"Multilateralism, Regionalism, and the Sustainability of 'Natural' Trading Blocs"

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Abstract: This paper compares the maximum level of world welfare attainable in an incentive compatible, multilateral trade agreement between 4 countries with the maximum attainable when pairs of countries form preferential trade agreements. It is shown that in a world where all countries are symmetric and export a single good to the rest of the world, preferential agreements can sustain lower tariff rates than multilateral agreements, although multilateral agreements will yield higher welfare if the discount parameter is sufficiently high. Under a trade pattern where countries import a single product, multilateral agreements dominate in sustainability and welfare for all discount parameters. Transportation costs that make intercontinental trade more costly than intra continental trade are introduced to examine whether “natural trading blocs” are more attractive. It is shown that higher welfare levels are sustainable with regional parameters for all discount parameters. Also, the existence of transport costs expands the range of discount parameters for which preferential arrangements are preferred to multilateral agreements when multilateral agreements are constrained to an MFN principle.

I. Introduction

Substantial attention has recently been focused on whether regional trade agreements have favorable effects on the world trading system and should be encouraged, or whether new initiatives for trade liberalization should be restricted to multilateral trade agreements that apply the MFN principle. This paper addresses the question by examining a model in which countries cannot write enforceable contracts on tariffs, so that trade agreements must be self-enforcing agreements that are supported through repeated interactions between the countries. Although a number of papers have examined the effect of preferential arrangements on the multilateral trading system under the assumption that multilateral trade agreements must be self-enforcing (e.g. Bagwell and Staiger (1997a,b) ,(1999), Bond and Syropoulos (1995), Bond Syropoulos and Winters (1998))[1], all of these paper have assumed that member countries can commit to tariff rates in the preferential trading arrangement. Thus, a fundamental asymmetry in commitment power is assumed between preferential agreements and the multilateral trading system.

The purpose of this paper is to compare preferential and multilateral trade agreements in an environment where both types of agreements must be self-enforcing in a repeated game between the participating countries, so there is no exogenous difference in commitment ability between preferential and multilateral agreements. A simple 4 country trade model is examined. A multilateral agreement is a trade agreement between all 4 countries in that is required to satisfy the MFN principle, with a deviation by any country being punished by reversion to the one shot Nash equilibrium by all participating countries. A preferential agreement equilibrium is one in which two pairs of countries form preferential

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[1] Bond and Syropoulos (1995) examine how an increase in the size of trading blocs affects multilateral cooperation in a many country world. Bagwell and Staiger (1997a,b) examine changes in trade relations over time between two countries when preferential trading agreements with outside countries, either free trade areas or customs unions, are anticipated in the future. Bagwell and Staiger (1999) and Bond and Syropoulos (1999) examine how the existence of preferential arrangements between two countries affects trade relations with a third.

trade agreements that give a discriminatory tariff reduction to member countries, with deviations punished by reversion to the Nash equilibrium of the one shot game by the member countries. The question to be examined is whether the level of world welfare that can be sustained under the multilateral trading system is higher than can be attained if instead the world were divided into symmetric PTAs.

Two basic sources of difference between multilateral and regional agreements will be examined. The first is due to difference between the deviation and punishment effects under the respective types of agreements in the case which all countries are symmetric. It will be shown that in the case where each country has comparative advantage in a single good which it exports to the rest of the world, the minimum sustainable tariff on trade between the countries is always lower under a preferential trade agreement than under a multilateral agreement. This ability to sustain lower tariffs under the preferential agreement results from strategic spillovers between the preferential trade groups during the punishment and deviation phases. However, this ability to attain lower tariffs under preferential agreements must be weighed against the fact that the discriminatory nature of these agreements results in lower welfare at a given agreement rate. It is shown that when both of these factors are combined, multilateral agreements will dominate unless disount factors are quite low. In contrast, in the case where each country imports a single good from all other countries, the minimum sustainable tariff under a multilateral agreement is lower than that under a preferential agreement. In this case there is strategic independence between blocs in the preferential case, so that multilateral agreements benefit from having superior punishment power. These two cases illustrate how the pattern of trade influences spillovers between preferential agreements, and hence the sustainability of tariffs under preferential agreements.

The second source of asymmetry between the agreements is obtained by giving the trade model a regional structure: the four countries are divided between two continents, with transport costs incurred on trade between continents but not within continents. It is shown that in this case the existence of transportation costs gives an advantage to preferential agreements over multilateral agreements when the discount parameter is low, regardless of the pattern of trade, because of the requirement that multilateral agreements satisfy the MFN principle. Multilateral agreements satisfying the MFN principle must impose the same tariff on all countries, even though deviation incentives may differ across the partner countries, which makes sustaining of multilateral agreements more difficult. However, when weight placed on the future is high this effect is dominated by the superior welfare effects of the multilateral agreeement.

The case with regional differences in trade costs also raises the question of whether the preferential trade equilibrium is better when there are regional partners or distant partners. It is shown that for both patterns of trade, the equilibrium with a regional trade blocs yields higher welfare. This result is due to the fact that the regional agreement has lower external tariffs than does the preferential agreement with a distant country. This analysis contributes to the literature on 'natural trading blocs,' which has been concerned with whether there is a presumption that tariff reductions with nearby partners are welfare improving. Krugman (1991), Frankel Sten and Wei (1995), and Bhagwati and Panagariya (1996) have examined this question by considering whether exogenously given preferential tariff reductions are welfare improving in a model where there are differing levels of transport costs between trading partners. The analysis in the present paper differs in that attention is focused on preferential reductions that are agreements that are self-enforcing.

Section II of the paper presents the trade model for the case where each country exports a single good, and compares sustainability of multilateral and preferential agreements in the absence of transport costs. Section III analyzes the case of inter-continental transport costs. Section IV examines how the results are affected by altering the pattern of trade so that each country imports a single good from all other countries. Section V offers some concluding remarks.

II. Multilateral and Regional Trade Agreements in the Symmetric Case

We examine a 4 country, 4 good trade model in which countries are symmetric. The four country framework is adopted because it is the simplest framework in which to compare multilateralism with regionalism when there is more than one regional trading bloc. The demand for good j in country i is $D_j^i = \alpha - p_j^i$, where p_j^i is the price of good j in country i. Each country i has an endowment of X of good i and 0 of goods $j \neq i$. Letting t_j^i denote the specific tariff imposed by country i on imports of good j, $p_j^i = p_j^j + t_j^i$ for $j \neq i$. It will be assumed that countries cannot levy export taxes, so $t_i^i \equiv 0$ for all i. The equilibrium prices will be $p_j^j = \alpha - (X + \sum_i t_j^i)/4$ and $p_j^i = \alpha - \left(X - 3t_j^i + \sum_{k \neq i} t_j^k\right)/4$ for $i \neq j$.

In an importing country, the social surplus obtained from imports of good j is the sum of consumer and producer surplus for tariffs that are not prohibitive will be

$$S_j^i(t_j^i, \sum_{k\neq i} t_j^k) = \int_{p_j^i}^{\alpha} (\alpha - u)du + t_j^i(\alpha - p_j^i) = \frac{(X + \sum_k t_j^k)^2 - 16(t_j^i)^2}{32} \qquad \text{for } 3t_j^i - \sum_{k \neq i} t_j^k \leq X. \qquad \textbf{(1)}$$

Surplus in the importable sector is concave in the country's own tariff, t_j^i, and increasing and convex in the tariff of other importing countries for tariffs are less than the prohibitive value. The surplus in the exporting country in sector j is the sum of consumer surplus and endowment income

$$S_j^j\left(\sum_{k\neq j} t_j^k\right) = \int_{p_j^j}^{\alpha} (\alpha - u)du + Xp_j^j = \alpha X + \frac{(\sum_{k\neq j} t_j^k)^2 - 6(\sum_{k\neq j} t_j^k)X - 7X^2}{32} \qquad \text{for } \sum_{k\neq j} t_j^k \leq 3X. \qquad \textbf{(2)}$$

Surplus in the export sector is convex and decreasing in the tariffs of importing countries for tariffs below the prohibitive level. Letting $\mathbf{t}^{\mathbf{i}}$ be the vector of tariffs imposed by country k on goods $j \neq k$, welfare of country i can be expressed as

$$W_i(\mathbf{t}^1, \mathbf{t}^2, \mathbf{t}^3, \mathbf{t}^4) = \sum_{j=1}^{4} S_j^i(t_j^i, \sum_{k\neq j} t_j^k) \qquad \textbf{(3)}$$

The free trade welfare level is $\alpha X - X^2/8$.

In the absence of a trade agreement, countries are assumed to play a one shot tariff setting game.

