The Role of MFN in WTO Accession*

by

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Abstract

We analyze the role played by the most favored nation (MFN) principle in accession negotiations in the WTO. We make use of a model with three countries trading in three goods. Two countries of similar size are existing members of WTO and the third country applies to join it. To capture the existing WTO accession procedure, we assume there to be a series of bilateral sequential bargaining. We found that not only does the applicant gain a higher share of the total surplus than the existing members, its absolute gain is also higher under MFN. Even when compared with multilateral Nash bargaining, bilateral sequential bargaining with MFN favors the applicant both relatively and absolutely. The result can be easily extended to an N-country case.

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The outcome of China's accession to the WTO will be marked with the feature of a "win-win" and "all-win" for China as well as for the world.

Long Yongtu, Head of the Chinese delegation

1 Introduction

While this statement may appear to be political, we find it difficult to dispute with. Let's have a glimpse of China's accession process first. China was the very first country applying for the membership of the World Trade Organization (WTO) when it was established in 1995.[1] A substantial part of the accession process involved bilateral negotiations between China and members of the Working Party, which consisted of all interested WTO members. The Working Party finalized the terms of China's accession agreement in September 2001 and all WTO members approved by consensus the membership in November 2001.[2] China ratified the agreement and became a member of the WTO thirty days later. During the accession process, all the decisions were made voluntarily by China and WTO members. It follows that the outcome of China's accession must be all-win. Indeed, the accession mechanism is standard and applies to all acceding economies (WTO 1995, 2001). Long's all-win statement is valid not only to the case of China, but also any other accession case. In fact, one could even argue that it is a tautology, due to the following three features of the accession mechanism: (1) the acceding economy voluntarily applies for the membership; (2) WTO members voluntarily participate in bilateral negotiations; and (3) all WTO members approve by consensus the accession.

The preceding analysis highlights two points. First, the interesting welfare question regarding China's accession is not to ask whether China or other WTO members gain or

[1] China's application for accession can be dated back to 1986 when China started the process of resuming its status as a General Agreement on Tariffs and Trade (GATT) contracting party. GATT is the predecessor of the WTO. A lesser-known fact is that China was one of the 23 original signatories of GATT in 1948. The contracting party status was withdrawn by the government in Taiwan after China's revolution in 1949.

[2] Theoretically, only a two-third majority of all WTO members are required for the accession approval, but an WTO official told us that, in practice, all decisions (including the accession approval) are taken by consensus at the WTO.

not. (We know that they all gain.) Instead, one should focus on relative gains and, in particular, compare China's gain to those of other members. Second, results of China's accession can be extended to other cases if one takes a general approach that emphasizes the institutional features of the accession mechanism. After all, the distinguishing feature of the WTO is that it is rules-based. We take the general approach in this paper and ask the following question: Does the WTO accession mechanism benefit new and existing members equally?

This question requires us to compare individual gains across new and existing members. To perform this task, additional institutional features of the WTO are involved. The most notable one is the most-favored-nation (MFN) principle, an overriding principle of the WTO. It is an equal-treatment principle, which requires a member to treat all the fellow members the same. For example, if member i lowers the tariff on member j to t^i_j, then MFN requires the tariff of i on any other member k be lowered to $t^i_k = t^i_j$. If a member grants to another member a certain degree of market access, patent protection or lowering of percentage ownership requirement in direct investment, MFN requires that it grant the same treatment to all other members.

Interestingly, we find that this equal-treatment principle creates different incentives for the applicant and members in the accession process, where the applicant negotiates with individual members bilaterally. In a bilateral negotiation, the applicant and a member bargain over the trade concessions to each other. When the applicant makes a concession to a member, MFN requires the same concession be extended to all other members. It magnifies the applicant's cost of making a concession. As a result, MFN turns the applicant into a tough bargainer. On the other hand, MFN has no magnifying effect on the members' action. Under MFN, a member can only extend to the applicant the concession it currently grants to other members. The trade barriers among all existing members remain unchanged, and no additional concessions are to be made between members. Consequently, the existing members are weaker bargainers, and are expected to gain less.

This intuition is further elaborated by a "competing-supplier" model in Sections 2 and 3, which consists of 3 countries and 3 goods. In this model, each country imports one good from the other two countries (and exports two goods). This trade pattern provides a rich structure to analyze MFN. Each country can impose different tariffs on the same good imported from different countries. Among the three countries, one is the applicant and the others the members. As a first cut, we assume that the members are symmetrical in size, which is not too unrealistic, given that the US and EU dominate the WTO.[3] The applicant is modeled to bargain with the members bilaterally and sequentially. The sequential model is motivated by the observation that the bilateral negotiations in the accession process often end one after another. It follows that a member in later negotiations can observe the outcomes of previous negotiations when it strikes a deal with the applicant. This information structure can only be captured by a sequential game. One result of our analysis of this game is that, because MFN turns the applicant into a tough bargainer, its share of the surplus is higher than any of the members' under MFN.

The MFN principle implies that any deal that an applicant makes with a member can be made more unfavorable to the applicant country by subsequent negotiations with other members. So, is the applicant hurt by the existence of the MFN rule? What would happen if the applicant is not bound by MFN? Our model allows us to answer this question by conducting counter-factual analyses. In Section 4, we use the model to examine the role of MFN in accession by hypothetically assuming that MFN was absent from the accession process. Specifically, the applicant is not required to provide MFN treatment to the members. Intuitively, the applicant is no longer a tough bargainer in the absence of MFN. In fact, it is quite the opposite: the counter-factual analysis confirms that the applicant is now a weaker bargainer compared with the members. As a result, it gets a lower share of the total surplus than that of any member. From the point of view of the existing members, MFN eliminates the early-mover advantage — members who negotiate earlier get higher shares than members who negotiate later since earlier negotiators have more surplus to split with the applicant. Towards the end of the negotiations, there is less and less surplus left to be split between the applicant and the members.

While the counter-factual exercise shows that MFN increases the applicant's share of surplus, it leaves out the possibility that MFN can decrease the total surplus sufficiently to lower the applicant's surplus. A related question is whether MFN tariffs are more or less efficient than tariffs without MFN, which is the subject of Section 5. We show that the tariffs the acceding country imposes on the members are efficient in the presence of MFN, while these tariffs are not efficient without MFN. Hence, MFN should raise the total surplus. The intuition is that MFN can mitigate the "opportunism" of later negotiators, who ignore the welfare of earlier negotiators in the absence of MFN. Thus, the absence of MFN leads to less efficient negotiated tariffs. Our efficiency result concerning MFN can shed some

[3] The result of this analysis would apply equally to a situation with two symmetric large members and a large number of much smaller members.

light on the literature. In our model, the possibility of transfers between the applicant and the members allows tariffs to be set efficiently under MFN, while the transfers are used to determine the shares of total surplus. The absence of lump sum transfers in other models may explain why they do not necessarily find MFN to be contributive to efficiency of negotiated tariffs. Caplin and Krishna (1988) point out that the free-rider problem of MFN, in general, keeps the bargaining outcome away from the efficiency frontier. Bagwell and Staiger (1999) show that MFN, *per se*, does not yield an efficient outcome. Nonetheless, our result echoes Ludema's (1991) result, which analyzes a multilateral bargaining game by extending Caplin and Krishna's model to allow all countries to have veto power. Incidentally, unanimity is also a maintained assumption in our analysis. Their result and ours suggest that perhaps more attention should be paid to the fact that decsion-making is usually done by consensus in (Working Party of) the WTO.

Our paper is related to an independent paper by Bagwell and Staiger (2001a). The two papers are similar in the sense that Bagwell and Staiger also study sequential bilateral negotiations under MFN using a 3-country model, but the papers are quite different in other aspects. The key difference is that there is no distinction between applicant and members in their model. In addition, they have one less good and, hence, a simpler trade pattern. Country A imports good x from countries B and C and exports good y to both of them. There is no trade between B and C. This trade pattern limits the scope of MFN to the tariffs of A, since only A imports from more than one country. Furthermore, they assume that the tariffs of A on B and C are always the same, i.e. MFN always applies. Hence, one cannot tell which country is not a member. Thus, their paper can perhaps be regarded as a contribution on negotiations between "active" members (those that always participate in negotiations) and "less active" members (those that only negotiate occasionally).

The intuitive argument of our result concerning the shares of surplus in the negotiation can be traced to the study of collusive practice in the industrial organization literature. Cooper (1986) and Salop (1986) point out that a contractual clause, known as most-favored-customer (MFC), can be used by firms to facilitate collusion. When a firm grants MFC to its customers, it guarantees that the customers will get the lowest price among all its customers. They argue that MFC increases the cost of price competition and, hence, facilitates collusion. In other words, firms can benefit from guaranteeing the customers the lowest price. If this result is counter-intuitive, ours is equally so. While it is in the interest of firms to grant MFC to their customers, it is not clear why members of the WTO do not design the accession mechanism that can put themselves in a more favorable bargaining position. The answer to this question will become apparent when we recognize that the end of the accession process is the beginning of the WTO journey, which we would discuss at the end of section 5.

