Which bargaining method gives the greatest benefit to developing countries?

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Abstract

This paper considers whether the principle of reciprocity benefits developing countries. To analyze this, developing countries are categorized in two groups: i) big countries with lower bargaining power, and ii) small countries, with bad threat points. This paper compares the welfare outcomes of developing countries under four tariff bargaining methods: i) sequential bargaining without MFN, ii) sequential bargaining with MFN, iii) sequential bargaining with MFN and reciprocity, and iv) sequential bargaining with the Enabling Clause. The study finds that reciprocity benefits developing countries if they have lower bargaining power; on the other hand, reciprocity hurts those countries when they are small. MFN always benefits developing countries regardless of their type. Finally, the Enabling Clause benefits developing countries only when they are small.

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1. Introduction

With its membership rising to some 150 members, about two-thirds of which are developing countries, the GATT/WTO has an increasingly vital role in the international trade system. When GATT was first established, only developed countries were meaningful participants in multilateral trade negotiations while developing countries were inactive in such negotiations; they remained free riders, extracting benefits from MFN tariffs. Today, however, developing countries play an increasingly important role in the WTO.

There are three reasons why more developing countries are participating in the WTO. First, trade is a crucial activity that drives the economic growth of developing countries. There is, therefore, an increase in trade liberalization which brings about the need for WTO multilateral trade negotiations. Second, developing countries are growing increasingly important in the manufacturing market, a traditional area of GATT negotiations. Third, agriculture, which is the most important sector for developing countries, has become an urgent issue in WTO negotiations since the Uruguay Round.

Many countries have become more dependent on the WTO and its dispute settlement mechanism. Developing countries have initiated more complaints in the WTO than the European Union, and almost as many as the United States.[2]

However, evidence from previous rounds in the WTO suggests that the gains from WTO negotiations were unequally divided between developed and developing countries, with the developed countries enjoying the major benefits.[3] The disadvantages of developing countries in WTO negotiations come from two main reasons. The first is that developing countries are small. As a result, they have worse threat points and will lose trade wars against big countries. Kennan and Riezman (1988) study the results of trade wars between two countries and find that if one country is substantially bigger than the other, the big country can expect to gain from a trade war. Many African countries are examples of this group.

The second reason is that developing countries have lower bargaining power in WTO negotiations due to lack of the following: coherence among developing countries, institutional capacity to deal with negotiation, and detailed examination of the subjects

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[2] Mendoza (2002) page 2.
[3] Ismail.(2006) page 40.

prior to discussion. As a result, developing countries have agreed to accept many unfair negotiations. East and South-East Asian countries are examples of this group.

In view of their disadvantages, developing countries propose that they should be treated differently with less than full-reciprocal negotiations and less onerous commitments than developed countries.

This paper studies whether reciprocity and MFN, the two central frameworks of WTO negotiations, benefit developing countries, and whether they prefer the special treatment, i.e. the Enabling Clause, granted by big countries. In our study, we divide developing countries into two categories: i) countries that are small and ii) countries with low bargaining power. We examine whether MFN, reciprocity and the Enabling Clause affect these two groups similarly. Also, we compare the welfare outcome under the following four bargaining methods and determine which method is better for developing countries: i) sequential bargaining without MFN, ii) sequential bargaining with MFN, iii) sequential bargaining with MFN and reciprocity, and iv) sequential bargaining with the Enabling Clause.

In addition, we consider the related literature. Bond, Ching and Lai (2003) analyze the role of MFN in accession to the WTO. Using the Nash bargaining framework and allowing direct transfers among countries, the study shows that both bilateral negotiations with MFN and multilateral negotiations yield efficient tariffs. Also, MFN allows the acceding country to gain a higher share of the total surplus than when MFN is not required. Aghion, Antras and Helpman (2004) consider whether multilateral bargaining or sequential bargaining is more likely to lead to global free trade. With the grand coalition superaddivity assumption, the study finds that both multilateral and sequential bargaining generate worldwide free trade. However, the country proposing negotiation prefers sequential bargaining when there are negative coalition externalities, and multilateral bargaining otherwise.

Some papers suggest that a multilateral mechanism is better. Maggi (1999) shows that, in the context of power imbalances, multilateral bargaining, more than a web of bilateral negotiations, enables countries to achieve deeper trade liberalization and gain higher welfare. Ludema (1991) shows that the MFN externality from free rider is internalized through multilateral bargaining.

To our knowledge, there are not many papers that investigate the effects of MFN on small countries. Ghosh, Perroni and Whalley (2003) study the benefits and costs of MFN to developing countries. The study uses a seven-region global trade model to numerically explore three solution concepts: competitive equilibrium, non-cooperative Nash equilibria, and Nash bargaining with side payments to access different benefits of MFN. The study finds large effects of MFN in influencing bargaining outcomes and very small direct effects from free riding, and concludes that the main benefit from MFN to smaller countries comes from the requirement for bilateral trade bargaining to be equivalent to multilateral bargaining.