Country i will choose $\mathbf{t^i}$ to maximize W_i, given $\mathbf{t^k}$. The tariff t_j^i will be chosen to maximize (1), which yields the optimal tariff formula

$$\tilde{t}_j^{\,i} = (X + \sum_{k \neq i} t_j^k)/15 \qquad \textbf{(4)}$$

Using the symmetry of countries, (1) - (4) can be solved for the unique Nash equilibrium tariff and welfare levels,

$$t^N = \frac{X}{13} \qquad W^N = \alpha X - \frac{X^2 + 3(t^N)^2}{8} \qquad \textbf{(5)}$$

These welfare functions generate the usual prisoner's dilemma feature of trade negotiations: unilateral tariff reductions will be welfare reducing but bilateral or multilateral tariff reductions have the potential to benefit all countries.

It is well known that repeated interactions between parties can be used to support payoffs to the parties that Pareto dominate those obtained in the one shot game. A trade agreement will be modeled here as a coordination mechanism in which parties choose tariffs that are to be sustained under the agreement and punishments that are to be imposed on any member countries that deviate from the agreement. A particular choice of tariffs in a trade agreement will be incentive compatible if the payoff to setting the tariffs specified under the agreement exceeds that obtained by deviating and then suffering the specified punishment.

A. Multilateral Trade Agreements

A multilateral agreement will be a 4 player repeated game in which each country i chooses $\mathbf{t^i}$ to maximize W_i. It will be assumed that the tariff rates chosen under a multilateral trade agreement satisfy the MFN principle, which requires country i to extend tariff reductions to all trading partners (i.e. $t_j^i = t_k^i$ for all i and k,j $\neq$ i). This restriction is imposed because it has been a cornerstone of the GATT negotiation process. It will be assumed that among the sustainable trade agreements satisfying the MFN principle, multilateral negotiations result in the selection of the symmetric trade agreement that maximizes the welfare of a representative member country. The assumption that the tariff agreement chosen is not Pareto dominated seems natural in an environment where the choice of tariff rates is made in a public forum where countries can negotiate. The symmetry of payoffs to countries under the agreement reflects the underlying symmetry of the model, and can be thought of as resulting from symmetric bargaining power of the countries. Finally, it is assumed that in the event of deviation by a member country, the country is punished by infinite reversion to the one shot Nash equilibrium of the tariff game.

Under a multilateral trade agreement, the assumption that trade agreements are symmetric and satisfy the MFN principle means that a trade agreement will consist of a single tariff rate which applies to all imported goods applies to all imported goods for all countries, $t_j^i = t$ for all i, j and $i \neq j$. Substituting these assumptions into (1)-(3), the payoff to a representative country under a multilateral trade agreement that specifies an import tariff of t will be

$$W^m(t) = \alpha X - \left(X^2 + 3t^2\right)/8 \qquad \textbf{(6)}$$

Since welfare is decreasing in the tariff rate, the member countries will choose the lowest tariff rate that is incentive compatible.

An agreement with tariff t will be incentive compatible if the gain to a country from deviating during the current period is less than the present value of the loss during the punishment phase. If country i were to deviate from this agreement, it would impose the optimal tariff (4) on all of its importables and receive a payoff of $S_j^i(\tilde{t}_j^i(2t),2t)$ for each $j \neq i$. The export sector payoff would be unaffected by the deviation. The gain from deviation in the current period is $G^m(t) = (X - 13t)^2/160$. Following a deviation, the deviating country will receive the Nash equilibrium payoff in all subsequent periods. This yields a loss of $L^m(t) = 3(X^2 - 169t^2)/1352$. Incentive compatibility requires that $G^m(t) \leq \delta L^m(t)/(1-\delta)$ where δ is the discount rate. The function $G^m(t)$ is decreasing and convex on $[0, t^N]$ with $G^m(t^N) = 0$ and $G^{m\prime}(t^N) = 0$. $L^m(t)$ is decreasing and concave on $[0,t^N]$, with $L^m(t^N) = 0$ and $L^{m\prime}(t^N) < 0$. It then follows that for $\delta > 0$, there will exist an interval of tariffs contained in $[0,t^N]$ at which the incentive compatibility constraint is satisfied. If $\delta \geq 169/229$, free trade will be incentive compatible. For lower values of the discount parameter, the minimum level of the tariff that is incentive compatible can be obtained by solving for the value of t at which the incentive constraint holds with equality,

$$t^{m}_{min} = \max\left[\frac{X(169 - 229\delta)}{13(169 - 109\delta)}, 0\right] \quad \textbf{(7)}$$

Note that the minimum sustainable tariff will be an increasing function of the magnitude of the gains from trade, as represented by X. Although the losses during the punishment phase are increasing in X, the gains from deviation are also increasing in X and the latter effect is dominant.

B. Preferential Trade Agreements

A preferential trade agreement, on the other hand, will be modeled as a situation where a country plays a repeated tariff-setting game with partner countries but plays a one shot game with outside countries. In order to maintain symmetry of the preferential agreements, we will restrict attention to the case in which each country is involved in a preferential agreement with one other country. The purpose of this is to abstract from market power issues that result when preferential arrangements create an asymmetry in the relative size of countries or trading blocs.[2] It will be assumed that the preferential trading arrangement takes the form of a free trade agreement (FTA), rather than a customs union, so that countries do not coordinate in their choice of external tariffs.[3] Note that there is some abuse of

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[2]Bond and Syropoulos (1996) focus on the difference in market power effects between expansion in the absolute size of trading blocs (holding relative size constant) and increases in relative size of trading blocs in the case where blocs take the form of customs unions.

[3]If instead the countries chose to form a customs union, they would cooperate in the choice of external tariff as well. Since the customs union would choose the external tariff to maximize union welfare, the union will take advantage of its market power and set higher external tariffs than would a customs union, as emphasized by Kennan and Riezman (1990). While this effect is favorable for a customs union for a given level of the external tariff imposed by the other union, the Nash equilibrium when both unions are setting their external tariffs will involve higher external tariffs for both unions. It

terminology in referring to this as a FTA, since trade is not necessarily free within the preferential trading agreement, but it highlights the assumption made regarding the formation of external tariffs. [4]

The structure of tariffs with a preferential trade agreement is illustrated in Figure 1, where it is assumed that country 1 (3) forms an FTA with country 2 (4). The FTA between countries 1 and 2 will involve coordination on the tariffs t_1^2 and t_2^1 imposed on trade with each other, with each country choosing its external tariffs. As in the case of a multilateral agreement, it will be assumed that the member countries are treated symmetrically so that the same tariff, denoted t^f, is imposed by each country on trade with its partner, and that this tariff is not Pareto dominated by another sustainable tariff. This is illustrated in Figure 1 where the internal tariff between 1 and 2 is denoted t_a^f, and that between 3 and 4 is denoted t_b^f. These tariffs are not necessarily equal, although we will show below that they will be equal in equilibrium.

In trade with the outside countries, 1 and 2 will individually choose optimal external tariffs. For country i (i = 1,2), its tariff on trade with outside country j (j = 3,4) will be chosen to maximize $S_j^i(t_j^i,t_b^f+t_j^k)$, where k = 1,2 and k ≠ i. By the symmetry of the countries, it follows that the external tariff will have a common value $t_a^{of} = t_j^i$ for i = 1,2 and j = 3,4, which is the solution to $t_a^{of} = \tilde{t}(t_b^f+t_a^{of})$. Substituting from (4) yields an expression for a country's external tariff as a function of the other FTA's internal tariff.

$$t^{of}(t^f) = \frac{t^f+X}{14} \tag{8}$$

Clearly, this formula also yields the external tariff of a representative member of the other FTA, $t_a^{of} = t^{of}(t_b^f)$.

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can be shown that when both customs unions can commit to internal and external tariffs, the Nash equilibrium external tariffs is X/6. Since this tariff level is substantially higher than in the Nash equilibrium (5), it results in a world welfare level that is lower than W^N. In light of this negative aspect of customs unions, we will concentrate here on the case of FTAs.

[4]Preferential trade agreements often involve fairly lengthy adjustment periods for internal tariffs and may exclude some commodities, so that internal liberalization may not be complete in practice.

Equation (8) can be used to derive the payoff to country 1 as a function of the tariffs chosen b the two FTAs. Country 1 will receive $S_2^1(t_a^f, 2t^{of}(t_a^f))$ on imports from its partner and $S_1^1(t_a^f + 2t^{of}(t_a^f))$ on exports. On trade with outside countries, 1 receives a surplus of surplus of $S_k^1(t^{of}(t_b^f), t_b^f + t^{of}(t_b^f))$ for k = 3,4. Substituting into these expressions from (1), (2), and (8) yields a payoff of

$$W^f(t_a^f, t_b^f) = \alpha X + \frac{-25X^2 - 24t_a^f X - 82(t_a^f)^2 + 30t_b^f + 15(t_b^f)^{2^2}}{196} \tag{9}$$

Welfare of country 1 will be decreasing and concave in the tariff that it negotiates with country 2, and will be increasing and convex in the tariff set by the other FTA. The latter result follows from the fact that increases in t_b^f raise country 1's external tariff, which leads to a greater surplus on imports from outside countries. This means that trade liberalization by the one FTA will have a negative effect on the welfare of the other FTA. The fact that W^f is decreasing in t_a^f means that the partner countries will always choose the lowest sustainable internal tariff in their negotiations, since the tariff of the other FTA would be treated as given in any tariff negotiations between the partner countries.