We begin the formal analysis by introducing the competing-supplier model in Section 2. Then in section 3 we present the case with MFN as the status quo benchmark. In section 4, we present the counter-factual case of no MFN by relaxing the MFN constraints. Section 5 discusses the efficiency properties of the negotiated tariffs with and without MFN in place. Section 6 compares bilateral sequential bargaining with MFN and multilateral Nash bargaining. Section 7 concludes.

2 Competing-Supplier Model

Consider a three-country model in which each country imports one good from each of the two other countries. (The extension to N-country case is straightforward.) This model is useful for analyzing the role played by the MFN principle, since each country can impose different tariffs on different trading partners.

We assume that each country i has an utility function $U_i = \lambda_i \left(\sum_{j=1}^{3} V(D_j) + D_0 \right)$, where λ_i denotes the population of country i, D_j denotes the per capita consumption of good j and good 0 is the per capita consumption of the numeraire good. It is assumed that $V'(.) > 0$ and $V''(.) < 0$. This utility function yields an inverse demand function for the non-numeraire good j in country i of $P_j^i = \lambda_i V'(D_j^i)$, where P_j^i and D_j^i are respectively the domestic price and per capita consumption of good j in country i. Country i is assumed to have a fixed endowment $\lambda_i x_0$ of good 0, $\lambda_i y$ of good i and an endowment $\lambda_i x$ (where $x > y$) of non-numeraire good $j \neq i$. In other words, the endowments of good 0, 1, 2 and 3 of country 1 are $(\lambda_1 x_0, \lambda_1 y, \lambda_1 x, \lambda_1 x)$; those of country 2 are $(\lambda_2 x_0, \lambda_2 x, \lambda_2 y, \lambda_2 x)$; those of country 3 are $(\lambda_3 x_0, \lambda_3 x, \lambda_3 x, \lambda_3 y)$. Note that since the per capita demand function for goods 1, 2 and 3 is the same in all countries, the fact that $x > y$ implies that country i would import good i from the other two countries. In fact, country i would import only good i while exporting the other two goods; moreover, country i would be the only importer of good i. This is true regardless of the values of λ_i. In the completely symmetrical case, $\lambda_1 = \lambda_2 = \lambda_3$. In this paper, however, we shall consider the less restrictive case of $\lambda_1 = \lambda_2$ only. In other words, the existing members are symmetrical (US and EU), but the outside country (China, Russia, etc.) can be smaller (or, in the unlikely case, larger). To make things more realistic, we assume that there is a unit transport cost c between each pair of countries for each good.

However, the introduction of transport cost would not affect our analysis in any major way. Markets are perfectly competitive, as there are a large number of buyers and sellers in each market in all countries. The numeraire good will not be traded under free trade, but is introduced to serve as a means of making transfers between the countries.

We assume that country i's only trade instrument is an import tariff. Since country i is the only importer of good i and only imposes tariffs on good i, we can drop the country superscript and let t_{ij} be the specific tariff imposed on imports of good i from country j. As long as t_{ij} and t_{ik} do not differ too much so that $|t_{ij} - t_{ik}| \leq c$ is maintained, an increase in t_{ij} will improve the terms of trade of countries i and k, but will worsen the terms of trade of country j.

It will be assumed that the trade negotiators choose tariffs to maximize a social welfare function of its own country. Tariff revenue, consumer welfare, and producer welfare in the export sectors all receive equal weight of one. But producer welfare in the import-competing sector receives a weight $\alpha > 1$, an assumption in keeping with political economy arguments, such as by Grossman and Helpman (1994). Under this assumption, the national welfare function of country i can be expressed as $W^i(t_{12}, t_{13}, t_{21}, t_{23}, t_{31}, t_{32}) =$ *consumer surplus* + *export sector revenue* + $\alpha\times$ *import sector revenue* + *tariff revenue* + $\lambda_i x_0$.

In the absence of a trade agreement, the optimal tariff policy for country i is obtained by choosing t_{ij} $(j \neq i)$ to maximize $W^i(t_{12}, t_{13}, t_{21}, t_{23}, t_{31}, t_{32})$. In Nash equilibrium, t_{ij} $= t_{ij}^N$ for all $i = 1, 2, 3$ and $j \neq i$. In other words, the Nash equilibrium is the tariff vector $(t_{12}^N, t_{13}^N, t_{21}^N, t_{23}^N, t_{31}^N, t_{32}^N)$. Due to the separability of markets and the endowment pattern, the optimal trade policy of country i is independent of tariffs set by other countries. That is, the derivative of W^i with respect to t_{ij} is dependent only on t_{ik} for $j, k \neq i$ and $j \neq k$. Symmetry between 1 and 2 implies that $t_{31}^N = t_{32}^N = t_3^N$, $t_{12}^N = t_{21}^N$, and $t_{13}^N = t_{23}^N$.

The tariff vector that maximizes world welfare, $\sum_{i=1}^{3} W^i$, yields the solution $t_{ij} = t_{ij}^C$ for all $i = 1, 2, 3$ and $j \neq i$. We call these efficient tariffs. Under some conditions that help to rule out corner solutions (in which case $t_{ij}^N = t_{ij}^C$ for some i and $j \neq i$), the welfare functions W^i reflect the standard prisoner's dilemma problem of trade policy, since all countries would gain by multilateral tariff reductions from the Nash equilibrium tariff. In other words, $t_{ij}^N > t_{ij}^C$ for all i and $j \neq i$. If countries can commit to tariff rates in negotiations, then the multilateral tariff negotiations involving all three countries can be modeled as a Nash bargaining problem in which the threat point of each country is its Nash equilibrium payoff. The solution to this problem is the tariff vector $(t_{12}^C, t_{13}^C, t_{21}^C, t_{23}^C, t_{31}^C, t_{32}^C)$. Again, symmetry between 1 and 2 implies that $t_{31}^C = t_{32}^C = t_3^C$, $t_{12}^C = t_{21}^C$, and $t_{13}^C = t_{23}^C$.

We make the following assumptions about the impact of tariffs on country i's national welfare and world welfare:

Assumptions We assume that the welfare function W_i has the properties:

(a) The derivative of W^i with respect to t_{ij} is dependent only on t_{ik} for $j,k \neq i$ and $j \neq k$. This implies that the optimal trade policy of country i is independent of tariffs set by other countries.

(b) W_i is strictly concave in t_{ij}, and is increasing in t_{ij} at $t_{ij} = t_{ij}^C$ and $t_{ik} = t_{ik}^C$.

(c) W_i is decreasing in t_{ji} and is increasing in t_{jk}.

(d) The derivative of $\sum_{j=1}^3 W^j$ with respect to t_{ij} is dependent only on t_{ij} and t_{ik}.

(e) An increase in t_{ik} would lead to an increase in the value of t_{ij} that maximizes $\sum_{j=1}^3 W^j$.

(f) $\sum_{l=1}^3 \partial W^l/\partial t_{ij} = 0$ at $t_{ij} = t_{ij}^C$ if $t_{ik} = t_{ik}^C$ provided that there is no corner solution to the efficient tariffs.

Part (a) follows from separability of markets and the endowment pattern. Part (b) assumes that each country will have optimal tariffs (against the other countries) greater than the efficient one. Part (c) assumes that country i is harmed by being discriminated against in country j's market but benefits from being favorably treated in country j's market. Separability of markets and the endowment pattern mentioned above are sufficient for (d) to be true. Part (e) assumes that t_{ij} and t_{ik} are complementary in their effects on $\sum_{j=1}^3 W^j$ (i.e. $\frac{\partial \sum W^j}{\partial t_{ij} \partial t_{ik}} > 0$). Part (f) follows from (d) and the definition of t_{ij}^C.

In the appendix, we show an example in which all the above assumptions are satisfied. The point is that these assumptions are plausible in a broad set of cases that include a variety of distribution of endowments and national utility function $V(.)$.

3 Accession Game under MFN

In this section, we present the accession game with MFN in place. This is the core of the analysis in this paper. In the next section, we would present the accession game with no MFN, which serves as a counter-factual analysis.