Some papers study the MFN costs to large countries. McCalman (1997) examines MFN negotiations in a principal-agent model within a private information environment. The study considers a bilateral negotiation with MFN in which one large country designs a mechanism for small countries. The study finds that the large country is always worse off when MFN is imposed.

Cebi and Ludema (2001) study the benefits and costs of the MFN clause to large countries. The study considers a model of two large countries and a continuum of small countries in which each small country trades with only one large country. The study makes comparisons between negotiations in which reciprocity restriction is constrained and those in which it is not constrained. It finds that tariff agreements in this case are efficient, and that the large country prefers MFN constrained with reciprocal tax cuts.

The purpose of our paper is to examine when MFN, reciprocity and the Enabling Clause benefit developing countries. Additionally, the paper seeks the negotiation mechanism which engenders the highest welfare for developing countries. It compares four tariff bargaining methods: i) sequential bargaining without MFN, ii) sequential bargaining with MFN, iii) sequential bargaining with MFN and reciprocity, and iv) sequential bargaining with the Enabling Clause.

The paper is divided into sections that construct the basic trade agreement model in an n+2 country framework; describe tariffs in GATT/WTO negotiations; examine the tariff bargaining game; compare the welfare of small countries that apply different bargaining methods; and, in conclusion, elucidate possible extensions.

2. Trade agreements in three-country framework

2.1 Case I: Three big-country model

We first develop a three-country model consisting of three big countries to capture a big developing country with lower bargaining power, and extend the framework to an n+2 country model with n small countries to capture a small developing country .

2.1.1 The basic model

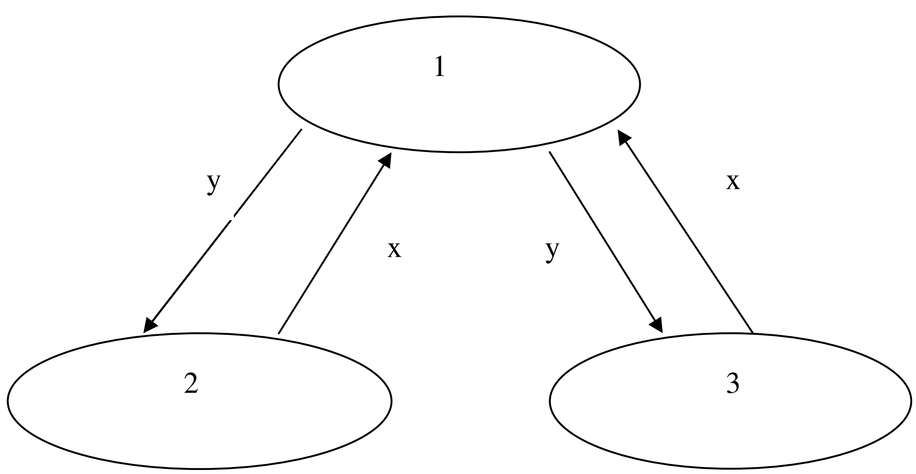
In this section, we develop a three-country partial equilibrium model with quasi-linear utility based on Bagwell and Staiger (2001).

Suppose that there are three symmetric countries, called 1, 2 and 3, with two taxable goods. There are three goods in this model, namely a numeraire (v) and two non-numeraire goods (x and y) whose trade can be taxed. Suppose that the numeraire good v is sufficiently abundant in each country so that we consider only a partial equilibrium analysis of the two traded goods. The existence of the numeraire is for the sake of overall trade balance and international transfers.

We assume that each country's representative consumer has a quasi-linear utility function in the form of:

$$U^j = v + \phi(x^j) + \phi(y^j) \tag{1}$$

For $j \in \{1,2,3\}$ and where $\phi(.)$ is a quadratic function so that the demand function is linear, D(P) = a-P. Country 1 is endowed with v_o units of the numeraire good and $\overline{Y}$ units of good y. Country 2 is endowed with v_o units of the numeraire good and $\overline{X}$ units of good x. Country 3 is endowed with v_o units of the numeraire good and $\overline{X}$ units of good x. Therefore, Country 1 is an importer of good x, and an exporter of good y. Country 2 is an importer of good y, and an exporter of good x. Country 3 is an importer of good y, and an exporter of good x. The trading pattern can be summarized in the following diagram:



Letting $P_i^j, i \in \{x, y\}$ $j \in \{1,2,3\}$ denote the local price of good i in country j, τ_x^j is the import tariff of good x from country j, imposed by country 1, and τ_y^k is the import tariff of good y from country 1, imposed by country k, the local prices obey the following arbitrage and market clearing conditions:

$$P_x^1 = P_x^j + \tau_x^j \qquad j = \{2,3\}$$
$$P_y^2 = P_y^1 + \tau_y^2 \qquad (2)$$
$$P_y^3 = P_y^1 + \tau_y^3$$

and $M^j(P_i^j) = \sum_{k\in N} E^k(P_i^k)$ for $j \neq k,\, j,k \in N$ and $N = \{1,2,3\}$ (3)

given that M(.) is the import function and E(.) is the export function.