We now examine the sustainability of an internal tariff t^f. If country 1 deviates from its FTA, it will impose its optimal tariff on imports from country 2, given that countries 3 and 4 are charging a tariff of $t_b^{of}(t_a^f)$). Tariffs by country 1 on imports from 3 and 4 are unaffected, because these tariffs are already best responses to t_b^f. This yields a gain from deviation of $G^f(t_a^f) = S_2^1(\tilde{t}(2t^{of}(t_a^f)), 2t^{of}(t_a^f)) - S_2^1(t_a^f, 2t^{of}(t_a^f)) = 2(X - 13t_a^f)^2/735$. In the punishment phase, the FTA between countries 1 and 2 has collapsed, so that these countries revert to charging static optimal tariffs on imports from the former partner. Since countries 3 and 4 are also imposing optimal tariffs on these goods, the markets for goods 1 and 2 will be characterized by a trade war in which all countries impose $t^N = X/13$ in these markets. Even though countries 3 and 4 are not parties to the FTA between 1 and 2, they will contribute to the punishment indirectly because the increase in tariffs by the partner countries will lead to a rise in tariffs by the outside countries from (9). The markets for goods 3 and 4 are unaffected by this trade war, because 1 and 2 are already imposing optimal tariffs in these markets. The loss to the deviating country during the punishment phase is $L^f(t_a^f) = [S_2^1(t_a^f, 2t^{of}(t_a^f)) - S_2^1(t^N, 2t^N)] + [S_1^1(t_a^f + 2t^{of}(t_a^f)) - S_1^1(3t^N)] = (t^N - t_a^f)(197X + 533t_a^f)/1274$. Note that since both G^f and L^f are independent of t_b^f, the sustainability of one FTA is independent of the tariff chosen by the other FTA.[5] An FTA equilibrium will be sustainable if $G^f(t) \leq \delta L^f(t)/(1-\delta)$. Using arguments similar to those for the multilateral case, there will exist a value t_{min}^f for $\delta > 0$ such that an FTA is incentive compatible for all $t \in [t_{min}^f, t^N]$.[6] Solving for the value at which the incentive constraint holds with strict equality, we obtain

$$t_{min}^f(\delta) = \max\left[\frac{X(676-3631\delta)}{13(676-61\delta)},\ 0\right] \qquad \textbf{(10)}$$

For $\delta > 676/3631$, free trade between the FTA members is incentive compatible.

Since the sustainability problem is symmetric for both FTAs and each will choose the minimum level sustainable tariff, the level of world welfare that is sustainable with FTAs is obtained by evaluating (9) at $t_a^f = t_b^f = t_{min}^f(\delta)$. The resulting welfare level can then be compared to that sustainable under a multilateral agreement, obtained by evaluating (7) at $t_{min}(\delta)$. There will be two conflicting effects present in the comparison of world welfare under the two regimes. The first is that for a given level of the tariff under the trade agreement, the multilateral system yields higher world welfare than does the FTA. If we evaluate (9) at a common agreement for each FTA, we obtain

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[5] In particular, we not have to worry about the possibility that a collapse of one FTA creates a domino effect on the other FTA in the following period.

[6] The function $G^a(t^f)$ is non-increasing and convex for $t \in [0, t^N]$ with $G^f(t^N) = G^{f\,\prime}(t^N) = 0$. $L^{fta}(t)$ is a decreasing and concave function for $t \in [0, t^N]$ with $L^{fta}(t^N) = 0$. If $G^f(0) > L^f(0)$, then there will be a unique value $t \in (0, t^N)$ at which the constraints hold with equality when $\delta > 0$. If $G^f(0) \leq L^f(0)$ then free trade is sustainable.

$$W^f(t^f,t^f) = \alpha X + \frac{-25X^2 + 6tX - 67(t^f)^2}{196} \quad \textbf{(11)}$$

Comparing (11) with (6) yields $W^m(t) > W^f(t,t)$ for $t \in [0,t^N)$. Welfare of the representative country with FTAs is concave in t and is maximized at $t^f = 3X/67$. This contrasts with the multilateral case, where the welfare of the representative country is maximized at t = 0. This follows from the fact that when an FTA reduces its internal tariff, the external tariff decreases but by a smaller amount. The average level of tariff falls but the difference between the tariffs increases. The former effect raises world welfare, but the latter effect decreases welfare. For sufficiently low tariffs, the latter effect will dominate and world welfare will fall when internal tariffs are reduced. In particular, the welfare level with free internal trade will be $\alpha X - 25X^2/196$, which is less than the Nash equilibrium level of welfare from (4).

On the other hand, it can be seen by comparison of (6) and (9) that $t^f_{min}(\delta) \leq t^M_{min}(\delta)$ for $\delta \in [0,1]$. The benefit of deviating from an FTA is less than that of deviating from and a multilateral agreement because the country is also deviating in only one market. However, the losses in the punishment phase are also lower because the punishment occurs in only one market. This result suggests that the punishment is relatively more severe in the FTA case. A contributing factor to the severity of the punishment in the FTA is that the non-member countries will also increase their tariffs in the punishment phase. There is thus a favorable punishment phase spillover from the other countries.

It is clear that for values of $\delta \geq 169/229$ the multilateral system must dominate the regional one, because global free trade will be sustainable. On the other hand, it can be established using (7), (8), (11) and (12) that $\left(\frac{\partial W^f(t^N,t^N)}{\partial t^f_a} + \frac{\partial W^f(t^N,t^N)}{\partial t^f_b} \right) \frac{\partial t^f_{min}(0)}{\partial \delta} > \frac{dW^m(t^N)}{dt^f_{min}} \frac{\partial t^m_{min}(0)}{\partial \delta} > 0$. This ensures that the FTA system must yield higher welfare than the multilateral system for values of δ in the neighborhood of 0, where cooperation is very difficult to sustain. Figure 2 illustrates $W^m(t^m_{min})$ and $W^f(t^f_{min})$ for the case where X = 13 and α =5, which yields $t^N = 1$ and $W^N = 44.5$.[7] In this case, the FTA yields a higher welfare level for $\delta < .15$. The fact that the payoff under the FTA is decreasing for $\delta \in [.1, .19]$ results from a coordination failure associated with the FTA case. The maximum payoff under preferential arrangements is attained when $t^f = 2X/13 = .58$ in this case, which is supportable for $\delta > .1$. The FTA equilibrium would yield higher payoffs if the internal tariffs were held at .58 for $\delta > .1$. However, each FTA will treat the internal tariff of the other FTA as given and will choose the lowest sustainable tariff. Similar conclusions were obtained for other values of X.

The result that bilateral agreements allow countries to sustain lower tariffs than do multilateral agreements may seem somewhat surprising. For example, Maggi (1999) has illustrated how multilateral punishment schemes may result in more effective punishment of countries in a case where there is an asymmetry in trade patterns which prevents one country from effectively punishing a partner that deviates from a bilateral agreement. In that model, the coordination of punishments allows the deviator to be punished by a third country. In the present model, the punishment following the deviation from a regional agreement is equally effective with that in the multilateral case because of the strategic ineractions between blocs. This allows the sustaining of lower internal tariffs under the regional agreement. However,

III. Transportation Costs Between Continents

The analysis of the preceding section assumed that the countries had symmetric trading relations with all partner countries. In this section we introduce a regional structure with an asymmetry in trade relations due to transportation costs. The world is assumed to be divided into two continents, with two countries located on each continent. There is a cost of c per unit on any goods imported from a country on the other continent, but zero transport cost on goods coming from the country on the same continent.

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[7]These parameter values yield a Nash equilibrium tariff rate of 100% and a welfare loss of the Nash equilibrium relative to free trade of approximately 1%.

In this section we analyze how the results of section II regarding the relative benefits of multilateral trade agreements and FTAs are affected by this transport cost structure.

The demand and supply structure for each good is assumed to be identical to that in previous sections. Since each exporter sells to two countries on the other continent, the price of good j in the exporting country will be $p_j^j = \alpha - (X + \sum_i t_j^i + 2c)/4$. The price in the importing country will be $p_j^i = p_j^j + t_j^i + c_j^i$, where c_j^i = c if i and j are on different continents and 0 otherwise. Substituting these results into the definitions of surplus in (1) and (2)

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\begin{aligned}
S_j^i(t_j^i, c_j^i, \sum_{k\neq i}(t_j^k + c_j^k)) &= \frac{u(u - 8t_j^i)}{32} \qquad \text{for } u \equiv X + \sum_{k\neq i}(t_j^k + c_j^k) - 3(t_j^i + c_j^i) \geq 0 \\
S_j^j\left(2c + \sum_{k\neq j} t_j^k\right) &= \alpha X + \frac{(2c + \sum_{k\neq j} t_j^k)^2 - 6(2c + \sum_{k\neq j} t_j^k)X - 7X^2}{32} \qquad \text{for } 2c + \sum_{k\neq j} t_j^k \leq X
\end{aligned}
\tag{12}
$$

where the inequality constraints reflect the requirement that trade barriers and transport costs not be so high that trade is eliminated. National welfare will be the sum of the sectoral surpluses.