We analyze the accession process by assuming that countries 1 and 2, who are members of WTO, have an existing trade agreement that specifies the tariffs that they impose on trade with each other. Due to the symmetry of the member countries, we assume that they choose a common tariff $\overline{t_{12}} = \overline{t_{21}} = t^m$ on trade with each other. We model the accession process with MFN as a bargaining game in which the non-member country 3 makes commitments on the tariffs it imposes on imports from member countries, $t^a = t_{31} = t_{32}$, in return for receiving MFN treatment by the member countries, $t_{13} = t_{23} = t^m$. The bargaining takes place sequentially. The assumption of sequential bargaining is realistic because in the real world, accession negotiations are conducted bilaterally and agreements are reached one after another. This means that later negotiators have full information about agreements that have been reached before. Thus, we believe the use of a sequential bargaining model is appropriate.

We also allow for the possibility of transfers between the countries in terms of the numeraire good as part of the bargaining process, with Z_1 and Z_2 denoting the transfer made by the acceding country 3 to country 1 and 2 respectively as part of the agreement. With MFN in transfer and symmetry between countries 1 and 2, we have $Z_1 = Z_2 = Z$. Define $W^j \equiv W^j(t_{12}, t_{13}, t_{21}, t_{23}, t_{31}, t_{32})$, $j \in \{1, 2\}$. With the above restrictions on the accession negotiation, the payoff to a representative member country under an agreement will be $W^m(t^m, t^a) + Z$, where $W^m(t^m, t^a) \equiv W^1(t^m, t^m, t^m, t^m, t^a, t^a)$. The payoff to the acceding country will be $W^a(t^m, t^a) - 2Z$, where $W^a(t^m, t^a) \equiv W^3(t^m, t^m, t^m, t^m, t^a, t^a)$.

The use of transfers as part of a trade agreement makes the model mathematically more tractable. The introduction of transfers allows us to linearize the welfare frontier so that the analysis of the bargaining can be decomposed into two independent parts, one over the size of the total surplus to be split among the acceding country and the members, and one over the distribution of the total surplus. Although the transfer is used to simplify our analysis, it also carries economic meaning. We can interpret the transfers as concessions made by the acceding country in non-tariffs issues, such as intellectual property rights, trade-related investment measures, and other market-access measures. We shall postpone the discussion of the robustness of the results to the existence of transfers to Section 5.

If an agreement is not reached between the countries, then we assume that the member countries impose t^m on each other and the optimal discriminatory tariff on imports from the non-member country. We assume that the members do not co-ordinate in setting their respective tariffs against the non-member. Note that by assumption (a), the optimal tariff imposed by 1 on 3 is a function of t_{12} only. Using symmetry, we can express the optimal tariff of the member on non-members as $t_{i3} = \tilde{t}(t^m)$for $i = 1, 2$. Similarly, assumption (a) implies that the optimal tariff of the non-member on members will be its Nash equilibrium tariff, t_3^N. The payoff to a member and the acceding country in the absence of an agreement can thus be represented respectively by $W_D^m(t^m) = W^1(t^m, \tilde{t}(t^m), t^m, \tilde{t}(t^m), t_3^N, t_3^N) = W^2(t^m, \tilde{t}(t^m), t^m, \tilde{t}(t^m), t_3^N, t_3^N)$ and $W_D^a(t^m) = W^3(t^m, \tilde{t}(t^m), t^m, \tilde{t}(t^m), t_3^N, t_3^N)$. These define the threat point of the bargains.

An alternative way to model the threat point is to assume that in case the acceding country reaches bilateral agreements with some but not all members (of the Working Party), it can still enter the WTO with those negotiated agreements being honored. We argue, however, that this assumption does not reflect the operation of the real world. As a matter of fact, most bilateral agreements reached during the accession process are conditional on successful accession. They would become invalid if the accession application fails. Take the example of the Sino-US trade agreement signed at the end of 1999 as part of China's accession negotiations to the WTO. The fact is that the agreement would only be valid conditional on China's successful accession to the WTO. Therefore, the appropriate threat point of China in a bilateral accession negotiation is that there is no agreement with any member (of the Working Party).

Given the above agreement and threat point payoff functions, the bargaining problem of the accession game can be described as follow. Recall that country 3 is the acceding country, and Z_i denote the transfer that country 3 gives to i = 1,2. The bargaining game takes the following structure: In Stage I, countries 1 and 3 bargain over t_{31} and Z_1; in Stage II, countries 2 and 3 bargain over t_{32} and Z_2, given t_{31} and Z_1, subject to the constraint of MFN. We solve the model in the following subsection.

Here, it is worthwhile discussing briefly another modeling choice for the negotiations: non-cooperative bargaining. The choice of model, however, turns out to be inconsequential to the result concerning the division of gains, since the Nash solution of the cooperative model of sequential bilateral negotiations is supported by the perfect equilibrium of the non-cooperative counterpart. Note that this result is in the spirit of Rubinstein's (1982) result, but does not follow from it immediately. Rubinstein's result applies to a two-person pure bargaining game. Our accession game is not a pure bargaining game. There are more than two players in the accession game, which consists of a sequence of bilateral negotiations. These negotiations are not independent. They are linked together in two ways. First, the applicant appears in every bilateral bargaining. Second, the terms of bilateral agreements are subject to the MFN rectification. We present the cooperative model here, which allows us to analyze not only the sizes of the negotiated transfers, but also the levels of negotiated tariffs. In other words, it allows us to compute not only the distribution of total gains, but also the size of the total gains.

3.1 Bargaining under MFN

Given the above agreement and threat point payoff functions, the Nash bargaining solution to the accession game can be described below. We solve the model by backward induction. Assume that country 3 negotiates with 1 at Stage One and reach an agreement, and then negotiates with 2 at Stage Two.

We assume that, in the event that 3's negotiations fail with either of the member countries, then 3 does not become a member. This is consistent with WTO rule that there has to be consensus among all members of the Working Party regarding accession of a country. In this case the payoffs revert to those in the previous Nash equilibrium (i.e. t_{12} and t_{21} are at the prevailing agreement levels and the remaining tariffs are set non-cooperatively in a one shot game). In this case the disagreement payoffs, W_D^i, $i = 1, 2, 3$, are functions only of t_{12} and t_{21}, and can be treated as constants in the maximization problems below.

Stage Two

We use a Nash bargaining framework to analyze the problem. Assume that the bargaining powers (or discount rates) of all countries are the same. At this stage, t_{31} and Z_1 have already been pre-determined in the negotiation in Stage One. Without MFN, the second stage bargaining problem is

$$\underset{t_{32}, Z_2}{max} \quad \left[W^2(t_{31}, t_{32}) - W_D^2 + Z_2\right]\left[W^3(t_{31}, t_{32}) - W_D^3 - Z_1 - Z_2\right]. \tag{1}$$

With MFN, we need to impose the condition $t_{31} = t_{32} = t^a$ and $Z_1 = Z_2 = \widetilde{Z}$. Moreover, with MFN, the maximization problem with respect to the choice of $\widetilde{Z}$ is

$$\max_{\widetilde{Z}} \quad \left[W^2 - W_D^2 + \widetilde{Z}\right]\left[W^3 - W_D^3 - 2\widetilde{Z}\right]$$

given $\widetilde{Z}_1$ negotiated in Stage One, with the constraint that $\widetilde{Z} \geq \widetilde{Z}_1$. Therefore, the first order condition with respect to the choice of $\widetilde{Z}$ is

$$(W^3 - W_D^3 - 2\widetilde{Z}) - 2(W^2 - W_D^2 + \widetilde{Z}) \leq 0 \text{ with equality if } \widetilde{Z} \geq \widetilde{Z}_1. \tag{2}$$

Suppose $\widetilde{Z} = Z_2^*$ solves the above with equality. Now, it is clear that if $Z_2^* > \widetilde{Z}_1$, then $\widetilde{Z} = Z_2^*$; if $Z_2^* < \widetilde{Z}_1$, then $\widetilde{Z} = \widetilde{Z}_1$. Therefore, $\widetilde{Z} = \max[\widetilde{Z}_1, Z_2^*]$. Define the function $\widehat{Z}(\widetilde{Z}_1) = \max[\widetilde{Z}_1, Z_2^*]$.