The import function can be defined as $M(P_i) = D(P_i)$ and the export function is $E(P_x) = \overline{X} - D(P_x)$ for Country 2 and Country 3 and $E(P_y) = \overline{Y} - D(P_y)$ for Country 1. We associate the tariff revenue of country j in the form of $TR^j = \sum_{k\in N\setminus j} E^k \tau_i^k$ when country j is an importer of good i.

From the demand functions and endowments, we can find the market clearing local price in Country 1 as follows:

$$P_x^1 = \frac{3a + \tau_x^2 + \tau_x^3 - \overline{X}}{3} \qquad (4)$$
$$P_y^1 = \frac{3a - \tau_y^2 - \tau_y^3 - \overline{Y}}{3}$$

The consumer surplus comes from $\int_{p_1}^{a} d(p)dp$. Let $CS_i^j(P_i^j)$ be denoted as the consumer surplus of good i in country j.

2.1.2 Government objectives

We now define a government objective function. Governments are assumed to maximize the sum of consumer surplus, producer surplus and tariff revenue. The aggregate welfare function in each country can be expressed as follows:

$$W^1(\tau_x^2,\tau_x^3,\tau_y^2,\tau_y^3) = v_0 + CS_x^1(P_x^1(\tau_x^2,\tau_x^3)) + CS_y^1(P_y^1(\tau_y^2,\tau_y^3)) + TR(\tau_x^2,\tau_x^3) + P_y^1\overline{Y}$$
$$W^2(\tau_x^2,\tau_x^3,\tau_y^2,\tau_y^3) = v_0 + CS_x^2(P_x^2(\tau_x^2,\tau_x^3)) + CS_y^2(P_y^2(\tau_y^2,\tau_y^3)) + TR(\tau_y^2,\tau_y^3) + P_x^2\overline{X} \qquad (5)$$
$$W^3(\tau_x^2,\tau_x^3,\tau_y^2,\tau_y^3) = v_0 + CS_x^3(P_x^3(\tau_x^2,\tau_x^3)) + CS_y^3(P_y^3(\tau_y^2,\tau_y^3)) + TR(\tau_y^2,\tau_y^3) + P_x^3\overline{X}$$

2.1.3 Nash Equilibrium

Consider that when each government sets its tariff policy unilaterally, it chooses a tariff that maximizes its own welfare function. Therefore, the tariff outcome becomes the best-response tariff, τ_i^{BRj} for $\forall j,k \in N$, $j \neq k$ $\forall i \in I$ which solves the following maximization problems:

$$\max_{\tau_x^2,\tau_x^3} W^1(\tau_x^2,\tau_x^3,\tau_y^2,\tau_y^3) \qquad \text{for country 1}$$

$$\max_{\tau_y^2} W^2(\tau_x^2,\tau_x^3,\tau_y^2,\tau_y^3) \qquad \text{for country 2} \qquad \text{(M1)}$$

$$\max_{\tau_y^3} W^3(\tau_x^2,\tau_x^3,\tau_y^2,\tau_y^3) \qquad \text{for country 3}$$

The best-response tariffs in our model are:

$$\tau_x^{BR2} = \frac{7\tau_x^3 + \overline{X}}{11}$$

$$\tau_x^{BR3} = \frac{7\tau_x^2 + \overline{X}}{11}$$

$$\tau_y^{BR2} = \frac{\tau_y^3 + \overline{Y}}{8}$$

$$\tau_y^{BR3} = \frac{\tau_y^2 + \overline{Y}}{8}$$

When all countries choose to set their tariff policy at the best-response level, we will have Nash equilibrium:

$$\tau_x^{NE2} = \tau_x^{NE3} = \frac{\overline{X}}{4}, \tau_y^{NE2} = \tau_y^{NE3} = \frac{\overline{Y}}{7}.$$

2.1.4 Efficient Tariff

In this section, we consider an efficient tariff policy. The tariff τ_i^{cj} for $\forall j \in N$, $\forall i \in I$ is the efficient tariff if and only if it maximizes the joint welfare function as transfers between countries are allowed. Such efficient tariff policy is the tariff outcome from the following maximization problem:

$$\max_{\tau_x^{12},\tau_x^3,\tau_y^2,\tau_y^3} \sum_{j \in N} W^j(\tau_x^2,\tau_x^3,\tau_y^2,\tau_y^3) \qquad \text{(M2)}$$

In our model, the efficient tariff leads to reciprocal free trade.

