfare functions are used to re-evaluate the impact of the three alternative policy scenarios outlined above. The last section recapitulates the main results.

## Basic model

The analysis is based on a one-commodity, three-large-countries world model. All the results are derived in a partial equilibrium framework. The only inter-sectoral linkages which are taken into account are those due to retaliations to trade policy changes. Fixed exchange rates, zero transportation costs, linear demand and supply curves, and perfect competition on both the domestic and the world markets are assumed.

Throughout the paper, country A is the importing developed country the effects of whose alternative trade policy choices on the market equilibrium are to be evaluated. These policy options are:

- the imposition of a non-discriminatory import tariff (NDT);
- the granting of free access to the imports from a preferred country, leaving a (discriminatory) tariff (DT) on the imports from a third, non-preferred, country; and
- complete trade liberalization (FT).

Country C will be granted preferential treatment, while country B will be the non-preferred country.

In making its trade policy choice, country A is assumed to be maximizing a welfare function ( $W_a$ ) whose arguments are its 'market-specific social welfare' ( $MSSW_a$ ), defined as the sum of producers' and consumers' surplus (CPS) and of the tariff revenue (TR) (assumed to be redistributed to producers and consumers as a lump sum transfer), and countries B ( $W_b$ ) and C's ( $W_c$ ) welfares, which are defined as the sum of their producers' and consumers' surplus:

$$W_a = W_a(MSSW_a, W_b, W_c) \quad (1)$$

$$W_b = \text{CPS}_b \quad (2)$$

$$W_c = \text{CPS}_c \quad (3)$$

It should be noted that a preferential trade policy is not consistent with a donor country's behavior maximizing a welfare function whose arguments are producers' and consumers' surpluses plus tariff revenue only. Blackhurst (1972) used such a welfare function to evaluate the comparative impact on the world's welfare of a preferential versus a generalized tariff reduction. The consequence is that one of the following two untenable propositions must hold: if the policy choices he considers are rationally justified, then a world's welfare function defined as the sum of producers' and consumers' surplus plus the tariff revenue does not equal the sum of each country's individual welfare; or if the world's welfare is given by the sum of the individual countries' welfares, then the donor country's preferential trade policy remains unjustifiable, because it reduces the sum of domestic producers' and consumers' surplus and of the tariff revenue.

A donor country social welfare function similar to (1) has been proposed, in a framework close to the one considered here, by McCulloch and Pinera (1977). The arguments of the welfare function they defined, however, did not consider the non-preferred country's welfare. By not doing so they left unjustifiable a donor-country policy which prefers the exports from the beneficiary country without increasing the tariff imposed on the non-preferred country's exports.

We will assume that country A's behavior is *always* such that its welfare function is maximized, and that in doing so country A is implicitly taking into account the effects of policy reactions by countries B and C to its own policy (only countries negatively affected by country A's policy changes are supposed to react). The impact on country A's welfare of these reactions is supposed to have been made endogenous to  $W_a$  as part of the  $W_b$  and  $W_c$  effects. In addition, the presence of  $W_c$  as one of the arguments of country A's welfare function reflects non-economical values that country A attaches to country C's welfare.

Country A's welfare monotonically increases as its market-specific social welfare increases. In addition, country A's welfare is positively related with country C's welfare because of a concern of country A for country C's economic growth, (while country A is indifferent to increases in country B's welfare). The same welfare decreases (due to retaliation in other markets, for example) when country B's and/or C's welfare decreases because of country A's policies.

In other words, country A makes its policy choice maximizing its welfare by exploiting its market power, while, at the same time, carefully evaluating the negative impact (if any) of its policy on countries B and C (because of their likely retaliation on other markets), and favorably weighting — either for humanitarian reasons or simply for more general longer run economical objectives — increases in country C's welfare. These assumptions about country A's

welfare function may be described as follows:

$$\partial W_a / \partial \text{MSSW}_a > 0 \quad (4)$$

$$\partial W_a / \partial W_c > 0 \quad (5)$$

$$\partial W_a / \partial W_b^+ = 0 \quad (6)$$

$$\partial W_a / \partial W_b^- > 0 \quad (7)$$

Consistent with the partial equilibrium nature of this paper, the impact of country A's alternative trade policies on countries B and C is evaluated by tracing the changes in those countries of the sum of consumers' and producers' surplus associated with the market under scrutiny.

An evaluation of the policies' impact on the world as a whole cannot be realized because of the assumptions made about country A's welfare function (specifically, because of the non-economical values country A attaches to country C's welfare), which are needed to make country A's trade-preference policy choice consistent with a welfare-optimizing behavior.

To simplify the analysis, no trade policy intervention is assumed to be implemented by countries B and C in the market considered. The only exception, as discussed below, will be the imposition by country C, whenever this is necessary, of a prohibitive tariff to make any arbitraging unprofitable.

In the basic scenario, country A is maximizing its welfare function by imposing a non-discriminatory per-unit import tariff. Given this 'reference' policy scenario, two policy changes are discussed: first, country A eliminating the tariff; and secondly, country A eliminating the tariff on its imports from country C, leaving the tariff level unchanged on its imports from country B. These policy changes are treated as determined exogenously, and may be thought of as induced by two different modifications of the parameters of country A's welfare function. These changes may be due, for example, to increased international criticism faced by its trade policy for reducing imports and/or by increased domestic concern about the economical problems faced by many less developed countries.

Country A is assumed to grant the preferential treatment to country C under the condition that it does not arbitrage; i.e. country C is not allowed to act *at the same time* on both sides of the market. Whenever it is necessary, country C imposes a prohibitive tariff either on its imports from country B or on its exports to country A.

To introduce the basic tools used throughout the analysis, the market equilibrium in the non-intervention case (under the hypothesis that country C is a net importer) is depicted in Fig. 1. Domestic and world prices are expressed in the same unit which, given the assumption of a fixed exchange rate, may be any of the three domestic currencies or a linear combination of them. In Fig.

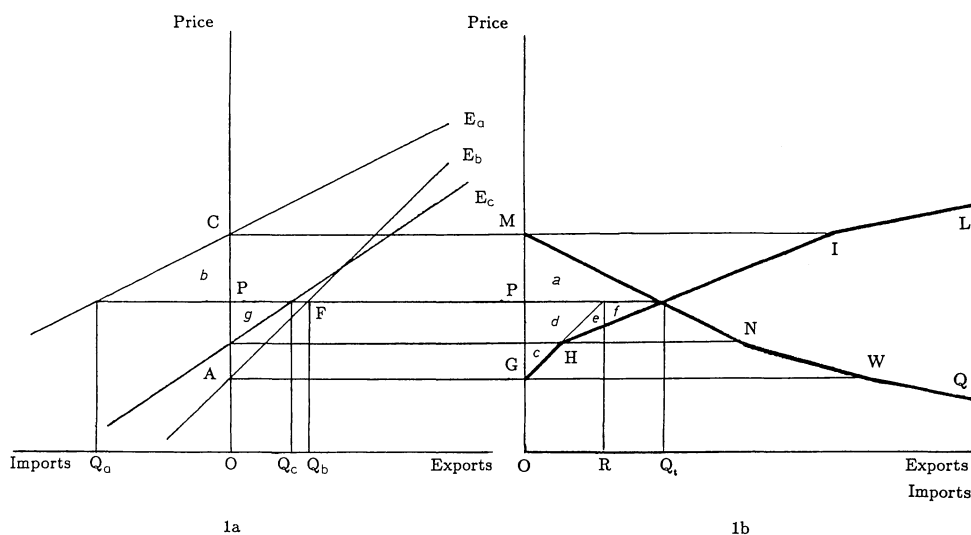


Fig. 1. Three-country world trade equilibrium.