Stage One

Without MFN, the first stage bargaining problem is

$$\max_{t_{31}, Z_1} \quad \left[W^1(t_{31}, t_{32}) - W_D^1 + Z_1\right]\left[W^3(t_{31}, t_{32}) - W_D^3 - Z_1 - Z_2\right]. \tag{3}$$

With MFN, we need to impose the condition $t_{31} = t_{32} = t^a$ and $Z_1 = Z_2 = \widehat{Z}$. Moreover, with MFN, the maximization problem with respect to the choice of $\widetilde{Z}_1$ is

$$\max_{\widetilde{Z}_1} \quad \left[W^1 - W_D^1 + \widehat{Z}(\widetilde{Z}_1)\right]\left[W^3 - W_D^3 - 2\widehat{Z}(\widetilde{Z}_1)\right]$$

knowing that $\widehat{Z}(\widetilde{Z}_1) = \max[\widetilde{Z}_1, Z_2^*]$ will be chosen in Stage Two. Therefore, the first order condition with respect to the choice of $\widehat{Z}$ is

$$(W^3 - W_D^3 - 2\widehat{Z}) - 2(W^1 - W_D^1 + \widehat{Z}) \leq 0 \text{ with equality if } \widehat{Z} = \widetilde{Z}_1 \tag{4}$$

Suppose $\widehat{Z} = Z_1^*$ solves the above with equality. Now, if $Z_1^* > Z_2^*$, then $\widetilde{Z}_1 = Z_1^*$, because the choice of $\widetilde{Z}_1$ would actually affect $\widehat{Z}$, which would affect the welfare of countries 1 and 2. However, if $Z_1^* < Z_2^*$, then $\widetilde{Z}_1 \in [0, Z_2^*]$. This is because if $Z_1^* < Z_2^*$, then $\widehat{Z}$ is determined by Z_2^*, and any $\widetilde{Z}_1 \in [0, Z_2^*]$ would give rise to the same outcome in the end.

Now, it is clear that the equilibrium outcome of the negotiations subject to MFN is $Z_1 = Z_2 = \max[Z_1^*, Z_2^*]$. To illuminate the negotiation process under MFN more clearly, a summary chart is given in Figure 1.

Now, if countries 1 and 2 are symmetrical, then $W^1(t^a, t^a) = W^2(t^a, t^a)$, and $W_D^1 = W_D^2$. Consequently, equations (2) and (4) would yield the same solution, and $Z_1^* = Z_2^*$. Therefore, under symmetry between 1 and 2, the equilibrium outcome is $Z_1 = Z_2 = Z$, where Z is a solution to

$$(W^3 - W_D^3 - 2Z) - 2(W^1 - W_D^1 + Z) = 0. \tag{5}$$

Let us first define country 1's surplus as $X_1 \equiv W^1 - W_D^1 + Z_1$; country 2's surplus as $X_2 \equiv W^2 - W_D^2 + Z_2$; country 3's surplus as $X_3 \equiv W^3 - W_D^3 - Z_1 - Z_2$; the total surplus to be allocated as $Y \equiv (W^1 - W_D^1) + (W^2 - W_D^2) + (W^3 - W_D^3)$. Note that $X_1 + X_2 + X_3 = Y$. Under symmetry, $W^1 = W^2$, $W_D^1 = W_D^2$, and $Z_1 = Z_2$. Therefore, $X_1 = X_2$. (5) implies that $X_3 - 2X_1 = 0$, which implies that $X_3 = 2X_1 = 2X_2$. Since $X_1 + X_2 + X_3 = Y$, we conclude that $X_2 = Y/4 = X_1$ and $X_3 = Y/2$. Hence the shares of surplus of country 1, 2 and 3 are (1/4, 1/4, 1/2) respectively. The acceding country gains a larger share than any of the members.

3.2 Interpretation of the Result

For the sake of analysis, it is useful to think of the two-stage bargaining problem as being separated into two independent parts. The first part involves bargain over t_{31}, t_{32}, t_{13} and t_{23}, which determines the total surplus Y. This is the size of the pie to be divided among all the countries. Therefore, at each stage of bargaining, countries would choose tariffs to maximize the size of the total surplus relevant to that particular bargain. The second part involves the bargain over the transfers, Z_1 and Z_2, which determines the share of each country in the total surplus.

Here, we focus only on the division of total surplus. The bargaining over Z_1 and Z_2 amounts to the following two-stage bargain: (I) countries 1 and 3 bargain over X_1; and (II) countries 2 and 3 bargain over X_2, given X_1.

Using backward induction, the stage 2 bargaining problem over Z_2 can be expressed as

$$\max_{X_2} \quad X_2(Y - X_1 - X_2) \;\text{ subject to }\; X_1 = X_2$$

This problem is similar to (1) subject to $Z_1 = Z_2$. The constraint $X_1 = X_2$ arises from MFN and symmetry. This problem is equivalent to solving

$$\max_{X_1} \quad X_1(Y - 2X_1).$$

The solution to this problem yields the first order condition $Y - 4X_2 = 0$ or $X_2 = Y/4 = X_1$. Moreover, $X_1 + X_2 + X_3 = Y$ implies that $X_3 = Y/2$. Therefore, we can conclude that the shares of country 1, 2 and 3 are respectively $1/4, 1/4$ and $1/2$, which are what we obtained above.

The intuition for the result is: when the MFN condition is imposed, country 3 views the cost of each \$1 given to country 1 as \$2, since it must also give the \$1 to country 2. The same principle applies when country 3 bargains with country 2. This makes country 3 a strong bargainer, and leads to its higher share of surplus compared to countries 1 and 2. While this argument is not clearly reflected in the Nash bargain model here, it can be more clearly seen from a non-cooperative bargaining model, in which the acceding country engages in alternating offer bargain over the *share* of a pie of given size with the members sequentially. The non-cooperative bargain is analyzed in an appendix available from the authors upon request.

With N members ($N > 2$), it can be easily shown that the shares of the countries are $1/(2N)$ for each member and $1/2$ for the acceding country. So, we summarize the findings in this section by

Proposition 1 *With MFN in place, the acceding country gets a higher share of total surplus than any of the members.*

4 Accession Game without MFN

In this section, we conduct a counter-factual analysis under the assumption that country 3 is not required to offer the same tariff concession or transfer to countries 1 and 2. The purpose of this exercise is to draw comparison with the outcome under MFN. With no MFN in place, the acceding country does not have to offer the same tariff concessions to all member countries. There are more tariffs and more transfers to be negotiated than when MFN is in place. In the context of the present model, t_{31}, t_{32}, Z_1 and Z_2 all have to be negotiated independently. Note that country 3 still enjoys the same tariff concessions from country 1 and 2 as before, viz. $t_{23} = t_{13} = t^m$.

As before, due to the symmetry of the member countries, we assume that they choose a common tariff $\overline{t_{12}} = \overline{t_{21}} = t^m$ on trade with each other. In this case, we model the accession process as a bargaining game in which the non-member country sequentially bargains with the member countries over the tariffs it imposes on imports from the member countries, t_{31} and t_{32}, in return for receiving tariff concessions from the member countries, t_{13} and t_{23}, which are equal to t_m. As before, we allow for the possibility of transfers between the countries in terms of the numeraire good as part of the agreement. With these restrictions on the accession negotiation, the payoff to a representative member country under an agreement will be $W^1 + Z_1$ and $W^2 + Z_2$, where $W^j \equiv W^j(t_{12}, t_{13}, t_{21}, t_{23}, t_{31}, t_{32})$, $j \in \{1, 2\}$. The payoff to the acceding country will be $W^a - Z_1 - Z_2$, where $W^a \equiv W^3(t_{12}, t_{13}, t_{21}, t_{23}, t_{31}, t_{32})$.

4.1 Bargaining without MFN

We solve by backward induction. Assume that country 3 negotiates with 1 at Stage One and reach an agreement, and then negotiates with 2 at Stage Two.

Stage Two

Without an MFN principle, the second stage Nash bargaining problem is

$$\underset{t_{32}, Z_2}{max} \left[W^2(t_{31}, t_{32}) - W_D^2 + Z_2\right] \left[W^3(t_{31}, t_{32}) - W_D^3 - Z_1 - Z_2\right] \tag{6}$$

given the terms negotiated between 1 and 3 in the first stage as well as the terms negotiated between 1 and 2 in previous negotiations and the tariff concessions received by 3 from 1 and 2 (these terms include $t_{12}, t_{21}, t_{13}, t_{23}, t_{31}$ and Z_1, with $t_{12}, t_{21}, t_{13}, t_{23}$ being suppressed in (6) to simplify the notation). The disagreement payoffs are pre-determined and (for j = 1,2,3) are therefore fixed.