2.2 Case II: n+2 country model

2.2.1 The basic model

Suppose that Country 1 and Country 2 are large countries, and Country 3 is partitioned into n identical countries, indexed by $j \in S = \{3,4,.....,n+2\}$, where n is very large $n \to \infty$, each of which shares the same endowment and preferences with the linear demand function $D^j(P) = \frac{a-P}{n}$ and endowment $\frac{\overline{X}}{n}$.

Using the arbitrage and market clearing conditions given in (2) and (3), the local prices in Country 1 are as follow:

$$P_x^1 = \frac{3a + \tau_x^2 + \frac{1}{n}\sum_{j=3}^{n+2} \tau_x^j - 2\overline{X}}{3} \quad (6)$$

$$P_y^1 = \frac{3a - \tau_y^2 - \frac{1}{n}\sum_{j=3}^{n+2} \tau_y^j - \overline{Y}}{3}$$

The welfare functions of Country 1 and 2 do not change from (5), and that of each small country j becomes:

$$W^j(\tau_x^2, \tau_x^3, \tau_y^2, ..., \tau_y^{n+2}) = v_0 + CS_x^j(P_x^j(\tau_x^2, ..., \tau_x^{n+2})) + CS_y^j(P_y^j(\tau_y^2, ..., \tau_y^{n+2}))$$
$$+ TR(\tau_y^2, ..., \tau_y^{n+2}) + P_x^j \frac{\overline{X}}{n} \quad (7)$$

2.2.2 Nash equilibrium and efficient tariffs

Using the tariff outcomes from the maximization problem (M1), the best-response tariff in Case II are:

$$\tau_x^{BR2} = \frac{7(\frac{1}{n}\sum_{j=3}^{n+2}\tau_x^j) + \overline{X}}{11}, \quad j \in S = \{3,4,.....,n+2\}$$

$$\tau_x^{BRj} = \frac{7(\frac{1}{n}\sum_{k \neq j}\tau_x^j + \tau_x^2) + \overline{X}}{11}, \quad j \in S = \{3,4,.....,n+2\}$$

$$\tau_y^{BR2} = \frac{\overline{Y} + \frac{1}{n}\sum_{j=3}^{n+2}\tau_y^j}{8} \quad (8)$$

$$\tau_y^{BRj} = \frac{\overline{Y} + \tau_y^2}{9n-1}$$

When all countries choose the best-response tariff at the same time, we see Nash equilibrium in the limit:

$$\lim_{n\to\infty}\tau_x^{NE2} = \lim_{n\to\infty}\tau_x^{NEj} = \frac{\overline{X}}{4}$$
$$\lim_{n\to\infty}\tau_y^{NE2} = \frac{\overline{Y}}{8} \qquad (9)$$
$$\lim_{n\to\infty}\tau_y^{j1} = 0$$

Using the maximization problem (M2), in the limit when $n \to \infty$, the efficient tariff also leads to reciprocal free trade.

3. Tariff in GATT/WTO negotiations

Before constructing the tariff bargaining game, it is useful to understand the negotiation process in the WTO.

The oldest negotiating method in the GATT/WTO is the bilateral item-by-item/country-by-country technique. This method is still being used for any bilateral negotiation during a round, for Article XXVIII renegotiations, and in the process of accession of new WTO members.

The sector approach, introduced since the Uruguay round, aims at the complete elimination of the tariffs in a given sector. The practice has been for the elimination or harmonization to be agreed upon only amongst the members with significant shares in international trade. The concessions, however, are applied on an MFN basis.[4]

There are two central frameworks to govern tariff negotiations in the WTO. The first is the principle of reciprocity, and the second is the principle of non-discrimination (MFN).

3.1 Reciprocity

The principle of reciprocity has been a main feature of tariff negotiations in the GATT/WTO since the creation of GATT in 1947. Although GATT does not directly require reciprocal tariffs as an outcome of negotiation, GATT requires reciprocal and mutually advantageous concessions when countries fail to reach an agreement under renegotiation.[5] To be precise, when negotiating parties cannot reach an agreement, a

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[4] www.wto.org
[5] See Bagwell and Staiger (1999,2001,2002)

party is free to modify and withdraw a concession, and receive a withdrawal of a substantially equivalent concession in return. Therefore, Article XXVIII implies that "the balance of concessions" is required when each country renegotiates tariffs.[6] Reciprocity is also mentioned in Article XXIII bis; when members negotiate in GATT, they do so with the presumed goal of securing a mutually advantageous arrangement through a reciprocal reduction in tariff bindings.[7]

3.2 MFN

MFN is a central framework of the multilateral trade negotiations under GATT/WTO. The MFN clause is contained in GATT Article I. According to Article I, WTO members are bound to grant to the products of other members treatment no less favorable than that accorded to the products of any other country. [8] Thus, the MFN principle requires that when one country makes a concession to a member, the same concession has to be extended to all other WTO members.