The optimal tariff formula with transport costs is obtained by maximizing S_j^i with respect to t_j^i, yielding

$$
\tilde{t}_j^i(c_j^i, \sum_{k\neq i}(t_j^k + c_j^k)) = (X - 3c_j^i + \sum_{k\neq i}(t_j^k + c_j^k))/15 \tag{13}
$$

Comparing with (4), it can be seen that the existence of transport costs leads to higher tariffs on goods from the same continent and lower tariffs on goods from the other continent for a given level of tariffs by other countries. This follows because the transport costs tend to lower (raise) the elasticity of demand for goods from the same (other) continent by increasing (decreasing) the volume of trade at given tariffs. Since there is an asymmetry between countries in this case, the Nash equilibrium tariffs imposed on the regional trading partner (denoted by r) will differ from those on the distant partner (d). Solving for the equilibrium tariffs yields

$$t^{Nr} = \frac{X}{13} + \frac{3c}{26}; \qquad t^{Nd} = \frac{X}{13} - \frac{7c}{52}; \qquad W^{N} = \alpha X + \frac{1293c^2 - 344X^2 - 1344cX}{2704} \qquad \textbf{(14)}$$

Nash equilibrium tariffs on regional trading partners will be higher than those on the distant partners.

Under a multilateral trade agreement, we continue to impose the requirement that the same tariff be imposed on imports from all partner countries. Utilizing (14) for the case of $t_j^i = t$ for all $i \neq j$ yields an expression for welfare under a multilateral trade agreement,

$$W^{M}(t,c) = \alpha X - \frac{X^2 + 3t^2 - 4c(X - c)}{8} \qquad \text{for } t < X - 2c \qquad \textbf{(15)}$$

Tariff levels exceeding X - 2c would never be chosen under a multilateral agreement, because they would eliminate trade with the distant country.

A deviating country will impose optimal tariffs on imports, with the optimal tariffs differing between regional and distant partners. If these optimal tariffs are substituted into the import surplus expressions, we obtain a gain from deviation of $G^M(t,c) = [3(X-13t)^2 + 4c(3c + 13t - X)]/480$. The effect of transport costs is to reduce the gains from deviation iff $t < (X - 6c)/13$, which implies that increases in transport costs raise the incentives for multilateral deviations when tariffs are close to the Nash equilibrium values. In particular, note that in the previous examples the gains from deviation were equal to zero at the Nash equilibrium tariff. In the present case the Nash tariff differs across countries, so with the MFN principle in place the gains from deviation are minimized at $t = X/(13+c/9)$. Under the assumption of reversion to the one shot Nash equilibrium in the punishment phase, the per period loss punishment phase is the difference between (17) and W^N, $L^M(t,c) = [3(X^2 - 169t^2)/1352] + c(59c - 8X)/2704$. Increases in transport costs will reduce the losses from punishment iff $c < 4X/59$.

These results on deviation and punishment phases suggest a non-monotonic relationship between transport costs and the sustainability of cooperation. When tariffs are high (i.e. in the neighborhood of the non-cooperative Nash equilibrium) and transport costs are low, the gains from deviation are increased and the losses from punishment are decreasing in the level of transport costs. Both of these forces will tend to make cooperation harder to sustain as transport costs rise. These effects are reversed for low tariffs. These effects can be formalized by solving for the minimum discount parameter for which a tariff t can be supported under multilateralism,

$$\delta^M(t,c) = \frac{G^M(t,c)}{L^M(t,c) + G^M(t,c)} = \frac{169\left(3(13t^2 - X)^2 + 4c(3c + 13t - X)\right)}{(687X^2 + 13182tX + 55263t^2) + c(3798c + 8788t - 916X)} \qquad \textbf{(16)}$$

In light of the complexity of this expression, the relationship between transport costs and the minimum discount parameter can best be seen by plotting (16) for several different tariff levels. Figure 3 illustrates the minimum discount parameter for the case in which X = 13 and $c \in [0,5]$, which yields a Nash tariff of 1 when there are no transport costs. For a relative low tariff off .1, the minimum discount factor is monotonically decreasing in c. For higher tariffs of .5 and .8, the minimum discount factor initially decreases in c and then increases in c.

A second point to note regarding (16) is the sustainability of tariffs for very low values of the discount parameter. In the expressions for minimum sustainable tariffs in (8) and (11), the minimum sustainable tariff approaches the Nash equilibrium tariff as $\delta \to 0$. This follows because both the gains from deviation approach zero more rapidly than do the losses from punishment as t approaches the Nash level. However, with transport costs there is a difference between the Nash tariffs imposed on distant and regional partners. Since multilateral agreements must utilize an MFN principle, there is no single tariff that will drive the gains from deviation to zero. This results in the minimum discount factor being bounded away from zero when transport costs are positive. This is illustrated in Figure 4, which shows the relationship between the minimum discount parameter and the level of tariffs for alternative levels of transport costs. With c = .1, there is no single tariff level that can be supported for $\delta < .05$. When c = 5, multilateral cooperation cannot be supported for $\delta < .49$. Thus, multilateral cooperation becomes increasingly difficult to sustain for high levels of transport costs because the MFN principle becomes a significant constraint on the ability to sustain cooperation.

B. Free Trade Areas

We next examine the sustainable tariffs between member countries in the case where countries pair up and form free trade areas. Under an FTA, a member country plays a repeated game with the partner country, while imposing an optimal tariff against non-member countries. In the absence of transport costs, it did not matter how the countries paired up because the trade flows were symmetric between all pairs of countries. When inter-regional transport costs are introduced, the agreement will differ depending on whether the partner country is on the same or a different continent. Therefore, we will consider sustainability of cooperation for both types of FTAs.

First consider the optimal tariff imposed on trade with outside countries. If country 1 forms an FTA with country 2, which is located on the same continent, then it will impose an optimal tariff on trade with both of the distant countries as illustrated in Figure 1. Using the same logic as in the derivation of (9), we obtain

$$t^{ofr}(t^f,c) = \frac{t^f + X - 2c}{14} \tag{17}$$

The external tariffs of regional FTA partners are decreasing in the level of transport costs. Using (17), the payoff to country 1 under a regional FTA can then be derived as in (10), where t_a^f is the internal tariff of country 1's FTA and t_b^f is the tariff of the other country's FTA.

$$W^{fr}(t_a^f,t_b^f,c) = \alpha X + \frac{-25X^2 - 24t_a^f(X-2c) - 82(t_a^f)^2 + 30t_b^f(X-2c) + 15(t_b^f)^{2^2} + 96c(c-X)}{196} \tag{18}$$

Welfare of a bloc is decreasing in its own tariff for $X \geq 2c$, a condition which is required for intercontinental trade to occur, so a bloc will always choose the lowest sustainable internal tariff. Welfare is decreasing in the internal tariff of the other bloc.

This welfare level can be compared with that obtained if country 1 chooses to form an FTA with a country 3, which is located on the other continent. This case is slightly more complicated because the external tariff of 1 on imports from country 2, t_2^{ofd}, will differ from that on imports from 4, t_4^{ofd} because of the difference in transport costs. In the market for good 2, country 1's tariff is a best response to the agreement tariff between 4 and 2 and the optimal tariff imposed by 3 on 2. By the symmetry between 1 and 3, 3's tariff on 2 will be the same as 1's tariff on 4, so $t_2^{ofd} = \tilde{t}(0, t_b^f + t_4^{ofd} + 2c)$. In the market for good 4, country 1's tariff on a distant non-member is the best response to the agreement tariff imposed by 2 on 4 and the optimal tariff on a regional non-member imposed by 3 on 4 (which will equal t_2^{ofd} by the symmetry between 1 and 3). This yields $t_4^{ofd} = \tilde{t}(c, t_b^f + t_2^{ofd} + c)$. Solving these two equations simultaneously, we have

$$t_2^{ofd}(t^f,c) = \frac{t^f+X}{14} + \frac{c}{8}, \qquad t_4^{ofd}(t^f,c) = \frac{t^f+X}{14} - \frac{c}{8} \tag{19}$$

The external tariff on the regional non-member will be higher in equilibrium than that on the distant non-member. Note that for a given level of an agreement tariff between the partners, all external tariffs are higher under an FTA with a distant partner than with a regional partner. This results from the fact that countries impose higher tariffs against nearby countries in this model, and this effect spills over to affect all external tariff levels under FTAs with distant partners due to the complementarities between tariffs. In the case of an FTA with a distant country, country 1 receives a surplus of $S_3^1(t^f, 0, t_2^{ofd}(t_a^f,c) + t_4^{ofd}(t_a^f,c)+c)$ on imports from the partner country, $S_2^1(t_2^{ofd}(t_b^f,c), 0, t^f + t_4^{ofd}(t_b^f,c)+2)$ from the regional non-member, $S_3^1(t_4^{ofd}(t_b^f,c), c, t_2^{ofd}(t_b^f,c) + t^f + c)$ from the distant non-member, and $S_1^1(t^f + t_2^{ofd}(t_a^f,c) + t_4^{ofd}$

$(t_a^f,c)+2c)$ from the export sector. Solving yields

$$W^{fd}(t_a^f,t_b^f,c) \;=\; \alpha X \;+\; \frac{-25X^2 - 24t_a^f X - 82(t_a^f)^2 + 30t_b^f X + 15(t_b^f)^{2^2}}{196} \;+\; \frac{c(1519c - 1568X)}{3136} \qquad \textbf{(20)}$$

W^{fd} also has the property of being decreasing and concave in t_a^f and increasing and convex in t_b^f.