1a the three countries' inverse excess demand/supply functions ( $E_i$ ) are represented. For each country the inverse excess function is obtained by horizontally subtracting the domestic inverse demand function from the domestic inverse supply function. Positive values on the horizontal axis will account for exports, negative values for imports. Country A's closed-economy domestic equilibrium price, for example, is C. If the world market equilibrium price is higher than C, country A is a net exporter; if the equilibrium price is lower than C, country A is a net importer. In Fig. 1b the world inverse excess demand and supply functions are presented. They are given by the lines  $MNWQ$  and  $GHIL$ , respectively. Both imports and exports will now be read on the positive portion of the horizontal axis. The world inverse excess supply function is obtained by summing horizontally the portions of the domestic excess functions which lie in Fig. 1a to the right of the vertical line. The world inverse excess demand function is given by the mirror image of what is obtained by summing horizontally the portions of the domestic excess functions lying in Fig. 1a on the left of the vertical line.

Traditionally, when excess demand and supply functions are used in empirical analyses, each country is considered as acting *only on one side* of the world market, either as an exporting country or as an importing one, regardless of the price level. No switching is allowed from one side of the market to the other as the price changes. However, any country, for example, will be willing to move from the importers' side to the exporters' side given a sufficiently high increase in the world equilibrium price. In both theoretical and empirical research analyzing trade policy changes, the 'no-switch' hypothesis induces rel-

evant distortions whenever in the reference scenario one or more countries have a degree of self-sufficiency close to one; and/or a substantial change in the world market equilibrium price is considered.

The free trade equilibrium in the world market is given by the intersection of the inverse world excess demand and supply functions. In Fig. 1b the world market equilibrium price is  $P$ , which is the domestic equilibrium price in each of the three countries as well. The traded quantity is  $Q_t$ . Country A, the only importer, imports  $Q_a$  (which is equal to  $Q_t$ ). Countries B and C export  $Q_b$  (which is equal to  $R$ ) and  $Q_c$  (which is equal to  $RQ_t$ ), respectively. Country A's gains from trade (i.e. the net gains in terms of consumers' plus producers' surplus accrued by country A through international trading) are given by area  $a$  in Fig. 1b, which is equal, by construction, to area  $b$  in Fig. 1a. Country B's gains from trade equal area  $(c+d)$  (which is equal to area AFP), country C's equal area  $(e+f)$  (which is equal to area  $g$ ).

## Analysis

Regardless of its policy choice, country A is supposed to be a net importer. Country B is assumed to be a net exporter. Four different cases, covering all possible positions on the market of country C, the beneficiary country, are considered:

Country C,

- (a) being an importer whatever policy country A implements;
- (b) being an exporter whatever policy country A implements;
- (c) being an importer if A imposes a non-discriminatory tariff and in the free trade scenario, but being able either to move to the exporters' side or to act as an importer when A imposes a discriminatory tariff;
- (d) being an importer when A imposes a non-discriminatory tariff, an exporter if free trading occurs, and to be able to act either as an exporter or as an importer if A imposes a discriminatory tariff.

The welfare results for all these four cases are synthesized in Table 1. However, only two cases — (b) and (d) above — are discussed below. A detailed discussion of all cases is in Anania (1988), while algebraic proof of all the results for two cases — (a) and (b) — is provided in Appendix.

*Country C as an exporter* (b). The reference scenario (Fig. 2) is characterized by country A imposing a non-discriminatory per-unit tariff on its imports. This tariff is supposed to be optimal with respect to its welfare function. The diagrammatic analysis used in this paper expands on the work by Johnson (1957, 1958). The main difference between this paper's treatment and Johnson's (as well as Blackhurst's, which makes use of Johnson's graphic representation) is that in Johnson's model a country is not allowed to switch from being an exporter to being an importer, or vice versa, as the equilibrium price changes.



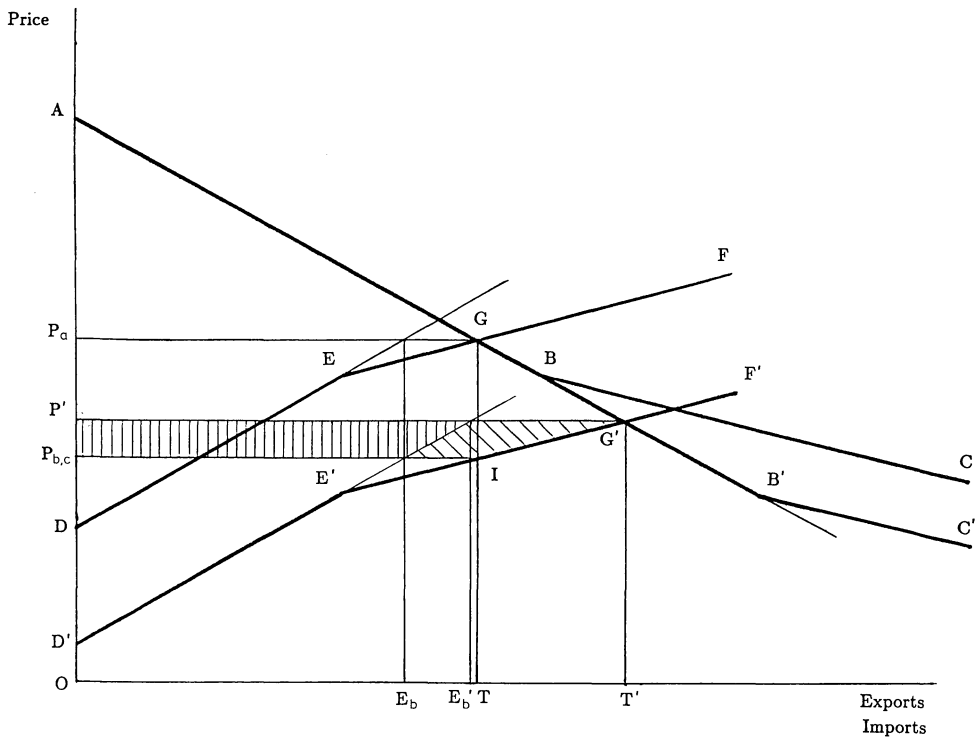


Fig. 2. Case (b): Generalized tariff reduction.

As a result, the excess demand function is misspecified, leading to the identification of incorrect market equilibria.

In Fig. 2, the world inverse excess supply and demand are expressed as functions of country A's equilibrium price. The no-tariff inverse excess supply is given by  $D'E'F'$ . The tariff imposed by country A is equal to  $DD'$ , and is introduced in the market representation through a parallel upward shift of the  $D'E'F'$  curve to the  $DEF$  one. The no-tariff inverse excess-demand curve is given by  $AB'C'$ . When the non-discriminatory tariff is considered, the inverse excess demand needs to be modified to take into account the fact that country B's exports to country C do not face any tariff. Now  $ABC$  is the relevant inverse excess demand function.

The market equilibrium results in a volume of trade equal to  $T$ . Countries B and C export price is equal to  $P_{b,c}$ , which is equal to  $P_a$ , the price in country A, minus the tariff. The tariff revenue collected by country A and redistributed to its consumers and producers as a lump-sum transfer is given by the area  $P_a P_{b,c} IG$ .