3.3 Special treatment in the WTO agreement for developing and least-developed countries

The GATT/WTO agreement allows special and differential treatment for developing and least developed countries. Article XXXVII of the GATT 1994 requires developed members to accord high priority to the reduction and elimination of barriers to products currently or potentially of particular export interest to developing countries.[9] Furthermore, since the early 1960s, the concept of non-reciprocity has been accepted in respect to trade negotiations among developed and developing countries. This concept is contained in Part IV of the GATT 1994, known as the Enabling Clause.[10]

4. The bargaining game

In this section, we construct the tariff bargaining game between 2 big countries and a developing country. We consider a transferable welfare game between 3 countries to consider when a developing country is big but has lower bargaining power; we then extend it to the case of n+2 country model to capture when a developing country is

[6] Article XXVIII of the GATT governs renegotiation in the WTO
[7] Bagwell and Staiger (2002), page 55.
[8] www.wto.org
[9] Development division, WTO (1999)
[10] www.wto.org.

small. The game structure we study is sequential bargaining. International transfers among member countries are allowed to make the model more tractable. The welfare functions after transfers can be defined as follows:

$$W^1(\tau_x^2,..,\tau_x^{n+3},\tau_y^2,,,.\tau_y^{n+2},T_2,..,T_{n+2}) = v_0 + CS_x^1(P_x^1(\tau_x^2,\tau_x^3)) + CS_y^1(P_y^1(\tau_y^2,\tau_y^3))$$
$$+TR(\tau_x^2,\tau_x^3) + P_y^1\overline{Y} - T_2 - T_3$$
$$W^2(\tau_x^2,..,\tau_x^{n+2},\tau_y^2,..,\tau_y^{n+2},T_2,...,T_{n+2}) = v_0 + CS_x^2(P_x^2(\tau_x^2,\tau_x^3)) + CS_y^2(P_y^2(\tau_y^2,\tau_y^3))$$
$$+TR(\tau_y^2,\tau_y^3) + P_x^2\overline{X} + T_2 \qquad (10)$$
$$W^3(\tau_x^2,\tau_x^3,\tau_y^2,\tau_y^3) = v_0 + CS_x^3(P_x^3(\tau_x^2,\tau_x^3)) + CS_y^3(P_y^3(\tau_y^2,\tau_y^3))$$
$$+TR(\tau_y^2,\tau_y^3) + P_x^3\overline{X} + T_3$$

In this study, we will consider four bargaining methods. We follow the sequential bargaining game presented in Bagwell and Staiger (2004). In stage 0, nature chooses whether Country 1 or Country 2 is the first proposer with equal probability of $\frac{1}{2}$. In Stage 1, the proposer makes a take-it-or-leave-it offer to the other party. The offer contains the tariff of good x imposed on Country 2 (τ_x^{B2}), the tariff of good y imposed by Country 2 (τ_y^{B2}) and transfers from Country 1 to Country 2 (T_2). Next, in the second stage, Country 1 makes a take-it-or-leave-it offer to Country 3. The offer contains the tariff of good x imposed on Country 3 (τ_x^{B3}), the tariff of good y imposed by country 3 (τ_y^{B3}) and transfers from Country 1 to Country 3 (T_3).

Second, we consider the bargaining game when MFN is enforced. The game is similar to the game without MFN except that in the first stage, the proposer will instead offer the proposal containing the binding MFN tariff of good x ($\tilde{\tau}_x$). In the second stage, the MFN tariff of good x that Country 1 offers cannot be higher than the binding level set in the first stage.

The third bargaining method considers when both MFN and reciprocity are enforced. In the WTO, there are two forms of reciprocity imposed. The first one is reciprocity as a rule going up; when a country cannot reach an agreement under renegotiation, it is free to withdraw a concession and receive a withdrawal of a substantially equivalent concession. The second one is reciprocity as a norm going down. The norm of reciprocity can be interpreted as the reciprocal changes in market access, i.e., changes that make the volume of import equal to export. [11] In our study, we will consider reciprocity as a norm going down. However, since reciprocity is not a rule governing downward negotiations in the WTO, we study the second case, when only MFN is imposed as an alternative of the tariff bargaining in the WTO.

Finally, we consider the sequential bargaining game when the Enabling Clause is granted. In this case, developing countries are free to choose whether to participate in the tariff bargaining or not. Even though developing countries do not participate in the tariff bargaining, they can still get the MFN tariff.

4.1 Case I: When Country 3 has lower bargaining power

This is the tariff negotiation game in which two developed countries (Country 1 and 2) first participate in tariff negotiation, and then Country 1 continues to negotiate with the developing country, Country 3, which has lower bargaining power than the first two countries. We consider sequential bargaining in four cases: i) without MFN status, ii) with MFN status, iii) with MFN status and reciprocity, and iv) with the Enabling Clause. The first case is used as the benchmark case of trade negotiations without international institutions. The second and third case are used to consider the outcome of WTO negotiations among developed and developing countries. Since reciprocity is the negotiating norm but not formally enforced in the negotiations, we should consider the results of WTO negotiations both when that reciprocity is imposed and when it is not imposed. Finally, we consider the tariff negotiation when the Enabling Clause is granted to a developing country.