The first order condition for bargaining over Z_2 is

$$-(W^2 - W_D^2 + Z_2) + (W^3 - W_D^3 - Z_1 - Z_2) = 0 \tag{7}$$

$$\Rightarrow Z_2 = \frac{(W^3 - W_D^3 - Z_1) - (W^2 - W_D^2)}{2} \tag{8}$$

Stage One

The first stage bargaining problem can be written as

$$\begin{aligned} &\underset{t_{31}, Z_1}{max} \left[W^1(t_{31}, t_{32}(t_{31})) - W_D^1 + Z_1\right] \times \\ &\left[W^3(t_{31}, t_{32}(t_{31})) - W_D^3 - Z_1 - Z_2(Z_1, t_{31})\right] \end{aligned} \tag{9}$$

Let us drop the arguments in the functions to simplify the exposition. Substituting equation (8) into (9), the problem becomes

$$
\begin{aligned}
& \underset{t_{31}, Z_1}{max} \left[W^1 - W_D^1 + Z_1\right] \times \left[W^3 - W_D^3 - Z_1 - \frac{(W^3 - W_D^3 - Z_1) - (W^2 - W_D^2)}{2}\right] \\
\Rightarrow \quad & \underset{t_{31}, Z_1}{max} \left[W^1 - W_D^1 + Z_1\right] \times \left[\frac{(W^3 - W_D^3 - Z_1) + (W^2 - W_D^2)}{2}\right]
\end{aligned}
$$

The first order condition with respect to Z_1 is

$$
\left[\frac{(W^3 - W_D^3 - Z_1) + (W^2 - W_D^2)}{2}\right] - \left[\frac{W^1 - W_D^1 + Z_1}{2}\right] = 0 \tag{10}
$$

which yields

$$
Z_1 = \frac{(W^3 - W_D^3) + (W^2 - W_D^2) - (W^1 - W_D^1)}{2} \tag{11}
$$

$$
\Rightarrow \quad X_1 \equiv W^1 - W_D^1 + Z_1 = \frac{\sum_{j=1}^{3}(W^j - W_D^j)}{2} = \frac{Y}{2}
$$

Substituting (11) into (8) yields

$$
\begin{aligned}
Z_2 \quad &= \quad \frac{(W^3 - W_D^3) - 3(W^2 - W_D^2) + (W^1 - W_D^1)}{4} \\
& \Rightarrow \quad X_2 \equiv W^2 - W_D^2 + Z_2 = \frac{\sum_{j=1}^{3}(W^j - W_D^j)}{4} = \frac{Y}{4}
\end{aligned}
$$

Since $X_1 + X_2 + X_3 = Y$, we further obtain $X_3/Y = 1/4$. Thus, the split of surplus among countries 1, 2 and 3 are respectively: (1/2, 1/4, 1/4).

4.2 Interpretation of the Result

Again, for the sake of analysis, the bargaining can be separated into two independent parts. The first part involves bargain over tariffs, t_{31} and t_{32}, which determines the total surplus to be divided among the bargaining partners. The second part involves the bargain over Z_1 and Z_2, which determines the share of each country in the total surplus Y.

Stage Two

The stage 2 bargaining problem over Z_2 can be expressed as

$$\max_{X_2} \quad X_2(Y - X_1 - X_2), \text{ treating } X_1 \text{ as given.}$$

This problem corresponds to (6). It yields the solution $X_2^* = (Y - X_1)/2$.

Stage One

The first stage bargaining problem over Z_1 can be expressed as

$$\max_{X_1} \quad X_1(Y - X_1 - X_2^*(X_1)) = 0.5X_1(Y - X_1)$$

where X_2^* is obtained in the stage two bargaining problem. This problem corresponds to (9). It has been determined that $X_2^* = (Y - X_1)/2$. Substituting this into the LHS of the above equation yields the RHS. Clearly, this maximization problem yields the solutions $X_1/Y = 1/2$. Substituting this into the equation for X_2^*, we obtain $X_2/Y = 1/4$. Since $X_1 + X_2 + X_3 = Y$, we further obtain $X_3/Y = 1/4$. These are exactly what we obtain in the last subsection. Thus, Country 1, the first country that negotiates with the acceding country, obtains half of the surplus (i.e. the difference between the world payoff under the agreement and the world disagreement payoff). Country 2, the second country that negotiates with the acceding country, obtains half of the remaining surplus. Therefore, the acceding country, country 3, gets what remains. The intuition is that in the first stage bargaining problem without MFN, country 3 takes into account the fact that each additional $1 it receives from country 1 in the first stage will be split between country 2 and country 3. This implicitly makes country 3 a weak bargainer in stage 1, because the cost of each $1 it gives up to country 1 is only $1/2.

With N members ($N > 2$), the shares of the countries will be ($1/2$, $1/4$, $1/8$, ..., $1/2^N$, $1/2^N$), where the acceding country is country $N + 1$. Therefore, the share of the acceding country drops dramatically as N increases. Moreover, it can be seen that there is a very strong early-mover advantage for the members. We summarize our findings in the following proposition.

Proposition 2 *With no MFN in place, (i) there is very strong early-mover advantage on the part of the members; (ii) the share of the acceding country is smaller than all the negotiating members except the last one.*

Comparing the cases with MFN and without MFN, we conclude that MFN leads to greater share of total surplus for the acceding country. The reason is that MFN makes the acceding country a tough bargainer.

5 MFN and Efficiency

Although the acceding country gains a higher share of the total surplus when MFN is in place, it does not imply that it gains more in absolute terms. A sufficient condition for the acceding country to gain in absolute terms when MFN is in place is for the total surplus to be higher with MFN than without MFN. We show below that the tariffs imposed by the acceding country on the members would be efficient under MFN. On the other hand, these tariffs would not be efficient without MFN. Consequently, the total surplus with MFN is indeed higher than without MFN.

Without MFN, the later-negotiated tariffs are not efficient since later negotiations do not take into account the welfare of earlier negotiators. Now, the earlier-negotiated tariffs are efficient provided only that the later-negotiated tariffs are expected to be efficient. This is because, from the point of view of the earlier negotiators, earlier-negotiated tariffs and later-negotiated tariffs must be chosen jointly so as to maximize the total size of the pie. Because the later tariffs are not going to be efficient, the earlier tariffs would also not be efficient. With MFN in place, the acceding country is forced to grant the same tariff concessions to all members. This prevents the later negotiators from ignoring the welfare of the earlier negotiators, and also prevents the the acceding country from giving different tariff concessions to earlier and later negotiators in response to the differential incentives of the earlier and later negotiators. Since the acceding country wants to maximize the total surplus in all negotiations, its tariffs on members will be all efficient under MFN. In this sense, we may say that the MFN eliminates the "opportunism" of the acceding country and later negotiators.

In the following subsections, we shall substantiate the above claims by analyzing the efficiency properties of the negotiated tariffs based on the Nash bargaining model.

5.1 Efficiency of tariffs with MFN

With MFN, we can re-write the maximization problem (3) as:

$$\underset{t^a, Z}{max} \quad \left[W^1(t_{31}, t_{32}) - W_D^1 + Z\right] \left[W^3(t_{31}, t_{32}) - W_D^3 - 2Z\right]$$

where $t_{31} = t_{32} = t^a$.

Define $W_j^i \equiv \partial W^i / \partial t_j$ where $i \in \{1, 2, 3\}$ and $j \in \{12, 21, 13, 31, 23, 32\}$. The first order condition of this maximization problem with respect to t^a is

$$(W_{31}^1 + W_{32}^1)(W^3 - W_D^3 - 2Z) + (W_{31}^3 + W_{32}^3)(W^1 - W_D^1 + Z) = 0 \tag{12}$$

Now MFN in tariffs (i.e. $t^a = t_{31} = t_{32}$) and symmetry between countries 1 and 2 implies that

$$W_{31}^1 = W_{32}^2; \quad W_{32}^1 = W_{31}^2. \tag{13}$$

Now, (12) and (5) lead to

$$2(W_{31}^1 + \ W_{32}^1) + (W_{31}^3 + W_{32}^3) = 0$$

which implies

$$W_{32}^2 + W_{31}^2 + W_{31}^1 + W_{32}^1 + W_{31}^3 + W_{32}^3 = 0 \ \text{ from (13).}$$

Consequently, we have

$$\sum_{j=1}^{3} W_{31}^j + \sum_{j=1}^{3} W_{32}^j = 0.$$

MFN in tariffs (i.e. $t^a = t_{31} = t_{32}$) and symmetry between countries 1 and 2 implies that $\sum_{j=1}^{3} W_{31}^j = \sum_{j=1}^{3} W_{32}^j$. Therefore,

$$\sum_{j=1}^{3} W_{3i}^j = 0 \ \text{ for } i = 1, 2,$$

which in turn implies that $\mathbf{t_{31}}$ **and** $\mathbf{t_{32}}$ **are efficient.** That is, $\mathbf{t_{31}}$= $\mathbf{t_{32}}$=t_3^C. With MFN in place, the tariff on the acceding country's exports, t_m, is given. The only tariff that has to be negotiated is t^a, which is equal to $\mathbf{t_{31}}$ and $\mathbf{t_{32}}$. Since the welfare of all countries increase with the total surplus, countries have incentive to choose an efficient t^a so as to maximize their own surplus.