Due to the symmetry of the incentive constraints between the two FTAs and the fact that each FTA will choose the minimum sustainable tariff, we will have $t_a^f = t_b^f$ in any FTA equilibrium involving either regional or distant FTAs. One way to illustrate the difference between the two types of FTAs is to compare the welfare of a representative country under the two different types of preferential arrangements, holding the internal tariff constant across the two regimes. Subtracting (20) from (18) yields $W^{fr}(t^f,t^f,c) - W^{fd}(t^f,t^f,c) = c(32X + 17c - 192t^f)/3136$. With $c > 0$, the welfare under an FTA with a regional partner will be higher than that for a distant partner for any agreement tariff that is less than $X/6 + 17c/192$. Since this will hold for any tariffs that are below the Nash equilibrium level, FTAs with regional partners dominate those with distant partners at a given agreement tariff. The reason for the dominance regional agreements is that the external tariffs imposed when countries form FTAs with distant partners are higher than those when countries form FTAs with regional partners. This increase in world tariffs will make regional FTAs more attractive, given the level of the internal tariff.

We now turn to the sustainability of tariffs under the respective types of FTAs. It can be shown using similar arguments as in the derivation of (11) that the minimum sustainable tariff with a regional FTA will be[8]

[8] With a regional FTA, there is a deviation gain of $G^{mr}(c,t^r) = 338(t^{nr} - t^f)^2/735$ and a punishment loss of $L^{mr}(c,t) = (t^{nr} - t^f)(394X + 1066t^f - 501c)/2548$. With a distant partner FTA, the deviation gain is $G^{fd}(c,t^f) = 2704(t^{nd} - t^f)^2/5880$ and the punishment loss is $L^{fd}(t^f,c) = (t^{nr} - t^f)(788X + 2132t^f - 287c)/5096$. In each case, there will be an interval of sustainable tariffs $[t^f_{min}, t^N]$ for any $\delta > 0$ with (25) and (26) being the minimum values in the respective cases.

$$t^{fr}_{min}(\delta) = \max\left[\frac{52X + 78c - (7262X - 5487c)\delta/26}{676 - 61\delta}, 0\right] \quad \textbf{(21)}$$

Tariffs below the Nash equilibrium tariff rate will be sustainable for very low discount parameters because (21) is decreasing in δ with $t^{fr}_{min}(0) = t^{nr}$. For the case of an FTA with a distant partner, the minimum sustainable tariff is

$$t^{fd}_{min}(\delta) = \max\left[\frac{52X - 91c - (14524X - 9037c)\delta/52}{676 - 61\delta}, 0\right] \quad \textbf{(22)}$$

t^{fd}_{min} is decreasing in δ with $t^{fd}_{min}(0) = t^{nd}$. Subtracting (22) from (21) yields $t^{fr}_{min}(\delta) - t^{fd}_{min}(\delta) > 0$. The difference reflects the fact that in general it is more attractive to deviate from a trade agreement when c is lower, so cooperation is easier (i.e. lower tariffs are sustainable) with a distant partner.

These results suggest conflicting effects in the evaluation of the attractiveness of regional and distant FTAs. The FTA with a regional partner provides a higher payoff at a given internal tariff, but at a given discount parameter the regional FTA will not be able to support as low a tariff rate. Substituting (21) and (22) into the respective welfare functions (18) and (20), we can derive the difference in welfare between the regional and distant FTA at given δ to be

$$\Gamma(\delta) = W^{fr}(\delta) - W^{fd}(\delta) = \frac{15c\delta\left[(146692 + 209333\delta)X - (107315 + 141185\delta)c\right]}{52(61\delta - 676)^2} \quad \textbf{(23)}$$

Γ(0) = 0 because both types of FTAs yield the Nash equilibrium payoff at δ = 0. For δ > 0, the sign of this expression will be determined by the sign of the term in brackets. By (12), $X \geq 2c$ is required for there to be imports from distant countries. This conditions is sufficient to ensure that the bracketed expression in (23) will be positive for all $\delta \in [0,1]$, so that FTAs with regional partners will always be preferred to FTAs with a distant partner.

These results are consistent with the notion that "natural trading blocs" between neighboring countries are more likely to be welfare improving. It should be noted that the exercise considered here differs from that performed by Frankel, Stein and Wei (1995) and Bhagwati and Panagariya (1995), who consider the effect of preferential reductions from an initial point of equal tariffs. Frankel, Stein and Wei utilize a general equilibrium model with constant elasticity of substitution models and find a significant range of parameter values for which regional agreements are preferred. Bhagawati and Panagariya, on the other hand, use a model with linear excess demands and find a preference for tariff reductions with a distant partner. In the exercise being considered in this paper, tariffs against regional and distant countries would not be the same in the initial equilibrium because of the different degree of market power created by transport costs. The regional FTA has the advantage of eliminating what would otherwise be relatively high tariffs against nearby partners.

Figure 5 illustrates the difference in payoffs between the regional FTA, distant FTA, and multilateral system utilizing the same parameter values as in Figure 3, but with an intercontinental transport cost of c = 2. Figure 5 shows how the regional FTA dominates the FTA with distant partners. Second, it illustrates how the existence of transport costs between countries expands the range of discount parameters for which preferential agreements yield higher welfare, since multilateral agreements cannot be sustained for $\delta < .39$ in this case.

IV. Sustainability and the Pattern of Trade

The model utilized to derive the results of the previous section assumed that each country exports a single good to all other countries. One implication of this assumption is that goods from one country do not compete directly with goods from other countries. In this section we consider an alternative endowment structure in which country i has a supply of X/3 of good $j \neq i$ and 0 of good i, with the demands for each good j in country i being given by $D_j^i = \alpha - p_j^i$ as in the previous section. This model, which is used by Bagwell and Staiger (1998) to analyze interactions between multilateral and preferential arrangements in a 3 country model, allows direct competition between imports from different countries and thus yields a more direct application of the MFN principle. However, it also affects strategic interactions between the preferential trading groups by making the external tariffs of preferential trading arrangements independent of the tariffs of the other blocs.

Let $T_j^{\,i}$ denote the tariff imposed by country j on imports of good j from country i and $c_j^{\,i}$ the transport cost between country i and j, so that the price of good j in country i will be $p_j^{\,i} = p_j^{\,j} - T_j^{\,i} - c_j^{\,i}$. The market clearing conditions yield equilibrium prices $p_j^{\,j} = \alpha + \left(\sum_{i \neq j} (T_j^{\,i} + c_j^{\,i}) - X\right)/4$ and $p_j^{\,k} = \alpha - \left(X + 3(T_j^{\,k} + c_j^{\,k}) - \sum_{k \neq i,j} (T_j^{\,i} + c_j^{\,i})\right)/4$. For country i, the surplus from exportable j ($j \neq i$) is the sum of consumer surplus and endowment income,

$$. \; S_j^{\,i}(T_j^{\,i}, c_j^{\,i} \sum_{k \neq i,j} (T_j^{\,k} + c_j^{\,k})) = \frac{1}{2}\left(\frac{X + 3(T_j^{\,i} + c_j^{\,i}) - \sum_{k \neq i,j} (T_j^{\,k} + c_j^{\,k})}{4}\right)^2 + \frac{X}{3}\left(\alpha - \frac{X + 3(T_j^{\,i} + c_j^{\,i}) - \sum_{k \neq i,j} (T_j^{\,k} + c_j^{\,k})}{4}\right) \quad \textbf{(24)}$$

Surplus in the importable sector is the sum of consumer surplus and tariff revenue. Imports of good j from country i be $M_j^{\,i} = X/3 - D_j^{\,i}$. Evaluating this expression at the equilibrium prices, surplus in the importable sector will be

$$S_j^{\,j}(\mathbf{T_j}) = \frac{1}{2}\left(\frac{X - \sum_{i \neq j} (T_j^{\,i} + c_j^{\,i})}{4}\right)^2 + \sum_{i \neq j} T_j^{\,i} \left(\frac{X}{12} - \frac{\left(3(T_j^{\,i} + c_j^{\,i}) - \sum_{k \neq i,j} (T_j^{\,k} + c_j^{\,k})\right)}{4}\right) \quad \textbf{(25)}$$

where $\mathbf{T_j}$ is the vector of tariffs $T_j^{\,i}$ for $i \neq j$ imposed by country j. The condition that tariffs be non-prohibitive on imports of good j from country i is that $T_j^{\,i} + c_j^{\,i} \leq \left(X + 3\sum_{k \neq i,j} (T_j^{\,k} + c_j^{\,k})\right)/9$.