If country A eliminates the tariff, the world inverse excess demand is given by  $AB'C'$ , while the inverse excess supply is represented by  $D'E'F'$ . At equilibrium, the volume of trade equals  $T'$  and the world price (which coincides

with the domestic prices in the three countries) equals  $P'$ . Country A's imports from country B are equal to  $E'_b$ , those from country C to  $E'_b T'$ .

The impact of the trade liberalization on countries B and C's welfare is positive. Country B's welfare expands by the area emphasized by vertical lines, country C's by the cross-hatched one. In both countries, consumers' welfare decreases by a lesser amount than producers' welfare expands.

The sign of the impact on the MSSW in the trade-liberalizing country is ambiguous, and depends on the tariff level in the initial scenario. Country A's consumers' and producers' surplus expands, but no tariff revenue is now collected.

Consider the policy option by country A of imposing a discriminatory tariff on its imports from country B only, granting tariff-free access to country C's exports (Fig. 3). Moving from a non-discriminatory tariff to a discriminatory one (assuming the amount of the tariff remains unchanged) only affects the representation of the inverse excess supply curve. This is now given by  $DE''F''$ . The change is needed to make exports from country C exempt from country A's tariff.

The equilibrium price in countries A and C is now equal to  $P''_{a,c}$ . Country B's price is  $P''_b$  ( $P''_{a,c}$  minus the tariff). Country A's imports equal  $T''$ . Country B's exports equal  $E''_b$ , country C's  $E''_b T''$ . Country C is definitely better off with

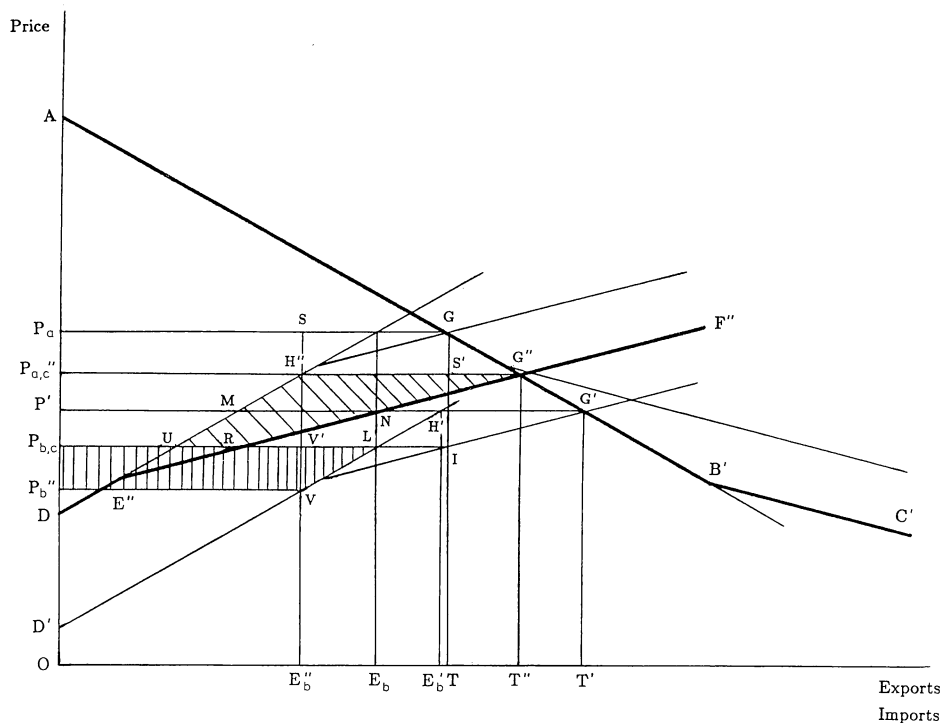


Fig. 3. Case (b): Preferential tariff reduction.

respect to both the free trade and the non-discriminatory tariff cases. Free trading is preferred to the non-discriminatory tariff. In the non-discriminatory tariff case, country C's gains from trade are equal to area  $E''UR$ . They increase by area  $URNM$  in the free-trade scenario. Under the discriminatory tariff, country C's welfare increases by an additional amount equal to the area  $MNG''H''$ . The cross-hatched area in Fig. 3 represents the increase in country C's welfare when country A moves from imposing a non-discriminatory tariff to a preferential one. Country C's consumers are worse off with respect to the other two scenarios, but their losses are offset by producers' gains. In order to neglect the possibility of any arbitrage, country C must impose a prohibitive tariff on its imports from country B. This tariff must be greater than country A's discriminatory tariff.

Under the discriminatory tariff, country B experiences the worst welfare impact. In Fig. 3, the area emphasized by vertical lines represents country B's welfare loss when A grants preferential tariff-free market access to country C's exports. Country B's ranking of the trade scenarios is: (1) free trade (its gains from trade being equal to the area  $D'H'P'$ ), (2) non-discriminatory tariff ( $D'LP_{b,c}$ ), (3) discriminatory tariff ( $D'VP''_b$ ). The same ranking is true for its producers, while consumers' ranking is: discriminatory tariff, non-discriminatory tariff, and free trade.

The overall impact (in terms of producers' and consumers' surplus plus tariff revenue) of the trade preference policy on country A itself is ambiguous. It is given by the difference between the sum of the areas  $P_aSH''P''_{a,c}$  and  $GG''S'$ , and area  $H''S'IV'$ .

*Country C as an importer in the non-discriminatory tariff case, as an exporter if free trading occurs, and being able to act either as an exporter or as an importer if A imposes a discriminatory tariff (d).* The starting scenario is, again, the one in which country A imposes a non-discriminatory tariff. In Fig. 4 at the equilibrium, the domestic price in country A is equal to  $P_a$ . Countries B and C's domestic price equals  $P_{b,c}$ . The volume of trade is equal to  $T$ . Country B exports  $I_a$  to country A and  $I_aT$  to country C.

Now assume that country A eliminates the tariff across the board due to a change in the weights attached to the arguments of its welfare function. The trade liberalization drives the equilibrium from  $G$  to  $G'$ . A is now the only importer (the volume of its imports being equal to  $T'$ ), while B and C are both exporting ( $E'_b$  and  $E'_bT'$ , respectively). The equilibrium price in all three countries equals  $P'$ . In the particular setting represented in Fig. 4, country C, which exports under the free trade option, is made better off by the imposition by the importing country of a non-discriminatory tariff (notice the cross-hatched area is bigger than that emphasized with horizontal lines), with a result which may appear counterintuitive. The imposition of the tariff causes a price decrease which makes country C move from the exporters' side to the

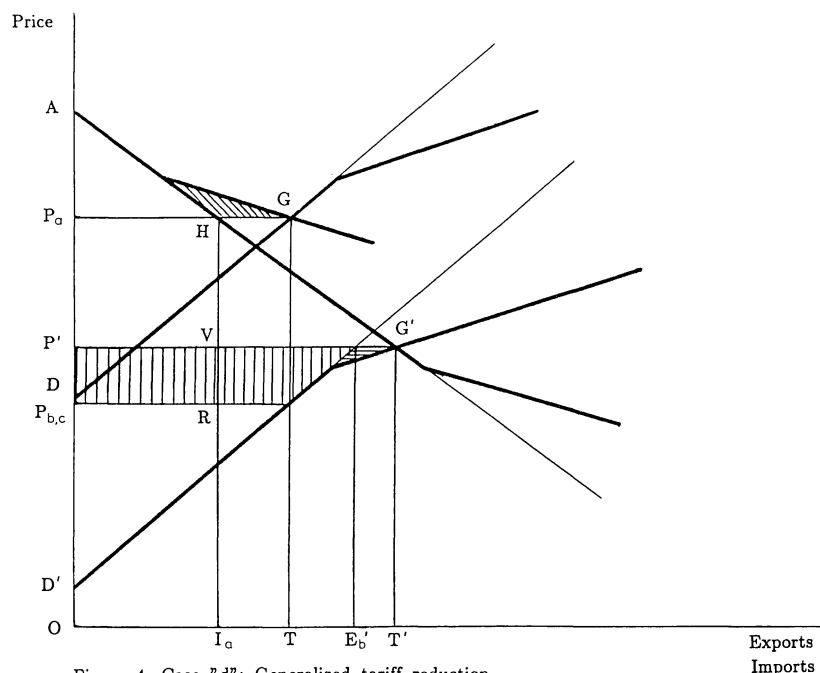


Figure 4. Case "d": Generalized tariff reduction.