We use the following proposition to summarize our findings:

Proposition 3 *With MFN, $t_{31} = t_{32} = t_3^C$. That is, the negotiated tariffs are efficient.*

5.2 Efficiency of tariffs without MFN

Stage Two

Recall the Stage Two maxmization problem (6), which is restated here:

$$\max_{t_{32}, Z_2} \left[W^2(t_{31}, t_{32}) - W_D^2 + Z_2\right] \left[W^3(t_{31}, t_{32}) - W_D^3 - Z_1 - Z_2\right]$$

At this stage, country 3 negotiates with 2 over t_{32}. The first order condition for bargaining over t_{32} is

$$(W^3 - W_D^3 - Z_1 - Z_2)W_{32}^2 + (W^2 - W_D^2 + Z_2)W_{32}^3 = 0.$$

This equation, together with the first order condition with respect to the choice of Z_2, (7), yields

$$W_{32}^2 + W_{32}^3 = 0, \tag{14}$$

It can be seen that countries 2 and 3 do not care about the welfare of country 1 at this stage of bargaining, and t_{32} is chosen to maximize $W^2 + W^3$. Now, since $W_{32}^1 > 0$ (due to Lemma 1(b)), we have

$$W_{32}^1 + W_{32}^2 + W_{32}^3 > 0 \tag{15}$$

at the values of t_{32} determined in (14).

We can use a diagram to help with the analysis. Refer to Figures 2. We know that $\sum_{j=1}^3 W^j$ is concave in t_{32}, since this property is the second order condition for maximization of Y with respect to the tariffs. According to Assumption (f), $\sum_{j=1}^3 W_{32}^j = 0$ at $t_{32} = t_3^C$ if $t_{31} = t_3^C$. From Figure 2, we see that when $t_{31} = t_3^C$, maximization of the size of the pie, $\sum_{j=1}^3 W^j$, yields the solution $t_{32} = t_3^C$ but maximization of $W^2 + W^3$ corresponds to $t_{32} < t_3^C$, in accordance with (15), since at t_{32}^*, $\sum_{j=1}^3 W_{32}^j > 0$. To summarize, t_{32} is in general not effficient. In particular, $\mathbf{t_{32}}<t_3^C$ **even if** $\mathbf{t_{31}}=t_3^C$. The above analysis indicates that the later negotiators (2 and 3) do not have incentive to choose efficient tariffs without MFN in place because they ignore the welfare of earlier negotiators (country 1).

(It will be seen in the analysis of Stage One that $\mathbf{t_{32}}<t_3^C$ and $\mathbf{t_{31}}>t_3^C$ when optimization in both stages are taken into account.)

Stage One

Recall the Stage One maximization problem (9), which is restated here:

$$\max_{t_{31}, Z_1} \left[W^1(t_{31}, t_{32}(t_{31})) - W_D^1 + Z_1\right] \times$$
$$\left[W^3(t_{31}, t_{32}(t_{31})) - W_D^3 - Z_1 - Z_2(Z_1, t_{31})\right]$$

where Z_2 is given by (8).

At this stage, country 3 negotiates with country 1. From (8) and (6), the first order condition with respect to t_{31} is

$$\frac{dW^1}{dt_{31}}\left[\frac{(W^3 - W_D^3 - Z_1) + (W^2 - W_D^2)}{2}\right] + \left(\frac{dW^3}{dt_{31}} - \frac{dZ_2}{dt_{31}}\right)\left[W^1 - W_D^1 + Z_1\right] = 0$$

where

$$\frac{dW^j}{dt_{31}} \equiv W_{31}^j + W_{32}^j \frac{\partial t_{32}}{\partial t_{31}},$$

and $\frac{\partial t_{32}}{\partial t_{31}}$ indicates the effect of t_{31} on the value of t_{32} that maximizes $W^2 + W^3$. Since $\frac{dZ_2}{dt_{31}} = \frac{1}{2}\left(\frac{dW^3}{dt_{31}} - \frac{dW^2}{dt_{31}}\right)$ from (8), the above equation is reduced to

$$\frac{dW^1}{dt_{31}}\left[\frac{(W^3 - W_D^3 - Z_1) + (W^2 - W_D^2)}{2}\right] + \left(\frac{dW^2}{dt_{31}} + \frac{dW^3}{dt_{31}}\right)\left[\frac{W^1 - W_D^1 + Z_1}{2}\right] = 0.$$

Combining the above equation with (10), we obtain the reduced form of the first order condition for choosing t_{31}:

$$\sum_{j=1}^{3} \frac{dW^j}{dt_{31}} = 0 \tag{16}$$

Therefore, (16) becomes

$$\sum_{j=1}^{3} W_{31}^j + \frac{\partial t_{32}}{\partial t_{31}} \sum_{j=1}^{3} W_{32}^j = 0.$$

Appendix B shows that $\frac{\partial t_{32}}{\partial t_{31}} > 0$. Therefore, the above equation indicates that $t_{31} \gtreqless t_3^C$ iff $t_{32} \lesseqgtr t_3^C$. In other words, t_{31} is higher (lower) than efficient iff t_{32} is lower (higher) than efficient. Also, t_{31} is efficient iff t_{32} is efficient. Since t_{32} is not efficient according to the analysis in Stage Two, t_{31} is also not efficient. Moreover, t_{31} and t_{32} cannot be both above or both below t_3^C according to the above equation. The possibility that $t_{31} < t_3^C$ and $t_{32} > t_3^C$ is also ruled out, since it is inconsistent with the fact that $\sum_{j=1}^{3} W_{32}^j > 0$ obtained in Stage

Two analysis.[4] Therefore, it must be the case that $t_{31} > t_3^C$ and $t_{32} < t_3^C$. That is, $\mathbf{t_{31}}$ **is always higher than efficient, and** $\mathbf{t_{32}}$ **is always lower than efficient**.

To summarize, the choice of t_{31} must satisfy $\sum_{j=1}^{3} dW^j/dt_{31} = 0$ because the choice of t_{31} must take into account its effect on the bargaining game in Stage 2. This condition implies that the choice of t_{31} in stage one is efficient only if the choice of t_{32} is expected to be efficient in stage two. The fact that country 1's welfare is ignored in Stage Two, however, leads to the inefficiency of t_{32}. Because $\mathbf{t_{32}}$ is expected to be inefficient, t_{31} would also be inefficient.

We record our findings in the case with no MFN by

Proposition 4 *With no MFN, $t_{32} < t_3^C$ and $t_{31} > t_3^C$. That is, the negotiated tariffs are inefficient.*

Comparison between Propositions 3 and 4 shows that the requirement of MFN leads to more efficient choice of t_{31} and t_{32} than the case without MFN, as long as countries 1 and 2 are sufficiently similar in size. Therefore, MFN would lead to a greater total surplus than no MFN.

6 Comparison with Multilateral Bargaining

Some may argue that comparison with the case with no MFN is not a fair one, since it obviously leads to first-mover advantage and inequality among the existing members. An alternative comparison that can be done is with a multilateral Nash bargain. Some authors have discovered that the multilateral Nash bargain outcome can in fact be replicated under different negotiation procedures. See, for example, Chae and Yang (1994) and Krishna and Serrano (1996). One feature of the multilateral bargain is that it seems "fair" compared with the case with no MFN. So, it can be considered an acceptable alternative to the MFN scheme. The maximization problem under multilateral Nash bargain is

$$\underset{t_{31},t_{32},Z_1,Z_2}{max} \left[W^1 - W_D^1 + Z_1\right]\left[W^2 - W_D^2 + Z_2\right]\left[W^3 - W_D^3 - Z_1 - Z_2\right] = X_1 X_2 X_3$$

where X_1, X_2, and X_3 are the surpluses of country 1, 2 and 3 respectively, as defined before.

[4] If $t_{31} < t_3^C$, then Proposition 1 says that the value of t_{32} that maximizes $\sum_{j=1}^{3} W^j$ must be smaller than t_3^C, and the value of t_{32} that maximizes $W^2 + W^3$ is even smaller. Therefore, $t_{31} < t_3^C$ and $t_{32} > t_3^C$ cannot hold.

The first order conditions with respect to the choice of Z_1 and Z_2 are

$$X_2X_3 - X_1X_2 = 0$$

and

$$X_1X_3 - X_1X_2 = 0$$

which imply that $X_1 = X_2 = X_3$. So, the split of surplus is (1/3, 1/3, 1/3), versus (1/4, 1/4, 1/2) under bilateral bargains with MFN.

The first order conditions with respect to the choice of t_{31} and t_{32} are

$$W_{31}^1 X_2X_3 + W_{31}^2 X_1X_3 + W_{31}^3 X_1X_2 = 0$$

and

$$W_{32}^1 X_2X_3 + W_{32}^2 X_1X_3 + W_{32}^3 X_1X_2 = 0$$

Together with the equal surplus result above, it can be easily seen that

$$\sum_{j=1}^{3} W_{3i}^j = 0 \quad \text{for} \quad i = 1, 2$$

Comparing bilateral sequential bargaining with MFN and multilateral bargaining, we see that both yield efficient tariffs, but the share of surplus of the applicant is smaller under the latter scheme. So, the applicant still gains more under bilateral negotiations with MFN than under multilateral negotiation.