The optimal tariff imposed by j on i is obtained by maximizing (25) with respect to $T_j^{\,i}$, which yields

$$\tilde{T}_j^{\,i} = \tilde{T}(c_j^{\,i}, \sum_{k \neq i,j} c_j^{\,k}, \sum_{k \neq i,j} c_j^{\,k}) = \frac{x - 33c_j^{\,i} + 15(\sum_{k \neq i,j} c_j^{\,k}) + 27(\sum_{k \neq i,j} t_j^{\,k})}{69} \quad \textbf{(26)}$$

The optimal tariff imposed on imports from country i depends only on tariffs imposed by country j on imports from other countries, so that there is strategic independence between tariffs imposed by the countries. This contrasts with (4), where increases in the internal tariffs of one bloc raise the optimal external tariff of the other bloc.

A. Trade Agreements with Zero Transport Costs

First consider the case in which $c_j^i = 0$ for all i and j, so that all countries are symmetric. Using the MFN principle, a multilateral agreement will involve the choice of a single tariff $T_j^i = T_j$ for each country j. The symmetry assumption will result in adoption of the same tariff by all countries, $T_j = T$. If we sum the sectoral payoffs from (24) and (25) for the case of a symmetric multilateral agreement, we obtain the payoff to the representative country to be

$$W^M(T^M) = \alpha - (X + 3(T^M)^2)/8 \qquad \textbf{(27)}$$

This payoff is identical to that obtained in the previous case, with welfare decreasing and concave in i. The Nash equilibrium tariffs are obtained by solving (26) for $\mathbf{T_j}$ with $c_j^i = 0$, which yields $T^N = X/15$ for each country by symmetry.

A deviation from a multilateral agreement will involve setting optimal tariffs on imports. Since optimal tariffs are independent of the tariffs imposed by other countries, country 1 will impose the Nash equilibrium tariffs when it deviates from the agreement, which gives a gain from deviation of $G(T^M) = 15(T^N - T^M)^2/32$. The punishment will be a permanent reversion to the Nash equilibrium tariffs by all countries, which yields a per period punishment of $L(T^M) = W(T^M) - W(T^N) = 3((T^N)^2 - (T^M)^2)/8$. Solving for the minimum sustainable tariff yields

$$T^M_{min}(\delta) = \max\left[\frac{X(5 - 9\delta)}{15(5 - \delta)}, 0\right] \qquad \textbf{(28)}$$

Any tariff on the interval $[T^M_{min}(\delta), T^N]$ is sustainable, and a multilateral agreement will choose the minimum sustainable value to sustain. Free trade is sustainable for $\delta \geq 5/9$.

Next consider the case in which there is an FTA between countries 1 and 2 with an internal tariff of T_a^f, and an FTA between 3 and 4 with an internal tariff T_b^f. Given this tariff on imports from country 2, country 1 will choose its tariff on imports from 3 and 4 according to the optimal tariff formula (26). Using the symmetry of countries 3 and 4, the tariff on imports from 3 and 4 will have a common value, denoted T_a^{of}, which is the solution to $T_a^{of} = \tilde{T}(0, T_a^f + T_a^{of})$. Solving using (26) yields $T_a^{of} = \dfrac{27T_a^f + X}{42}$, which will also be the external tariff imposed by country 2 on imports from 3 and 4. Under the FTA, country 1 will receive a payoff of $S_2^1(T_a^f, 0, 2T_a^{of})$ on exports to the partner, $S_j^1(T_b^{of}, 0, T_b^{of} + T_b^f)$ on exports to non-members for j = 3,4, and $S_1^1(T_a^f, 0, 2T_a^{of})$ on imports. Summing across sectors using (24) and (25) yields

$$W^f(T_a^f, T_b^f) = \alpha + \frac{221X^2 + X(12T_a^f - 18T_b^f) - 468(T_a^f)^2 + 9(T_b^f)^2}{1764} \qquad \textbf{(29)}$$

Welfare of the FTA is concave in its own internal tariff, and is maximized at $T_a^f = X/78$. This means that when the FTA chooses its own internal tariff, treating T_b^f as given, it will choose the greater of the minimum sustainable tariff and X/78. (29) also shows that welfare of the FTA is convex and decreasing in the internal tariff of the other bloc over the relevant range (i.e. $T_b^f \leq T^N$). This occurs because when the other FTA lowers its internal tariff, its optimal external tariff is also reduced, creating a spillover benefit to the rest of the world. Finally, note that if we evaluate (29) using a common value $T^f = T_a^f = T_b^f$ for the internal tariffs of the FTAs, world welfare will be monotonically decreasing in T^f on $[0, T^N]$.

These results regarding world welfare under FTA internal tariffs provide several contrasts with those obtained in the previous case where countries were specialized in exporting, represented by (9) and (11). First, in that model a lowering of an FTA's internal tariff caused a negative spillover to the other FTA, because it raised the price of imports from FTA members. In contrast, in the present case with competing exporters, there is a positive spillover between FTAs from internal liberalization. Second, in the specialized exporter model world welfare under symmetric FTAs was maximized at a positive tariff, whereas in the present model world tariff is maximized if both FTAs choose internal free trade. This difference is due to the fact that in the model with competing exporters, reductions in the internal tariff result in much more aggressive reductions in the external tariffs than in the case of specialized exporters, resulting in a lower level of world trade barriers. The complementarity between internal tariff reductions and external tariff reductions is much stronger in the present case. Finally, in the case with specialized exporters the welfare of an FTA is highest at internal free trade, given the internal tariff of the other FTA. This means that in that case FTAs would choose internal tariffs that are below the level that maximizes world welfare because they fail to internalize the negative spillovers of their policy on other countries. In contrast, in the present case the FTAs choose an internal tariff that is above the socially optimal level, because they fail to internalize the positive spillover effects of their tariffs on the other FTA.

We now turn to the sustainability of internal tariffs under FTAs. The gain from deviation under an FTA is $G^f(T^f) = 5(T^N - T^f)^2/14$, while the loss from punishment is $L^f(T^f) = W^f(T^f, T_b^f), - W^f(T^N, T_b^f) = (8X+195T^f)(T^N - 15T^f)/735$. Due to the strategic independence of the tariffs in this case, the tariffs of the other FTA are unaffected during the punishment phase. The tariff that will be chosen by the FTA will be the greater of its minimum sustainable tariff, which solves $(1-\delta)G^f(T^f) - \delta L^f(T^f) = 0$, and X/78. This yields

$$T^f(\delta) = \max\left[\frac{X(35-51\delta)}{15(35-9\delta)}, \frac{X}{78}\right] \quad \textbf{(30)}$$

Comparing (30) with (28), we obtain $T^f(\delta) - T^M_{min}(\delta) \geq 0$, with strict inequality holding for $\delta > 0$. Note that this contrasts with the result of the previous case, where minimum sustainable tariffs were lower under the FTA. One of the contributing factors to this result is that the rest of the world does not participate in the punishment phase in the case where there are competing exporters. Thus, punishment in the multilateral case is more effective than punishment in the regional case.

It is clear from (27) and (29) that $W^M(T) > W^f(T,T)$ for $T \in [0,T^N)$ and that $W^f(T,T)$ is decreasing in T for It then follows from the above result that $W^M(T^M_{min}(\delta)) > W^f(T^f(\delta),T^f(\delta))$ for $\delta > 0$. Thus, multilateralism always dominates regionalism in the case with zero transport costs.

B. Trade Agreements with Inter-Continental Transport Costs

We now extend the analysis to consider the case in which there are inter-continental transportation costs of c between countries on one continent (1 and 2) and those on the other (3 and 4). There were two main results from the case in which exporters are specialized. The first was that the presence of inter-continental transport costs created a range of discount parameters in the neighborhood of $\delta = 0$ for which no trade agreements that dominate the one shot Nash equilibrium are sustainable, due to the MFN restriction imposed on multilateral agreements. In contrast, no such range existed for FTAs. The second result was that for $\delta > 0$, a higher welfare level can be sustained under a regional FTA than under an FTA with a distant partner. In this section we show that both of these conclusions continue to hold under the pattern of trade with competing exporters.