Fig. 4. Case (d): Generalized tariff reduction.

importers' one; this switch is such that its welfare increases. Analogously, another possible result (not shown here) is that an importing country could be made better off by a trade liberalization. In this case, the elimination of the tariff drives the price up and this price increase is large enough to make the country switch from being an importer to being an exporter and its welfare to increase.

The trade liberalization makes country B definitely better off, its welfare increasing by the area emphasized by vertical lines in Fig. 4. The sign of the change of country A's MSSW is ambiguous (it is given by the difference between the area of the triangle  $HG'V$  and that of the rectangle  $P'VRP_{b,c}$ ).

An interesting outcome is obtained when we consider the trade preference policy option. Moving from a non-discriminatory tariff to a discriminatory one (assuming the amount of the tariff remains unchanged) only affects the representation of the inverse excess supply curve (Fig. 5), now given by  $DE''F''$ . In this case, country C has to choose between two distinct feasible market equilibria in which it trades on different sides of the market. A choice would be required at this point under the assumption that country C cannot *at the same time* export to country A and import from country B, thereby cheating on the trade preference granted by country A. Country C must choose between

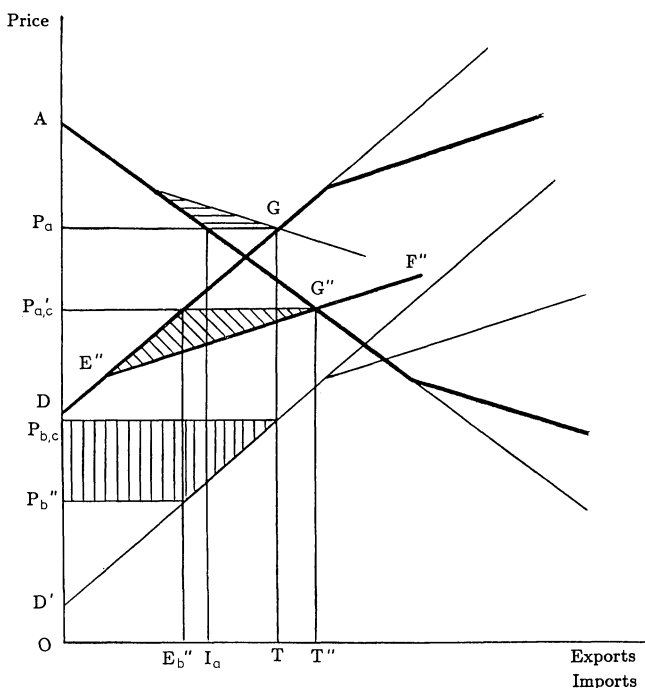


Fig. 5. Case (d): Preferential tariff reduction.

two alternative feasible market equilibria: one in which it acts as an exporter, making use of the trade preference (in this case the market equilibrium in Fig. 5 will be in  $G''$ ); the other in which it acts as an importer, choosing not to use the preferential treatment granted by country A (the market equilibrium will be in  $G$ ). The choice is made on the basis of its welfare associated with the two possible outcomes. In the specific case represented in Fig. 5, country C is better off by capitalizing on the preferential treatment granted (the cross-hatched area is greater than the area outlined by the horizontal lines). However, in another case, the other alternative might have been more profitable.

The impact on country B of the implementation of the trade preference policy is a function of country C's choice. If country C chooses to make use of the preference and to become an exporter, country B is definitely worse off, its welfare decreasing by the area emphasized by vertical lines. If country C finds it more profitable not to move to the exporters' side, country B's welfare remains unchanged, and the non-discriminatory tariff scenario and the discriminatory tariff one are equivalent. The free trade policy scenario is preferred by country B whatever country C's choice would be if it were granted a preferential tariff (Table 1).

If country C finds it profitable to switch to the exporters' side, the impact

TABLE 1

Generalized vs. preferential tariff reduction — comparative analysis of the welfare impacts

	Country A						Country B		Country C	
	CPS		TR		MSSW		W		W	
Scenario (a)										
NDT to FT	+		—		?		+		—	
NDT to DT	=		=		=		=		=	
Rankings										
NDT	2		1		?		2		1	
DT	2		1		?		2		1	
FT	1		3		?		1		3	
Scenario (b)										
NDT to FT	+		—		?		+		+	
NDT to DT	+		—		?		—		+	
Rankings										
NDT	3		1		?		2		3	
DT	2		2		?		3		1	
FT	1		3		?		1		2	
Scenario (c)										
NDT to FT	+		—		?		+		—	
NDT to DT										
(i) C importing	=		=		=		=		=	
(ii) C exporting	+		?		?		—		+	
Rankings										
	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)
NDT	2	3	1	?	?	?	2	2	1	2
DT	2	2	1	?	?	?	2	3	1	1
FT	1	1	3	3	?	?	1	1	3	3
Scenario (d)										
NDT to FT	+		—		?		+		? (i)-; (ii) ?	
NDT to DT										
(i) C importing	=		=		=		=		=	
(ii) C exporting	+		?		?		—		+	
Rankings										
	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)
NDT	2	3	1	?	?	?	2	2	1	?
DT	2	2	1	?	?	?	2	3	1	1
FT	1	1	3	3	?	?	1	1	3	?

NDT, non discriminatory tariff; DT, discriminatory tariff; FT, free trade; CPS, consumers' plus producers' surplus; TR, tariff revenue; MSSW, CPS + TR; W, welfare.

on the sum of country A's consumers' and producers' surpluses and of the tariff revenue remains ambiguous.

Country C is never worse off under the discriminatory tariff than under the

non-discriminatory one. On the other hand it may be definitely better off in the preferential trade scenario. When the discriminatory tariff and the non-discriminatory tariff options are equivalent, the free trade scenario is definitely ranked as the worst scenario. When the discriminatory tariff is clearly preferred by country C over the non-discriminatory tariff, the discriminatory tariff is definitely preferred to both the other two policy options. However, country C's relative ranking of the other two policies (non-discriminatory tariff and free trade) remains undetermined.

### A more complex welfare function

So far, the analysis has been based on the assumption that countries B and C's welfare was given only by their producers' and consumers' surplus. Although this definition of welfare has been widely used both in theoretical and empirical analyses, its effectiveness in explaining real world trade policy choices remains dubious. In this section a different definition of the welfare functions is used. The intent is to take into account a larger number of variables, representing a more likely subset of determinants in the trade policy decision-making processes. These modified welfare functions are then used to test the robustness of the results obtained in the previous section, verifying to what extent they resulted from the particular characterization of the welfare functions which were used.