Discussion

We have made the assumption that lump sum transfers are possible in the accession negotiations, which makes the model mathematically tractable. It also allows us to analyze separately the effects of MFN in the non-tariff part of the negotiations (i.e. the amount of transfer) and those in the tariff part of the negotiations. In the extreme case that transfers are not possible, would the applicant still get a larger share of total surplus under MFN? Our conjectured answer is yes, since the acceding country would still adopt a tougher position when considering making a tariff concession under MFN.[5] Would our results concerning the efficiency properties of the tariffs still hold? Our answer is less certain. On the one hand,

[5] Calculation for the fully symmetric case shows that when there is no lump sum transfer, country 3's share of total surplus is more than eight times that of country 1 or 2.

the welfare of earlier negotiators would still be ignored by later negotiations when there is no MFN, making the negotiated tariffs less efficient. On the other hand, the acceding country is less willing to cut tariffs under MFN, based on the tough bargainer argument. This would make the negotiated tariffs less efficient. It is not clear which effect dominates.

Although MFN can give rise to unequal split of gains between the applicant and the members, it is probably a principle that is hard to change. This principle is a general overriding principle at the WTO that essentially governs all multilateral agreements. To the applicant, the end of the accession process is the beginning of the WTO journey. Upon successful accession, the accession agreement will automatically become a multilateral agreement within the WTO. If the WTO insists on requiring MFN in all multilateral agreements, then MFN has to apply to the accession agreement as well. So, the real reason why there is the MFN in accession negotiations is that it is a pillar in multilateral negotiations in the WTO. Explaining why MFN is important in GATT/WTO multilateral negotiations is beyond the scope of this paper. The reader is referred to, for example, Horn and Mavroidis (2001) and Bagwell and Stagier (1999, 2001b) for some basic understanding.

7 Conclusion

We have developed a model to analyze the role of MFN in accession negotiations of WTO. We make use of a competing-supplier model to explain trade in three goods among three countries based on comparative advantage. We assume an applicant negotiates with two existing members of similar size. (Extension to N-country case is straightforward.) Our model allows us to divide the analysis of the negotiations into two parts: one that determines the shares of this total surplus (non-tariff negotiations) , and one that determines the size of the total surplus (tariff negotiations). We show that implementing MFN in the first part of negotiations turns the acceding country into a tough bargainer, allowing it to gain higher share of the total surplus than in the case without MFN. Having MFN in place also mitigates the (unfair) early-mover advantage of the earlier negotiators, since the size of the remaining surplus gets smaller in the later negotiations, giving disadvantage to later negotiators. In the part of negotiations that determines the total surplus, the implementation of MFN mitigates the "opportunism" of the later negotiators, who ignore the welfare of the earlier negotiators in the absence of MFN. Thus, MFN increases efficiency. The two results together makes us conclude that MFN benefits the acceding country.

Although we focus only on the simple case of symmetry between country 1 and 2, this paper demonstrates that it is plausible that the acceding country gains more than each of the members under the existing WTO accession rules. The result that the MFN principle benefits the acceding country is a rather counter-intuitive result, but once the economic intuition is explained, the arugment is quite compelling.

Even when compared with multilateral Nash bargain, bilateral sequential bargain with MFN still yields higher gains to the applicant country. Both schemes yield equal share of gains for all members, but the tough bargainer effect tilts the share of gains in favor of the applicant country under bilateral bargains with MFN.

In the extreme case that there are no non-tariff negotiations, the fact remains that MFN in tariff negotiations turns the acceding country into a tough bargainer as far as tariff-reductions are concerned. Thus, we believe that in general MFN would still give the acceding country a higher share than in the case with no MFN. However, MFN makes the acceding country less willing to cut tariffs based on the tough bargainer argument above. This effect tends to make tariffs imposed by the acceding country on the members less efficient, thus making the total surplus smaller. Therefore, while the acceding country gains a higher share of the pie, the size of the pie might get smaller. If the total surplus does get smaller, it is not clear whether the acceding country is better off. However, the member countries would definitely be worse off under MFN in this case.

Appendix

A An Example of Competing-Supplier Model

In this appendix, we present a simple example of a competing-supplier model to show that the assumptions we make are plausible and reasonable. First, we present the example; then we derive some properties of the model which are consistent with the assumptions we make in the main text of the paper.

The example we present is a special case of the model we present in the main text. Here, we set $\lambda_1 = \lambda_2 = \lambda_3 = 1$ and $V(D_i) = AD_i - 0.5D_i^2$. In other words, we assume that each country has an identical utility function $U = \sum_{i=1}^{3}(AD_i - 0.5D_i^2) + D_0$, where D_i denotes consumption of good i and good 0 is the numeraire good. This utility function yields a demand function for the non-numeraire good j in country i of $D_j^i = A - P_j^i$, where P_j^i is the domestic price of good j in country i. Country i is assumed to have a fixed endowment x_0 of good 0, y of good i and an endowment x (where $x>y$) of non-numeraire good $j \neq i$. It is assumed that there is a unit transport cost c between each pair of countries for each good. Markets are perfectly competitive, as there are a large number of buyers and sellers in each market in all countries. Under these assumptions, the non-numeraire goods would each sell for a price of $A - [2(x-c)+y]/3$ in a free trade equilibrium, with country i importing $(x-y-c)/3$ units of good i from each of the other countries. The numeraire good will not be traded under free trade, but is introduced to serve as a means of making transfers between the countries.

We assume that country i's only trade instrument is an import tariff. Since country i is the only importer of good i and only imposes tariffs on good i, we can drop the country superscript and let t_{ij} be the specific tariff imposed on imports of good i from country j. If $|t_{ij} - t_{ik}| \leq c \quad \text{for} \quad j,\, k \neq i$, then both j and k will prefer to export to country i and $P_i^j = P_i^i - t_{ij} - c$ (and $P_i^k = P_i^i - t_{ik} - c$). This condition can then be substituted into the market clearing conditions to solve for P_i^i and imports by country i from country j, M_{ij},

$$P_i^i = A - \left[\frac{2x + y - t_{ij} - t_{ik} - 2c}{3}\right]; \qquad M_{ij} = \frac{x - y - 2t_{ij} + t_{ik} - c}{3}$$

where $|t_{ij} - t_{ik}| \leq c$ for all $k \neq j, i$. The expression for M_{ik} can be derived similarly. As long as t_{ij} and t_{ik} do not differ too much so that $|t_{ij} - t_{ik}| \leq c$ is maintained, an increase in t_{ij}

will improve the terms of trade of countries i and k, but will worsen the terms of trade of country j.

If $|t_{ij} - t_{ik}| \leq c$ is violated, for example, if country i chooses $t_{ik} > t_{ij} + c$, the prices determined by (1) yield $P_i^j - P_i^k > c$. If country j does not impose a tariff on imports of good i from k, then exporters in k could earn more by selling in j than by selling in i. Commodity arbitrage would then yield $P_i^j = P_i^i - t_{ij} - c$ and $P_i^k = P_i^j - c$. Note in particular that with the assumption made here on endowments, such trade would not violate any rules of origin imposed by country i, because the market in i can be satisfied by exports from j. However, in the event of such arbitrage, it can be easily shown that it would not be in the interest of country j to impose a tariff on imports of good i from k. Furthermore, it will not be in the interest of i to choose tariffs t_{ij} and t_{ik} that creates such arbitrage. Therefore, the no arbitrage condition will serve as a constraint on the tariff choice of the countries. To simplify the presentation, we will assume that if $t_{ik} = t_{ij} + c$, country k exporters will sell in country i (which minimizes world transaction costs).

It will be assumed that the trade negotiators choose tariffs to maximize a social welfare function of its own country. Tariff revenue, consumer welfare, and producer welfare in the export sectors all receive equal weight of one. But producer welfare in the import-competing sector receives a weight $\alpha > 1$, an assumption in keeping with political economy arguments, such as by Grossman and Helpman (1994). Under this assumption, the national welfare function can be expressed as

$$W^i(t_{12}, t_{13}, t_{21}, t_{23}, t_{31}, t_{32}) = \sum_{j=1}^{3} \frac{1}{2}(A - P_j^i)^2 + \sum_{j \neq i} P_j^i x + \alpha P_i^i y + \sum_{j \neq i} t_{ij} M_{ij} + x_0. \tag{17}$$

The first term on the right hand side is consumer surplus, the second term is export sector revenue, the third term is import sector revenue weighted by α, and the forth term represents tariff revenue.