In the absence of a trade agreement, the Nash equilibrium tariffs against the distant countries, t^{Nd}, and the regional country, t^{Nr}, can be solved using (26) to be

$$T^{Nr} = \frac{X+3c}{15}, \quad T^{Nd} = \frac{2X-9c}{30} \qquad \textbf{(31)}$$

The optimal tariff against the nearby partner is higher than that against the distant partner, as in the case with specialized exporters. It can be shown in the multilateral case that the minimum discount parameter consistent with a given multilateral tariff

$$\delta^M(T,c) = \frac{3\left((15t^2 - X)^2 + 4c(21c + 15t - X)\right)}{3\left((3X^2 - 50TX + 75T^2) + c(212c + 100T - 12X)\right)} \qquad \textbf{(32)}$$

As was the case for (16), the difference in Nash tariffs between countries when $c > 0$ means the numerator of this expression cannot be driven to 0 for any T. Therefore, there will be an interval of values of δ in the neighborhood of 0 for which no MFN agreement is sustainable.

In contrast, FTAs will be able to support tariff liberalization in the neighborhood of $\delta = 0$ because of their discriminatory nature. For the case of a regional FTA between countries 1 and 2, we obtain the external tariff (T^{ofr}) and welfare (W^{fr}), given the internal tariff of the other bloc (T_b^f), to be

$$T_a^{ofr}(T_a^f,c) = \frac{27T_a^f + X - 18c}{42}$$

$$W^{fr}(T_a^f,T_b^f,c) = \alpha X + \frac{12T_a^f(X+3c-39T_a^f)+9T_b^f(8c+15T_b^f-2X) + (720c^2-276cX-221X^2)}{1764} \quad \textbf{(33)}$$

Welfare of the FTA is maximized when its internal tariff is $(X + 3c)/78$.

For the case of an FTA between countries 1 and 3, we obtain external tariffs against the regional non-member (T^{ofr}), the tariff against the distant non-member (T^{ofd}), and welfare (W^{fd}) to be

$$T^{ofr}(T_a^f,c) = \frac{2X+54T_a^f+33c}{84}, \qquad T_{ofd}(T^f,c) = \frac{2X+54T^f+-9c}{84}$$

$$W^{fd}(T_a^f,T_b^f,c) = \alpha X + \frac{-884X^2-24T_a^f(2X-9c-78T_a^f)+36T_b^f(2(X+c)+T_b^f+15c(201c-80X)}{7056} \quad \textbf{(34)}$$

The external tariff on the regional non-member will be higher in equilibrium than that on the distant non-member. Welfare of an FTA is maximized at an internal tariff of $(2X-9c)/156$.

Using (33) and (34), $W^{fr}(T^f,T^f,c) - W^{fd}(T^f,T^f,c) = c(32X + 192T^f - 45c)/2352$. With $c > 0$, the welfare under an FTA with a regional partner will be higher than that for a distant partner as long as $X > 45c/32$. In order for trade to be possible between continents, we must have $X > 6c$, so this condition will be satisfied and we again obtain the result that regional FTAs yield higher welfare for a given internal tariff level. This result is also due to the fact that regional FTAs have lower external tariffs.

With regard to the sustainability of tariffs under FTAs, the minimum tariff which is both sustainable and individually rational for a regional FTA (T^{fr}_{min}) and under a distant FTA (T^{fr}_{min}) can be derived to be

$$T^{fr}_{min}(c,\delta) = \max\left[\frac{(35-51\delta)(X+3c)}{30(35-9\delta)},\ \frac{X+3c}{78}\right]$$

$$T^{fd}_{min}(c,\delta) = \max\left[\frac{(2X-9c)(35-51\delta)}{30(35-9\delta)},\ \frac{2X-9c}{78},0\right] \quad \textbf{(35)}$$

Note that the critical value of δ at which the minimum sustainable tariff equals the tariff that maximizes the FTA welfare is δ = 35/61 for each case. It follows from (35) that $T^{fr}_{min}(c,\delta) \geq T^{fd}_{min}(c,\delta)$, so we again have the result that FTAs with distant partners yield lower internal tariffs.

As in the previous case, we have conflicting effects in the evaluation of the attractiveness of regional and distant FTAs. Substituting the tariff rates from (35) into the respective welfare functions yields

$$\Gamma(\delta) = W^{fr}(T^{fr}_{min},T^{fr}_{min}) - W^{fd}(T^{fd}_{min},T^{fd}_{min}) = \frac{c\,\delta\,\big(X(910-846\delta)-c(945-702\delta)\big)}{20(9\delta-35)^2} \quad \textbf{(36)}$$

With c > 0, this expression must be positive for X > 6c, which is required for intercontinental trade to be possible. This yields the result that regional FTAs dominate FTAs with distant partners.

VI. Conclusions

This analysis has departed from previous work by comparing the ability of preferential trade agreements and multilateral agreements to sustain trade agreements. The results illustrated a tradeoff between greater sustainability of internal tariffs under preferential agreements against the losses resulting from discrimination in tariffs against non-member countries when countries exported a single good to the rest of the world. The advantage in sustainability of tariffs under preferential agreements was obtained in the case where punishment took the form of reversion to the Nash equilibrium of the one shot game, and resulted from the fact that an FTA could impose relatively severe punishment in the event of deviation in partner markets because punishment induced higher tariffs by outside countries. However, this advantage of an FTA does not arise if the pattern of trade involves all countries importing a single good because there is strategic independence between the blocs in that case.

A second point concerned the relative advantages of regional and distant preferential trade agreements. In the presence of transport costs, countries will have higher optimal tariffs against nearby countries. One might anticipate that this fact would make it more difficult to support trade liberalization with nearby countries, because the incentive to deviate at a given agreement tariff would be higher. However, it was shown that this effect was more than offset by the fact that the welfare level under regional FTAs is higher than that with a distant partner (with given internal tariffs). This is due to the fact that FTAs with distant partners have higher external tariffs against all countries, which leads to lower world welfare under distant FTAs. Also, the results indicated that multilateral trade agreements with the MFN principle become more difficult to sustain in the presence of transport costs because deviation against some trading partners is more attractive than that against others.

These results suggest several directions for future work. One is to examine interactions between multilateral and regional agreements when the degree of enforceability of both agreements is endogenous. A second issue concerns the role of other factors which may affect the enforceability of regional agreement relative to multilateral agreements. For example, the incorporation of side agreements involving environmental standards, competition policy, and infrastructure investments in regional agreements may reflect the bundling of issues among regional trading partners to enhance the enforceability of agreements.