In our model, we allow the different bargaining power for big countries than for developing countries. We suppose that two big countries have equal bargaining power. Therefore, they have equal probability to be chosen as a proposer. However, in the second stage, the big country has all bargaining power when negotiating tariffs with a developing country.

The equilibrium concept used in this game is a subgame perfect equilibrium. To find the equilibrium of the tariff negotiation game, we use backward induction.

[11] See also Bagwell and Staiger (2004).

4.1.1 Sequential bargaining without MFN

We first consider the outcome of the sequential bargaining game without MFN as the benchmark case. This case represents tariff negotiations when there is no international institution.

We follow the sequential bargaining game presented in Bagwell and Staiger (2004). In stage 0, nature chooses whether Country 1 or Country 2 is the first proposer with equal probability of $\frac{1}{2}$. In Stage 1 of the game, the proposer makes a take-it-or-leave-it offer to the other party. The offer contains the tariff of good x imposed on Country 2 (τ_x^{B2}), the tariff of good y imposed by country 2 (τ_y^{B2}) and transfers from Country 1 to Country 2 (T_2). Next, in the second stage, Country 1 makes a take-it-or-leave-it offer to Country 3. The offer contains the tariff of good x imposed on Country 3 (τ_x^{B3}), the tariff of good y imposed by Country 3 (τ_y^{B3}) and transfers from Country 1 to Country 3 (T_3). The game can be summarized as follows:

Stage 0: Nature chooses either Country 1 or Country 2 to be the first proposer with equal probability.

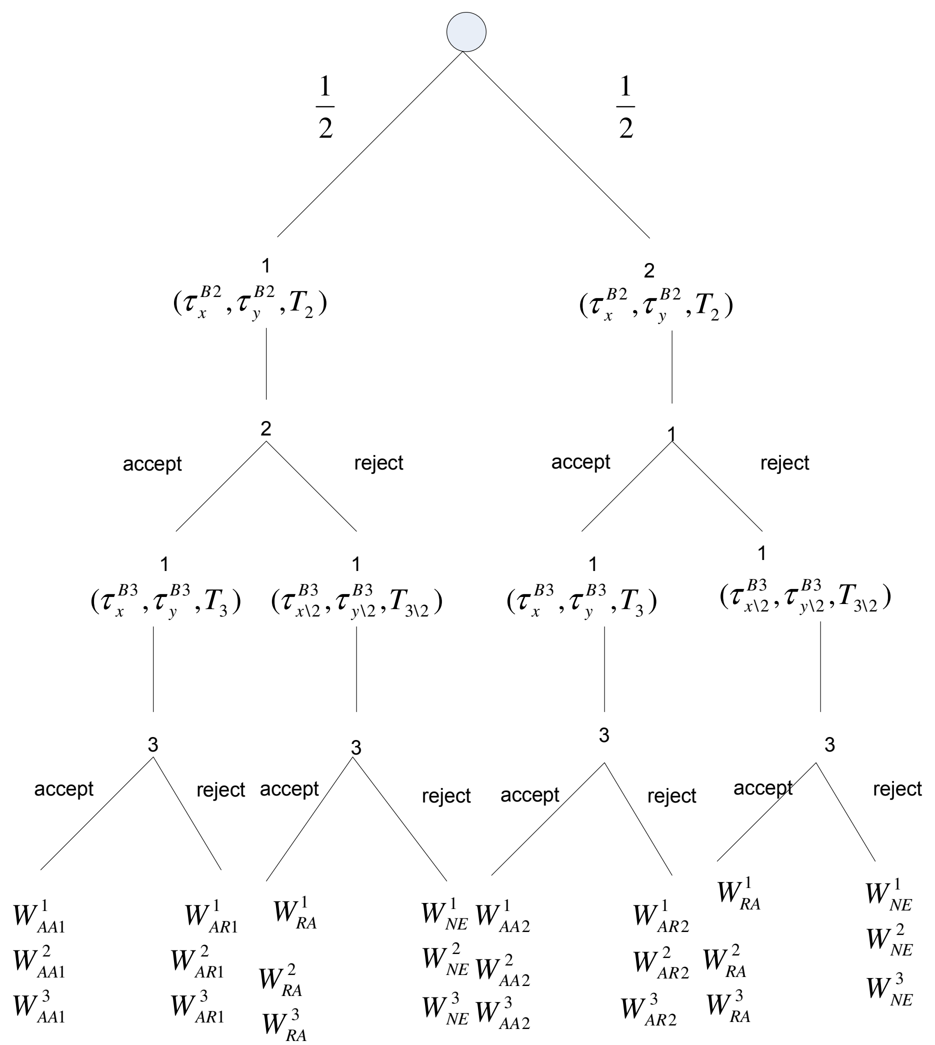
Stage 1: The proposer offers tariff $(\tau_x^{B2}, \tau_y^{B2})$ and transfers T_2. The other party either accepts or rejects.