For reasons which will be made clear later, the postulate that the sector under analysis uses inputs (both direct and indirect) which are entirely domestically produced needs to be added to the assumptions made in the first part of the paper (namely, results derived in a partial equilibrium framework, fixed exchange rates, zero transportation costs, linear domestic demand and supply functions and perfect competition on both the world and the domestic markets).

Countries B and C's welfare functions are now defined as positive monotonic functions of three variables: consumers' plus producers' surplus (PCS), national income ( $Y$ ) and foreign exchange earnings (FE). National income is defined here as the market value of the domestic production, plus the tariff revenue (if any). The assumption that the inputs (both direct and indirect) used are domestically produced lets us be sure that the total producers' revenue collected in the specific sector under consideration is entirely distributed among domestic economic agents.

Country A's welfare will be a function of  $W_b$  and  $W_c$ , as well as of  $PCS_a$ ,  $Y_a$  and  $FE_a$ .

The new welfare functions may be stated as follows:

$$W_a = W_a(PCS_a, Y_a, FE_a, W_b, W_c) \quad (8)$$

$$W_b = W_b (PCS_b, Y_b, FE_b) \quad (9)$$

$$W_c = W_c (PCS_c, Y_c, FE_c) \quad (10)$$

As before, the changes in country A's trade policy are considered exogenous, determined by a modification of the parameters of its welfare function.

In Table 2 countries B and C's ranking of the three trade policy scenarios, with respect to each argument of their welfare functions and with respect to the welfares themselves, are synthesized. Only two cases — (b) and (d) — are briefly discussed here. Again, algebraic proof of the results for cases (a) and (b) is given in the Appendix.

*Country C as an exporter* (b). The different possible market equilibria when country C remains an exporter whatever policy country A implements have been already discussed in detail.

When country A eliminates the tariff on its imports across the board the volume of trade increases and the price is equal in all three countries (Fig. 2).

The sum of consumers' and producers' surpluses increases in all three countries. The income effect of the trade liberalization is positive in countries B and C (they both produce more at a higher equilibrium price), negative in country A (which produces less at a lower equilibrium price, and, in addition, loses the tariff revenue collected in the non-discriminatory tariff policy scenario). The impact of the trade liberalization on the foreign exchange reserves is also negative in country A (which imports more at a higher price) and positive in countries B and C (which export more at a higher price).

Countries B and C's welfare functions are now defined as strictly positive monotonic functions of consumers' and producers' surplus, domestic income and foreign exchange earnings. If the change in country A's trade policy has a positive (negative) effect on *all* three arguments of their welfare functions, we may deduce that their overall welfare increases (decreases). In all the other cases the welfare change depends on the specific weights attached to each of the arguments of the welfare function. Therefore, the effect of a trade liberalization on countries B and C's welfare is definitely positive.

Moving from the non-discriminatory tariff scenario to the discriminatory tariff one makes countries B and C's producers' plus consumers' surplus increase, while country B's decreases (Fig. 3). Country C is better off in terms of both its foreign exchange earnings and its domestic income. Both are higher under the preferential tariff than in the trade liberalization case. Hence, when country C is an exporter whatever country A's policy choice is, it is definitely better off under the preferential tariff than under either the non-discriminatory tariff or the free trade policy.

Country B, on the contrary, is made worse off by the preferential tariff both in terms of its foreign exchange earnings and of its income. Country A's pref-



TABLE 2

Generalized vs. preferential tariff reduction — comparative analysis of the welfare impact using a more complex welfare function

	Country A						Country B							
	CPS		Y		FE		CPS		Y		FE		W	
Scenario (a)														
NDT to FT	+		−		−		+		+		+		+	
NDT to DT	=		=		=		=		=		=		=	
Rankings														
NDT	2		1		1		2		2		2		2	
DT	2		1		1		2		2		2		2	
FT	1		3		3		1		1		1		1	
Scenario (b)														
NDT to FT	+		−		−		+		+		+		+	
NDT to DT	+		−		?		−		−		−		−	
Rankings														
NDT	3		1		?		2		2		2		2	
DT	2		2		?		3		3		3		3	
FT	1		3		?		1		1		1		1	
Scenario (c)														
NDT to FT	+		−		−		+		+		+		+	
NDT to DT														
(i)	=		=		=		=		=		=		=	
(ii)	+		−		?		−		−		−		−	
Rankings														
	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)
NDT	2	3	1	1	1	?	2	2	2	2	2	2	2	2
DT	2	2	1	2	1	?	2	3	2	3	2	3	2	3
FT	1	1	3	3	3	?	1	1	1	1	1	1	1	1
Scenario (d)														
NDT to FT	+		−		−		+		+		+		+	
NDT to DT														
(i)	=		=		=		=		=		=		=	
(ii)	+		−		?		−		−		−		−	
Rankings														
	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)
NDT	2	3	1	1	1	?	2	2	2	2	2	2	2	2
DT	2	2	1	2	1	?	2	3	2	3	2	3	2	3
FT	1	1	3	3	3	?	1	1	1	1	1	1	1	1

NDT, non discriminatory tariff; FT, free trade; DT, discriminatory tariff; CPS, consumers' plus producers' surplus; Y, domestic income; FE, foreign exchange earnings/expenditure; W, welfare; (i) country C importing; (ii) country C exporting.

## Country C

CPS		Y		FE		W	
—		+		?		?	
=		=		=		=	
1		2		?		?	
1		2		?		?	
3		1		?		?	
+		+		+		+	
+		+		+		+	
3		3		3		3	
1		1		1		1	
2		2		2		2	
—		+		?		?	
=		=		=		=	
?		+		+		+	
(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)
1	?	2	3	?	?	?	?
1	?	2	1	?	1	?	?
3	?	1	2	?	?	?	?
?		+		+		?	
=		=		=		=	
?		+		+		+	
(i)	(ii)	(i)	(ii)	(i)	(ii)	(i)	(ii)
?	?	2	3	2	3	?	?
?	?	2	1	2	1	?	1
?	?	1	2	1	2	?	?

erential policy is perceived by country B as the worst possible scenario, the complete trade liberalization as the most favorable.

The income impact of the implementation of the preferential policy on country A itself is negative, while the sign of the change in its foreign exchange expenditure remains in general unknown. Country A's income losses are smaller in the discriminatory tariff scenario than in the free trade one. The ranking of these two policy options with respect to its foreign exchange expenditure remains ambiguous. In the discriminatory tariff scenario, country A's imports are smaller than in the free trade one, but it pays a portion of them (those it is importing from country C) at a price which is higher than the one prevailing when free trading occurs, while on the other hand it pays a portion of them (those it is importing from country B) at a price which is below that level.

*Country C as an importer in the non-discriminatory tariff case, as an exporter if free trading occurs, and being able to act either as an exporter or as an importer if A imposes a discriminatory tariff (d).* In this case, if the import tariff is eliminated across the board, country C is better-off both in terms of its income and in terms of its foreign exchange reserves (Fig. 4). However, because the impact on the consumers' plus producers' surplus is uncertain, the sign of the change in its welfare remains, in general, undetermined. Country B, on the contrary, is better off with respect to all three arguments of its welfare function. The trade liberalization makes country A's consumers' and producers' surplus increase and its income and its foreign exchange reserves decrease.