In the absence of a trade agreement, the optimal tariff policy for country i is obtained by choosing t_{ij} $(j \neq i)$ to maximize (17). It is straightforward to show that due to the symmetry between the countries, the optimal tariff policy will have equal tariffs on imports from all partners at a value given by

$$t^N = \frac{x + (3\alpha - 4)y - c}{4} \quad \text{for} \quad x - \alpha y - c > 0 \tag{18}$$

The restriction on the endowments, which will be maintained throughout the analysis, ensures that the optimal equilibrium tariff is not corner solution, that is, $t^N = t^C$, the efficient tariff level, which will be defined below. If the restriction is violated, there will be no prisoners' dilemma problem in tariff setting, as will be shown below. Due to the separability of markets and the endowment pattern, the optimal trade policy of country i is independent of tariffs set by other countries and (18) will be the tariffs in the non-cooperative Nash equilibrium.

If the endowments restriction in (18) is not violated, the welfare functions W_i reflect the standard prisoner's dilemma problem of trade policy, since all countries would gain by multilateral tariff reductions in the neighborhood of the Nash equilibrium tariff. If countries can commit to tariff rates in negotiations, then the multilateral tariff negotiations involving all three countries can be modeled as a Nash bargaining problem in which the threat point of each country is its Nash equilibrium payoff. The solution to this problem is the tariff vector that maximizes world welfare, $\sum_{i=1}^{3} W^i$, which yields the solution

$$t_{ij} = t^C = (\alpha - 1)y \quad \text{for} \quad i, j = 1, 2, 3 \text{ and } i \neq j.$$

From the above analysis, we can easily see that assumptions (b) and (c) are true. In the following calculation, we shall show that assumptions (d), (e) and (f) are also true.

From (17),

$$\begin{aligned} \frac{\partial W^i}{\partial t_{ij}} &= (-1)\left(A - P_i^i\right)\frac{\partial P_i^i}{\partial t_{ij}} + \alpha y \frac{\partial P_i^i}{\partial t_{ij}} + M_{ij} + t_{ij}\frac{\partial M_{ij}}{\partial t_{ij}} + t_{ik}\frac{\partial M_{ik}}{\partial t_{ij}} \\ &= \frac{1}{9}\left[-11t_{ij} + 7t_{ik} + x + (3\alpha - 4)y - c\right] \end{aligned}$$

$$\begin{aligned} \frac{\partial W^j}{\partial t_{ij}} &= (-1)\left(A - P_i^j\right)\frac{\partial P_i^j}{\partial t_{ij}} + x\frac{\partial P_i^j}{\partial t_{ij}} \\ &= \frac{1}{9}\left(4t_{ij} - 2t_{ik} - 2x + 2y + 2c\right) \\ \frac{\partial W^k}{\partial t_{ij}} &= (-1)\left(A - P_i^k\right)\frac{\partial P_i^k}{\partial t_{ij}} + x\frac{\partial P_i^k}{\partial t_{ij}} \\ &= \frac{1}{9}\left(t_{ij} - 2t_{ik} + x - y - c\right) \end{aligned}$$

Therefore,

$$\frac{\partial}{\partial t_{ij}} \sum_{l=1}^{3} W^l = \frac{1}{9} [-6t_{ij} + 3t_{ik} + 3(\alpha - 1)y]$$

Therefore,

$$\frac{\partial}{\partial t_{ij}} \sum_{l=1}^{3} W^l = 0 \quad \Longrightarrow \quad -2t_{ij} + t_{ik} + (\alpha - 1)y = 0 \tag{19}$$

and, by symmetry,

$$\frac{\partial}{\partial t_{ik}} \sum_{l=1}^{3} W^l = 0 \quad \Longrightarrow \quad -2t_{ik} + t_{ij} + (\alpha - 1)y = 0 \tag{20}$$

Therefore an increase in t_{ik} implies an increase in t^*_{ij}, the value of t_{ij} that maximizes world welfare; and an increase in t_{ij} implies an increase in t^*_{ik}, the value of t_{ik} that maximizes world welfare. Moreover, (19) and (20) implies that $t_{ij} = t_{ik} = t^C = (\alpha - 1)y$ in order to maximize $\sum_{l=1}^{3} W^l$, i.e.

$$\frac{\partial}{\partial t_{ij}} \sum_{l=1}^{3} W^l = 0 \text{ at } t_{ik} = t^C \text{ and } t_{ij} = t^C.$$

Therefore, when $t_{ik} = t^C$ and $t^*_{ij} = t^C$. Consequently, $t_{ik} > t^C$ implies that $t^*_{ij} > t^C$, and vice versa.

B Derivation of $\frac{\partial t_{32}}{\partial t_{31}}$

$\frac{\partial t_{32}}{\partial t_{31}}$is the effect of t_{31} on the value of t_{32} that maximizes $W^2 + W^3$. The first order condition that determines the value of t_{32} that maximizes $W^2 + W^3$ is (14):

$$W^2_{32} + W^3_{32} = 0.$$

This implies, using the example in Appendix A,

$$\frac{1}{9} [-7t_{32} + 5t_{31} - x + (2\alpha - 2)y + c] = 0$$

It it clear that $\frac{\partial t_{32}}{\partial t_{31}} = \frac{5}{7} > 0$. This derivative should be positive in sign in a larger set of endowment distributions and $V(.)$ functions.

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Stage 1

$\tilde{Z}_1$ to be chosen, expecting $\tilde{Z}$ will be chosen in Stage Two

Z_1^* solves (4)

$Z_1^* > Z_2^* \Rightarrow \tilde{Z}_1 = Z_1^*$
$Z_1^* < Z_2^* \Rightarrow \tilde{Z}_1 \in [0, Z_2^*]$

Stage 2

$\tilde{Z}$ to be chosen, knowing $\tilde{Z}_1$ has been chosen in Stage One

Z_2^* solves (2)

$Z_2^* > \tilde{Z}_1 \Rightarrow \tilde{Z} = Z_2^*$
$Z_2^* < \tilde{Z}_1 \Rightarrow \tilde{Z} = \tilde{Z}_1$

So, $\tilde{Z} = \max[Z_2^*, \tilde{Z}_1]$

Therefore, in equilibrium, $\tilde{Z} = \max[Z_1^*, Z_2^*]$

Figure 1. Determination of Z_1 and Z_2 under MFN.

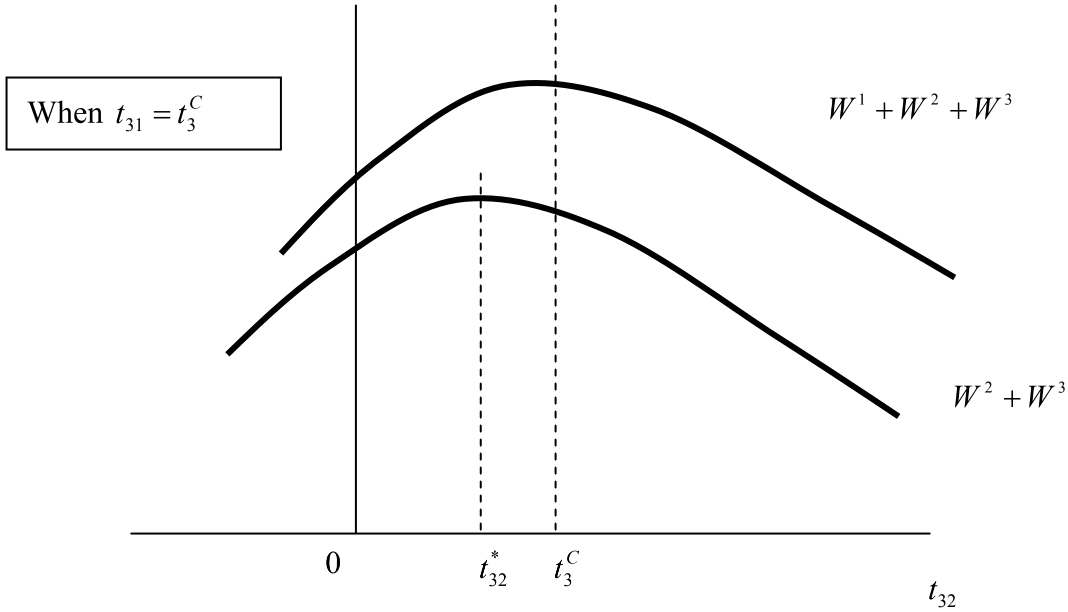

Figure 2. Note that $W_{23}^1 > 0$ according to Assumption (c). Therefore, the peak of the curve $W^1 + W^2 + W^3$ is to the right of the peak of the curve $W^2 + W^3$.