Stage 2: Country 1 offers tariff $(\tau_x^{B3}, \tau_y^{B3})$ and transfers T_3, which Country 3 accepts or rejects.

Let τ_i^{Bj} denote the tariff proposal of good i in Country j, T_j denote transfers from Country 1 to Country j, and $\tau_{i\backslash 2}^{Bj}$ denote the tariff proposal of good i in Country j when Country 2 rejects the proposal in the first stage and set the best-response tariff.

The extensive form of the sequential bargaining game without MFN is illustrated in Figure 1. Let W_{AAk}^{j} be the welfare of Country j when Country k is the first proposer and all countries choose to accept the offer; therefore, $W_{AAj}^{j} = W^{j}(\tau_x^{B2}, \tau_x^{B3}, \tau_y^{B2}, \tau_y^{B3}, .., \tau_y^{Bn+2}, T_2, T_3)$. Next, let W_{RA}^{j} be the welfare of Country j when the other party rejects the offer from the proposer in the first stage but Country 3 accepts the offer in the second stage. Therefore, $W_{RA}^{j} = W^{j}(\tau_{x\backslash 2}^{BR2}, \tau_{x\backslash 2}^{B3}, \tau_y^{BR2}(\tau_{y\backslash 2}^{B3}), \tau_{y\backslash 2}^{B3}, T_3)$. Then, let W_{ARk}^{j} be the welfare of Country j when Country k is the first proposer and the other party accepts the offer from Country k but Country 3 rejects it. We have $W^j_{ARk} = W^j(\tau_x^{B2}, \tau_x^{BR3}(\tau_x^{B2}), \tau_y^{B2}, \tau_y^{BR3}(\tau_y^{B2}), T_2)$. Finally, W^j_{NE} denotes when all countries reject the offers and trigger trade wars. The welfare outcome here is the welfare from Nash equilibirum.

Figure 1: Sequential Bargaining without MFN



When a country chooses to reject, it will play a best-response tariff regardless of the strategies that other countries are choosing. Also, it will not receive transfer.

Solve the bargaining game using backward induction. First, concentrate on the last stage of the game. The tariff outcome from the first stage is taken as given. Consider when Country 2 is chosen as the proposer in the first stage. Following the rejection of Country 1, the offer Country 1 proposes solves the following maximization problem:

(M4) $\max_{\tau_x^3,\tau_y^3,T_3} (W^1(\tau_x^{BR2},\tau_x^3,\tau_y^{BR2},\tau_y^3,T_3)$

s.t. $(W^3(\tau_x^{BR2},\tau_x^3,\tau_y^{BR2},\tau_y^3,T_3) = W_{NE}^3$

Country 1 always makes an acceptable offer to Country 3. This will always be the equilibrium as Country 1 has all bargaining power. Starting from Nash equilibrium, it is possible for Country 1 to change the policy by offering a lower tariff to Country 3 and compensating with transfers. As the total welfare improves, this policy adjustment makes Country 1 better off. As a result, Country 1 always makes an acceptable offer that leaves the welfare of Country 3 no worse than the welfare under Nash equilibrium.

Next, consider when Country 1 accepts the offer in the first sage; the threat point of Country 3 is the function of τ_x^{B2} and τ_y^{B2} instead. By the same logic, Country 1 is at least weakly better off by offering Country 3 an acceptable offer since the total welfare improves and Country 1 can extract all surplus because it holds all bargaining power here. The maximization problem is:

(M5) $\max_{\tau_x^3,\tau_y^3,T_3} (W^1(\tau_x^{B2},\tau_x^3,\tau_y^{B2},\tau_y^3,T_3)$

s.t. $(W^3(\tau_x^{B2},\tau_x^3,\tau_y^{B2},\tau_y^3,T_3) \geq W_{AR2}^3$

Next, consider when Country 1 is chosen as a proposer in the first stage. Following Country 2's rejection, the maximization problem is identical to (M4). By the same argument, Country 1 always makes an acceptable offer to Country 3.

Follow the acceptance of Country 2, Country 1 chooses the policy that solves:

(M6) $\max_{\tau_x^3,\tau_y^3,T_3} (W^1(\tau_x^{B2},\tau_x^3,\tau_y^{B2},\tau_y^3,T_3)$

s.t. $(W^3(\tau_x^{B2},\tau_x^3,\tau_y^{B2},\tau_y^3,T_3) \geq W_{AR1}^3$

Using the same argument, Country 1 is better off by always offering an acceptable proposal to Country 3.