When the preferential trade policy is considered, as discussed above, two equilibria are feasible. The one which takes place is the one associated with country C's highest welfare. If country C chooses to stay on the importers' side of the market, the equilibrium does not move from the reference one. If country C is better off moving from the importers' side to the exporters' one, then the equilibrium prices in countries A and C are equal, while the price in country B is equal to the price in the other two countries minus country A's import tariff (Fig. 5). Country A sees its producers' and consumers' surplus increase and its income decrease. The sign of the impact on its foreign currency reserves remains ambiguous. Country B is worse off in terms of all the three arguments of its welfare function. Country C is better off in terms of its income and of its foreign exchange earnings, but the impact on its consumers' and producers' surplus remains undetermined. Its overall welfare, however, increases.

Whatever position country C chooses, country B's highest welfare is definitely associated with the free trade alternative. If country C chooses to remain on the importers' side of the market when country A implements the trade preferential policy, than country B finds the non-discriminatory tariff and the discriminatory tariff options equivalent. However, the non-discriminatory tariff scenario is preferred to the discriminatory tariff one if country C finds it more convenient to capitalize on the trade preference granted by country A by

exporting. Country C's ranking remains partially undetermined. If it does not make use of the preference (i.e. it does not switch to the exporters' side of the market) the discriminatory tariff scenario and the non-discriminatory one are equivalent, but it cannot be determined whether the level of the welfare associated with these scenarios is greater, equal or smaller than the one associated with the free trade option. If country C moves to the exporters' side of the market when country A offers the opportunity of a preferred treatment of its imports coming from country C, the discriminatory tariff policy scenario is definitely the most attractive for country C. This is (a) because the discriminatory tariff policy scenarios certainly preferred to the non-discriminatory one (otherwise country C would not become an exporter), and (b) because in the free trade case all the arguments of the welfare function are smaller than those in the discriminatory tariff policy scenario.

## Conclusions

The paper's main goal was to compare, on a theoretical basis, the welfare implications of a preferential tariff reduction with those of a generalized tariff reduction. The analysis has been developed using an innovative model which allows the switching of the beneficiary country from being an exporter to being an importer, or vice versa, as the price changes. Two different formulations of the welfare functions have been considered. The results that emerged when a more basic, and more traditional, definition of the welfare functions has been used, may be synthesized as follows:

(1) Whatever the position of the beneficiary country on the world market, it is *always* better off under a preferential tariff reduction than under a generalized tariff reduction.

(2) In cases (a) and (c) the beneficiary country is made worse off (with respect to the existence of a non-discriminatory tariff) by a generalized tariff reduction. This result may be true as well in case (d).

(3) From the donor country's point of view, for a given beneficiary country benefit, the cost under the generalized tariff reduction is *always* greater than under the preferential tariff reduction.

(4) The non-targeted country, under the hypothesis made in the paper (i.e. that it is an exporter whatever country A's policy is), is *always* better off in the generalized tariff reduction scenario than in the preferential tariff reduction one.

When a more complex, and less traditional, formulation of the welfare functions has been used, the following results have been obtained:

(1) If the beneficiary country is already exporting in the reference scenario it is definitely better off under a preferential tariff reduction than under a generalized tariff reduction. In most of the other cases, the way it will rank

these trade policy alternatives remains undetermined. However, in all the cases considered, a trade liberalization will *never* make the beneficiary country definitely better off in comparison to a preferential trade policy scenario.

(2) In most of the cases considered, the beneficiary country may be made worse off by a generalized tariff reduction than by a non-discriminatory tariff. On the other hand, when the case is considered in which the beneficiary country is always an exporter — whatever trade policy country A implements — it is definitely made better off by a trade liberalization.

(3) From the donor country point of view, for a given beneficiary country welfare gain, the cost in terms of both income and foreign exchange reserves is *always* greater under the generalized tariff reduction option than under the preferential tariff reduction.

(4) The non-targeted country, under the hypothesis made (i.e. that it is an exporter whatever country A's policy is), is *always* better off in the generalized tariff reduction scenario than in the preferential tariff reduction one.

The results obtained in the second part of the paper, even if less robust, are fully consistent and largely confirm those emerged in the first part, when a much more simple specification of the welfare function was considered. Based on the results of the analysis, we may conclude that many importing and exporting developed countries have taken positions consistent with their own self-interest when it came to advocating general rather than preferential tariff reductions as a means to assist less developed countries. However, if the interests of the less developed countries alone were considered, the paper's findings suggest that there is no evidence whatsoever to suppose that less developed countries may be assumed a priori to be better off under a generalized tariff reduction than under a preferential tariff reduction. On the contrary, for those developing countries which are already exporting under the unfavorable conditions of a non-discriminatory tariff, quite the opposite result will definitely be true.

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## Appendix

The appendix develops mathematically some of the paper's results using a diagrammatical approach. The assumptions the appendix builds on are those stated in the paper.

First, equilibrium conditions are derived, then comparative statics results are used to prove the conclusions reached in the paper, which are summarized in Tables 1 and 2, for two of the four cases taken into consideration: those labeled above as (a) and (b). The use of a comparative statics approach, in fact, precludes the possibility of proving the results when the targeted country switches from being an exporter to being an importer, or vice versa, as the equilibrium price changes.

Let:

$$S_a = \alpha_a + \beta_a p_a \quad (\text{A1})$$

$$S_b = \alpha_b + \beta_b p_b \quad (\text{A2})$$

$$S_c = \alpha_c + \beta_c p_c \quad (\text{A3})$$

be the domestic supply functions, and:

$$D_a = \gamma_a + \delta_a p_a \quad (\text{A4})$$

$$D_b = \gamma_b + \delta_b p_b \quad (\text{A5})$$

$$D_c = \gamma_c + \delta_c p_c \quad (\text{A6})$$

be the domestic demand functions in the three countries, with  $\gamma_i > \alpha_i > 0$ ,  $\beta_i > 0$  and  $\delta_i < 0$  ( $i = a, b, c$ ); let:

$$Q_a = S_a - D_a = a + bp_a \quad (\text{A7})$$

$$Q_b = S_b - D_b = c + dp_b \quad (\text{A8})$$

$$Q_c = S_c - D_c = e + fp_c \quad (\text{A9})$$

be the correspondent excess demand/supply functions, with (given the assumptions on the parameters in A1–A6)  $a, c, e < 0$ , and  $b, d, f > 0$ . A positive  $Q$  implies that the country is an exporter (its exports being equal to  $Q$ ), while a

negative  $Q$  implies that the country is an importer (its imports being equal to  $-Q$ ).

Under the assumptions made in the paper the following equilibrium price linkages hold:

$$p_b^* = p_a^* - t_{ab} \quad (\text{A10})$$

$$p_c^* = p_a^* - (1 - \phi)t_{ac} - \phi t_{ab} \quad (\text{A11})$$

where  $t_{ab}$  and  $t_{ac}$  are the tariffs imposed by country A on its imports from countries B and C, respectively;  $\phi$  is a dummy variable, which is equal to 0 when country C is an exporter, to 1 when it is an importer, and the \* indicates equilibrium values.