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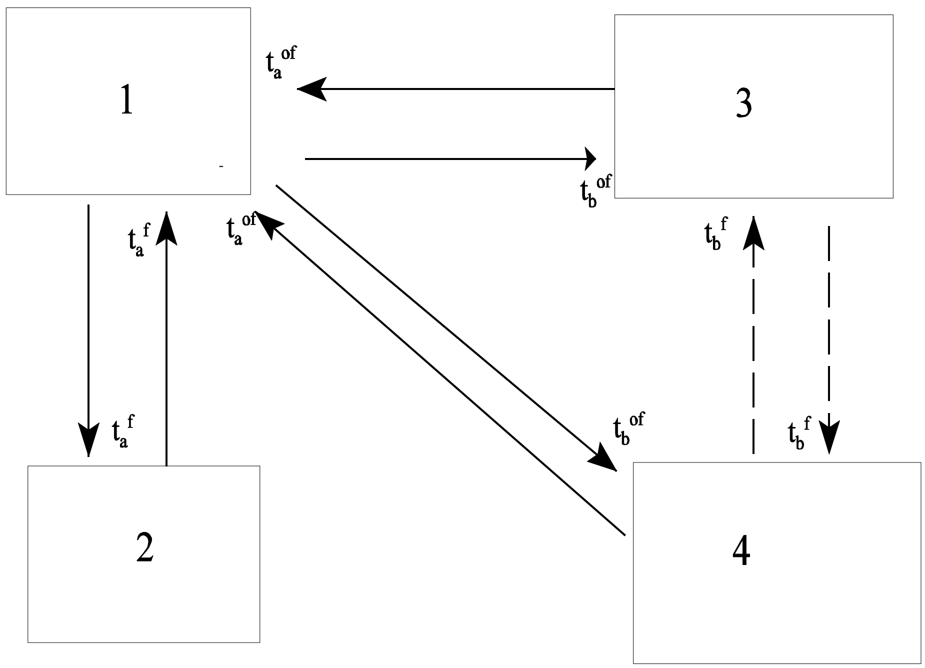
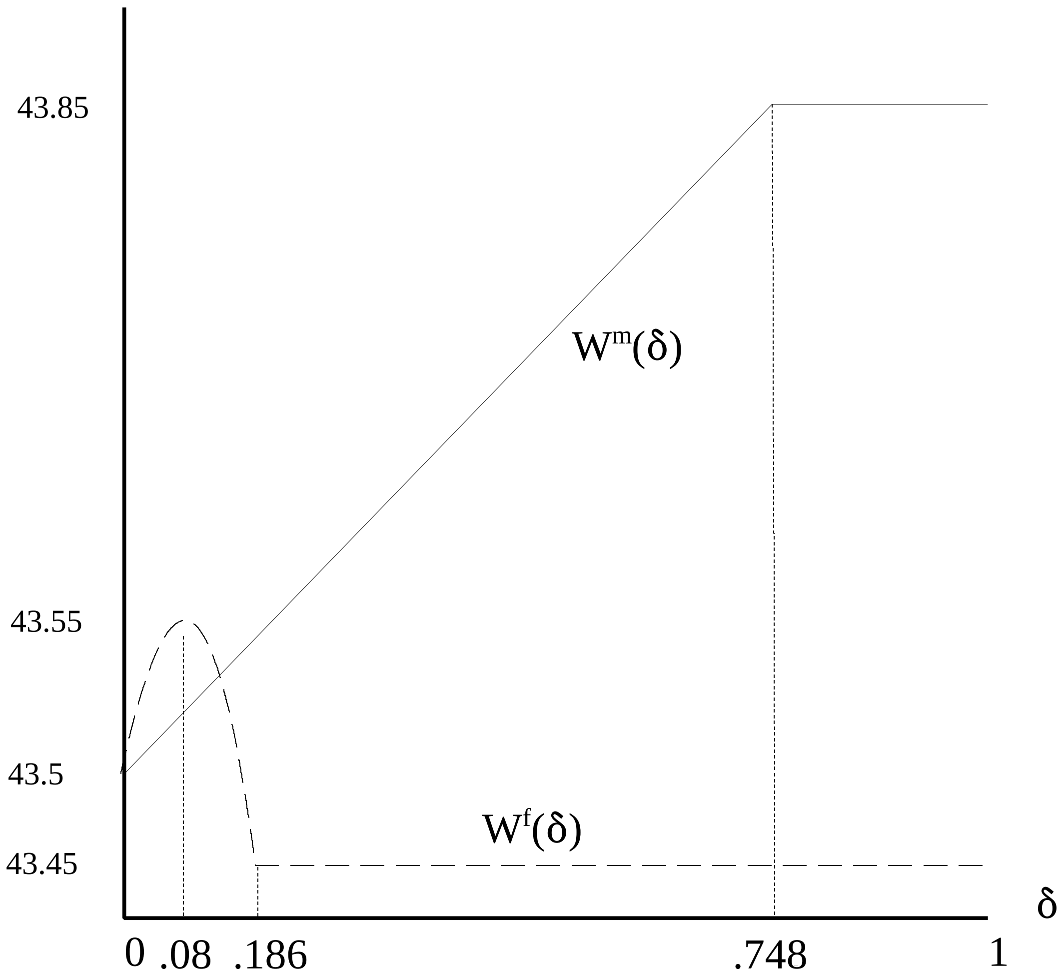


Figure 1 Preferential Arrangement with Countries 1 and 2


43.85
43.55
43.5
43.45
$W^m(\delta)$
$W^f(\delta)$
δ
0
.08
.186
.748
1

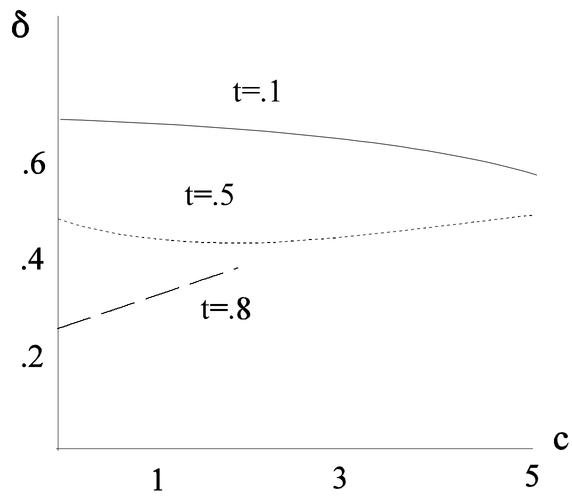


Figure 3 Minimum Discount Rates as a Function of Intercontinental Transport Costs

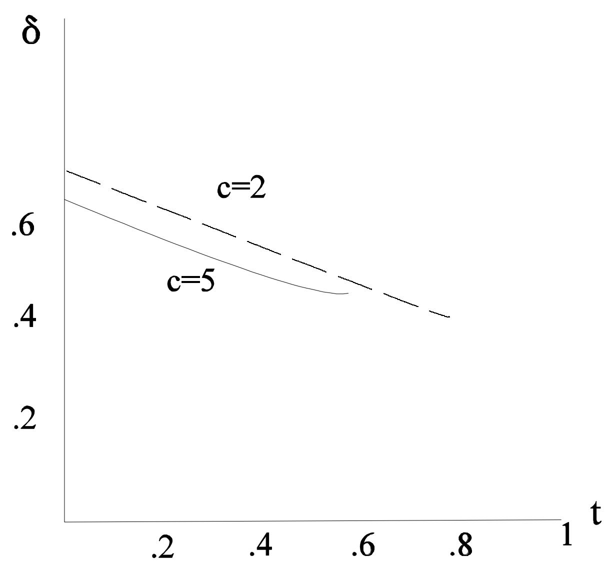


Figure 4 Minimum Discount Factors as a Function of Tariffs

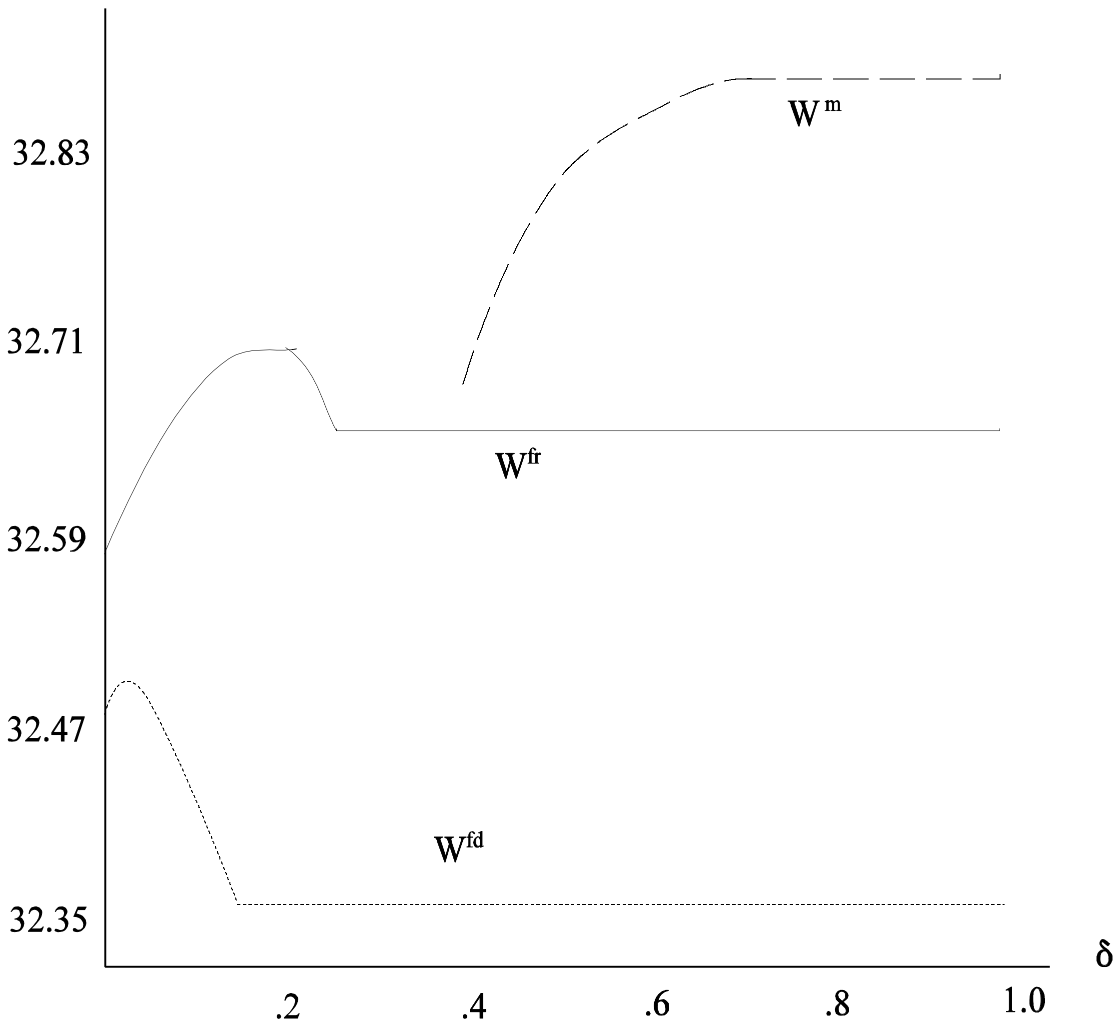


Figure 5 Welfare Comparison of Mulilateral, Regional FTA, and Distant FTA with Transport Costs