By imposing a market-clearance condition, the equilibrium prices can be easily obtained:

$$p_a^* = [(d + f\phi)t_{ab} + f(1 - \phi)t_{ac} - a - c - e] / (b + d + f) \quad (\text{A12})$$

$$p_b^* = [(d + f\phi)t_{ab} + f(1 - \phi)t_{ac} - a - c - e] / (b + d + f) - t_{ab} \quad (\text{A13})$$

$$p_c^* = [(d + f\phi)t_{ab} + f(1 - \phi)t_{ac} - a - c - e] / (b + d + f) - (1 - \phi)t_{ac} - \phi t_{ab} \quad (\text{A14})$$

In Fig. A1, SS' represents an excess supply/demand function as those given in (A7)–(A9). The cross-hatched area represents the gains from trade (i.e. the amount by which domestic consumers' and producers' surplus increases as a result of international trading) when the equilibrium price is  $p_1$  and, as a result, the country is exporting. The area emphasized by the vertical lines gives the gains from trade when the equilibrium price is  $p_2$  and the country is importing. These gains from trade are equal, respectively, to  $0.5(p_1 - c)Q_1$  and  $0.5(p_2 - c)Q_2$  (note that both  $p_2 - c$  and  $Q_2$  are less than zero).

Hence, countries A, B and C's producers' and consumers' surplus (CPS) and country A's market-specific social welfare (MSSW) may be defined as follows:

$$PCS_a^* = DPCS_a + 0.5(p_a^* + a/b)Q_a^* \quad (\text{A15})$$

$$PCS_b^* = DPCS_b + 0.5(p_b^* + c/d)Q_b^* \quad (\text{A16})$$

$$PCS_c^* = DPCS_c + 0.5(p_c^* + e/f)Q_c^* \quad (\text{A17})$$

$$MSSW_a^* = DPCS_a^* - \phi t_{ab}Q_a^* + (1 - \phi)(t_{ab}Q_b^* + t_{ac}Q_c^*) \quad (\text{A18})$$

where  $DPCS_i$  ( $i = a, b, c$ ) equals country  $i$ 's closed economy domestic consumers' and producers' surplus.

Based on the definitions given in the paper, foreign exchange earnings/expenditures (FE) and incomes (Y) are given by:

$$FE_a^* = \phi p_b^*Q_a^* - (1 - \phi)(p_b^*Q_b^* + p_c^*Q_c^*) \quad (\text{A19})$$

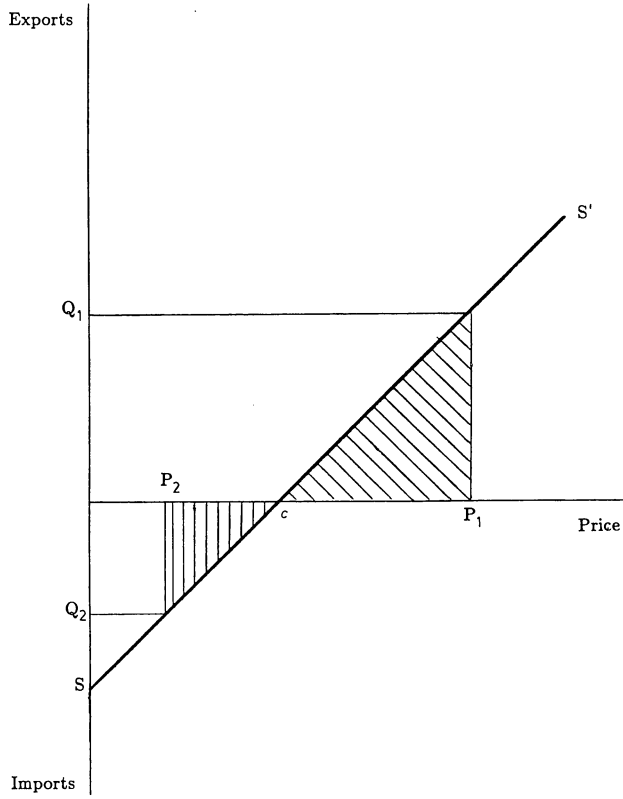


Fig. A1. Gains from trade.

$$FE_b^* = p_b^* Q_b^* \quad (A20)$$

$$FE_c^* = p_c^* Q_c^* \quad (A21)$$

and

$$Y_a^* = p_a^* (\alpha_a + \beta_a p_a^*) - \phi t_{ab} Q_a^* + (1 - \phi) (t_{ab} Q_b^* + t_{ac} Q_c^*) \quad (A22)$$

$$Y_b^* = p_b^* (\alpha_b + \beta_b p_b^*) \quad (A23)$$

$$Y_c^* = p_c^* (\alpha_c + \beta_c p_c^*) \quad (A24)$$

Note that when FE is greater than zero it is equal to the country's foreign exchange earnings, when it is less than zero it is equal to the country's foreign exchange expenditure with the sign reversed.

As we did in the paper, it is assumed that the reference scenario is the one in which country A imposes a non-discriminatory tariff (NDT) on its imports from countries B and C (i.e.  $t_{ab} = t_{ac} = t$ ). Comparative statics results are then



derived assuming that country A (1) moves toward free trading (FT) by lowering across the board its non-discriminatory tariff  $t$ , and (2) moves toward a discriminatory tariff (DT) by lowering  $t_{ac}$ , while leaving  $t_{ab}$  unchanged.

First let's derive the impact on equilibrium prices and quantities of both the FT and the DT policy choices:

$$\partial p_a^* / \partial t = (d+f) / (b+d+f) > f(1-\phi) / (b+d+f) = \partial p_a^* / \partial t_{ac} \geq 0 \quad (A25)$$

$$\partial p_b^* / \partial t = -b / (b+d+f) < 0 \leq f(1-\phi) / (b+d+f) = \partial p_b^* / \partial t_{ac} \quad (A26)$$

$$\begin{aligned} [\partial p_c^* / \partial t_{ac}]_{\phi=0} &= -(b+d) / (b+d+f) < -b / (b+d+f) \\ &= \partial p_c^* / \partial t < 0 = [\partial p_c^* / \partial t_{ac}]_{\phi=1} \end{aligned} \quad (A27)$$

$$\partial Q_a^* / \partial t = b(d+f) / (b+d+f) > bf(1-\phi) / (b+d+f) = \partial Q_a^* / \partial t_{ac} \geq 0 \quad (A28)$$

$$\partial Q_b^* / \partial t = -db / (b+d+f) < 0 \leq df(1-\phi) / (b+d+f) = \partial Q_b^* / \partial t_{ac} \quad (A29)$$

$$\begin{aligned} [\partial Q_c^* / \partial t_{ac}]_{\phi=0} &= -f(b+d) / (b+d+f) < -fb / (b+d+f) \\ &= \partial Q_c^* / \partial t < 0 = [\partial Q_c^* / \partial t_{ac}]_{\phi=1} \end{aligned} \quad (A30)$$

These results will be needed later on in this Appendix. However, it is worthwhile at this point to underline some of the information they provide. In particular (keeping in mind that the case of a price change such that country C moves from being an importer to being an exporter, or vice versa, is now ruled out), the following conclusions may be drawn:

- No matter what the position of country C on the market is, country A's imports increase more if it uniformly lowers its tariff than if it lowers its tariff on its imports from country C only (A28).
- When country A lowers its tariff across the board, country B's exports increase. On the contrary, when country A lowers its tariff on its imports from country C only, country B's exports either decrease (if country C is an exporter) or remain unchanged (if country C is an importer) (A29).
- If country C is an exporter, its exports increase more under the preferential tariff reduction than under the generalized tariff reduction. If it is an importer, its imports decrease under a generalized tariff reduction and do not change under a preferential tariff reduction (A30).

*Country C as an importer (a).* Let's consider first the case in which country C is an importer whatever policy country A implements.

If this is the case, the impacts of country A uniformly lowering its tariff, or lowering its tariff on its imports from country C only, on each country's producers' and consumers' surpluses, may be described as follows:

$$\begin{aligned} \partial PCS_a^* / \partial t &= 0.5 [ (\partial p_a^* / \partial t) Q_a^* + (p_a^* + a/b) (\partial Q_a^* / \partial t) ] < 0 \\ &= 0.5 [ (\partial p_a^* / \partial t_{ac}) Q_a^* + (p_a^* + a/b) (\partial Q_a^* / \partial t_{ac}) ] = \partial PCS_a^* / \partial t_{ac} \end{aligned} \quad (A31)$$

$$\begin{aligned}\partial \text{PCS}_b^*/\partial t &= 0.5 [ (\partial p_b^*/\partial t) Q_b^* + (p_b^* + c/d) (\partial Q_b^*/\partial t) ] < 0 \\ &= 0.5 [ (\partial p_b^*/\partial t_{ac}) Q_b^* + (p_b^* + c/d) (\partial Q_b^*/\partial t_{ac}) ] = \partial \text{PCS}_b^*/\partial t_{ac} \quad (\text{A32})\end{aligned}$$

$$\begin{aligned}\partial \text{PCS}_c^*/\partial t &= 0.5 [ (\partial p_c^*/\partial t) Q_c^* + (p_c^* + e/f) (\partial Q_c^*/\partial t) ] > 0 \\ &= 0.5 [ (\partial p_c^*/\partial t_{ac}) Q_c^* + (p_c^* + e/f) (\partial Q_c^*/\partial t_{ac}) ] = \partial \text{PCS}_c^*/\partial t_{ac} \quad (\text{A33})\end{aligned}$$

$$\begin{aligned}\partial \text{MSSW}_a^*/\partial t &= \partial \text{PCS}_a^*/\partial t + (\partial Q_b^*/\partial t) t + Q_b^* \geq 0 \\ &= \partial \text{PCS}_a^*/\partial t_{ac} + (\partial Q_b^*/\partial t_{ac}) t_{ab} = \partial \text{MSSW}_a^*/\partial t_{ac} \quad (\text{A34})\end{aligned}$$

(A31), for example, holds because:  $\partial p^*/\partial t > 0$  (from A25),  $Q_a^* < 0$  (country A being assumed to be an importer),  $p_a^* + a/b < 0$  (for the same reason),  $\partial Q_a^*/\partial t > 0$  (A28),  $\partial p_a^*/\partial t_{ac} = 0$  (A25, country C being assumed to be an importer), and  $\partial Q_a^*/\partial t_{ac} = 0$  (A28).

Analogously, the impact of the generalized and the preferential tariff reduction on foreign exchange earnings/expenditures and incomes may be described as follows:

$$\partial \text{FE}_a^*/\partial t > 0 = \partial \text{FE}_a^*/\partial t_{ac} \quad (\text{A35})$$

$$\partial \text{FE}_b^*/\partial t < 0 = \partial \text{FE}_b^*/\partial t_{ac} \quad (\text{A36})$$

$$\partial \text{FE}_c^*/\partial t \geq 0 = \partial \text{FE}_c^*/\partial t_{ac} \quad (\text{A37})$$

$$\begin{aligned}\partial Y_a^*/\partial t &= (\partial p_a^*/\partial t) (\alpha_a + \beta_a p_a^*) + p_a^* \beta_a (\partial p_a^*/\partial t) \\ &\quad + (\partial Q_b^*/\partial t) t + Q_b^* \geq 0 = \partial Y_a^*/\partial t_{ac} \quad (\text{A38})\end{aligned}$$

$$\partial Y_b^*/\partial t < 0 = \partial Y_b^*/\partial t_{ac} \quad (\text{A39})$$

$$\partial Y_c^*/\partial t < 0 = \partial Y_c^*/\partial t_{ac} \quad (\text{A40})$$

The effects of the two country A's policy changes under consideration may be summarized as follows:

— When country C is an importer nothing happens if country A lowers  $t_{ac}$  only (A31–A40).

When country A uniformly lowers its import tariff:

- Country A's and B's producers' and consumers' surplus increase (A31 and A32), country C's decreases (A33), and the sign of the impact on country A's *MSSF* remains undetermined (A34).
- Its foreign exchange expenditure increases (A35, note that  $\text{FE}_a < 0$ ), country B's earnings increase (A36), while the sign of the change on country C's foreign exchange expenditure is in general ambiguous (A37).
- While the impact of a marginal reduction across the board of country A's tariff on its own income remains in general undetermined (A39), when, as assumed in the paper, it grants countries B and C tariff-free access (i.e.  $t=0$ ) its income definitely decreases.

- The impact on country B and C's income is definitely positive (A39 and A40).

*Country C as an exporter (b).* The impact of two policy changes considered when country C is an exporter no matter what country A's policy choice is, may be described as follows:

$$\partial \text{PCS}_a^* / \partial t < \partial \text{PCS}_a^* / \partial t_{ac} < 0 \quad (\text{A41})$$

$$\partial \text{PCS}_b^* / \partial t < 0 < \partial \text{PCS}_b^* / \partial t_{ac} \quad (\text{A42})$$

$$\partial \text{PCS}_c^* / \partial t_{ac} < \partial \text{PCS}_c^* / \partial t < 0 \quad (\text{A43})$$

$$\partial \text{MSSW}_a^* / \partial t \geq 0 \geq \partial \text{MSSW}_a^* / \partial t_{ac} \quad (\text{A44})$$

$$\partial \text{FE}_a^* / \partial t > 0 \geq \partial \text{FE}_a^* / \partial t_{ac} \quad (\text{A45})$$

$$\partial \text{FE}_b^* / \partial t < 0 < \partial \text{FE}_b^* / \partial t_{ac} \quad (\text{A46})$$

$$\partial \text{FE}_c^* / \partial t_{ac} < \partial \text{FE}_c^* / \partial t < 0 \quad (\text{A47})$$

$$\partial Y_a^* / \partial t \geq 0 \geq \partial Y_a^* / \partial t_{ac} \quad (\text{A48})$$

$$\partial Y_b^* / \partial t < 0 < \partial Y_b^* / \partial t_{ac} \quad (\text{A49})$$

$$\partial Y_c^* / \partial t_{ac} < \partial Y_c^* / \partial t < 0 \quad (\text{A50})$$

Hence, when country C is assumed to be an exporter whatever policy country A implements:

- Country A's producers' and consumers' surplus increases more under the generalized tariff reduction than under the preferential one (A41). The change in its market-specific social welfare remains ambiguous under both scenarios (A44). Its foreign exchange expenditure is definitely higher when the generalized tariff reduction occurs, while the result is ambiguous when it lowers  $t_{ac}$  only (A45). If marginal decreases in the tariffs are considered the sign of the changes in country A's income remain ambiguous (A48). However, if, as is the case in the paper, a free trade scenario ( $t=0$ ) is compared with the granting to country C of a preferential tariff-free market access ( $t_{ab}$  unchanged,  $t_{ac}=0$ ), then country A's income decreases in both cases, but the drop is larger when free trade occurs;
- Country B is better off in terms of all terms of its welfare function when the generalized tariff reduction takes place, and worse off when country A lowers the tariff on its imports from country C only (A42, A46, A49);
- Country C, on the contrary, is better off under both country A's policy choices. However, the increases in its consumers' and producers' surplus, foreign exchange earnings and income are all higher when the preferential tariff reduction occurs (A43, A47, A50).