We turn our attention to the first stage of the game. First consider when Country 2 is chosen as a proposer. The maximization problem is:

(M7) $\max_{\tau_{xx}^2,\tau_y^2,T_1} (W^2(\tau_x^2,\tau_x^{B3}(\tau_x^2),\tau_y^2,\tau_y^{B3}(\tau_y^2),T_2\ ,T_3)$

s.t. $W^1(\tau_x^2,\tau_x^{B3}(\tau_x^2)\tau_y^2,\tau_y^{B3}(\tau_y^2),T_2\ ,T_3) \geq W_{RA}^1$

In the equilibrium, Country 2 always submits an acceptable offer. Country 2 will not benefit from inducing rejection here as it cannot deter the disagreement payoff of

Country 1. Instead, the acceptance improves the total welfare and Country 2 can choose one of the policy instruments inducing acceptance that gives it highest welfare.

Finally, consider when Country 1 is chosen by nature to be the proposer. The maximization problem is:

(M8) $\max_{\tau_x^2, \tau_y^2, T_1} (W^1(\tau_x^2, \tau_x^{B3}(\tau_x^2), \tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T_3)$

s.t. $W^2(\tau_x^2, \tau_x^{B3}(\tau_x^2)\tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T_3) \geq W_{RA}^2$

Using the above argument, Country 1 always offers an acceptable proposal to Country 2. Hence the subgame perfect equilibrium is that, regardless of the first proposer, all countries accept the offers. The outcome of the sequential tariff bargaining game without MFN can be summarized in the following proposition.

Proposition 1: The outcome of the sequential tariff bargaining game without MFN is:

i) the tariff outcome $\{\tau_x^2, \tau_y^2\}$ that maximizes $W^1(\tau_x^2, \tau_x^{B3}(\tau_x^2), \tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T_3) + W^2(\tau_x^2, \tau_x^{B3}(\tau_x^2)\tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T_3)$, and $\{\tau_x^3, \tau_y^3\}$ that maximizes $W^1(\tau_x^{B2}, \tau_x^3, \tau_y^{B2}, \tau_y^3, T_3) + W^3(\tau_x^{B2}, \tau_x^3, \tau_y^{B2}, \tau_y^3, T_3)$, taking $\{\tau_x^{B2}, \tau_y^{B2}\}$ as given.

ii) and transfers from Country 1 are equal to:

$$E(T_2) = \frac{1}{2}(W^2(\tau_{x\backslash 2}^{BR2}, \tau_{x\backslash 2}^{B3}\tau_y^{BR2}(\tau_{y\backslash 2}^{B3}), \tau_{y\backslash 2}^{B3}) - W^2(\tau_x^{B2}, \tau_x^{B3}\tau_y^{B2}, \tau_y^{B3})) + \frac{1}{2}(W^1(\tau_{x\backslash 2}^{BR2}, \tau_{x\backslash 2}^{B3}\tau_y^{BR2}(\tau_{y\backslash 2}^{B3}), \tau_{y\backslash 2}^{B3}, T_3) - W^1(\tau_x^{B2}, \tau_x^{B3}\tau_y^{B2}, \tau_y^{B3}, T_3))$$

and $T_3 = W^3(\tau_x^{B2}, \tau_x^{BR3}, \tau_y^{B2}, \tau_y^{BR3}) - W^3(\tau_x^{B2}, \tau_x^{B3}\tau_y^{B2}, \tau_y^{B3}) > 0$.

Proof: See Appendix.

Lemma 1: The tariff outcome from the bargaining game is not efficient.

The tariff outcome from the sequential bargaining game without MFN, though lower than the best-response tariff, is not efficient. The result conforms Bagwell and Staiger (1999). The result from the bargaining game exhibits a bilateral opportunism problem[12]: The welfare outcome of Country 2 in the first stage is eroded from the negotiation between Country 1 and 3 in the second stage. Country 1 will set a lower tariff of good x for Country 3 in the second stage and receive a lower tariff of good y imposed by Country 3 in return. By doing so, both Country 1 and Country 3 gain higher

[12] See Bagwell and Staiger (1999).

welfares at the expense of Country 2's welfare loss. The bilateral opportunism problem is the source of the inefficiency of the sequential bargaining game without MFN.

4.1.2 Sequential tariff bargaining with MFN

We now consider the outcome of the sequential bargaining game with MFN. In this section, we have the MFN restriction that $\tau_x^k = \tau_x^l$ for $k,l \in \{2,3\}$, $k \neq l$. The structure of the game is similar to the previous section except that in the first stage, the proposer will instead offer a proposal containing the binding MFN tariff of good x ($\tilde{\tau}_x$). In the second stage, the MFN tariff of good x cannot be higher than the binding level set in the first stage.When MFN is imposed, the tariff bargaining game can be formalized as follows:

Stage 0: Nature chooses either Country 1 or Country 2 to be the first proposer with equal probability.

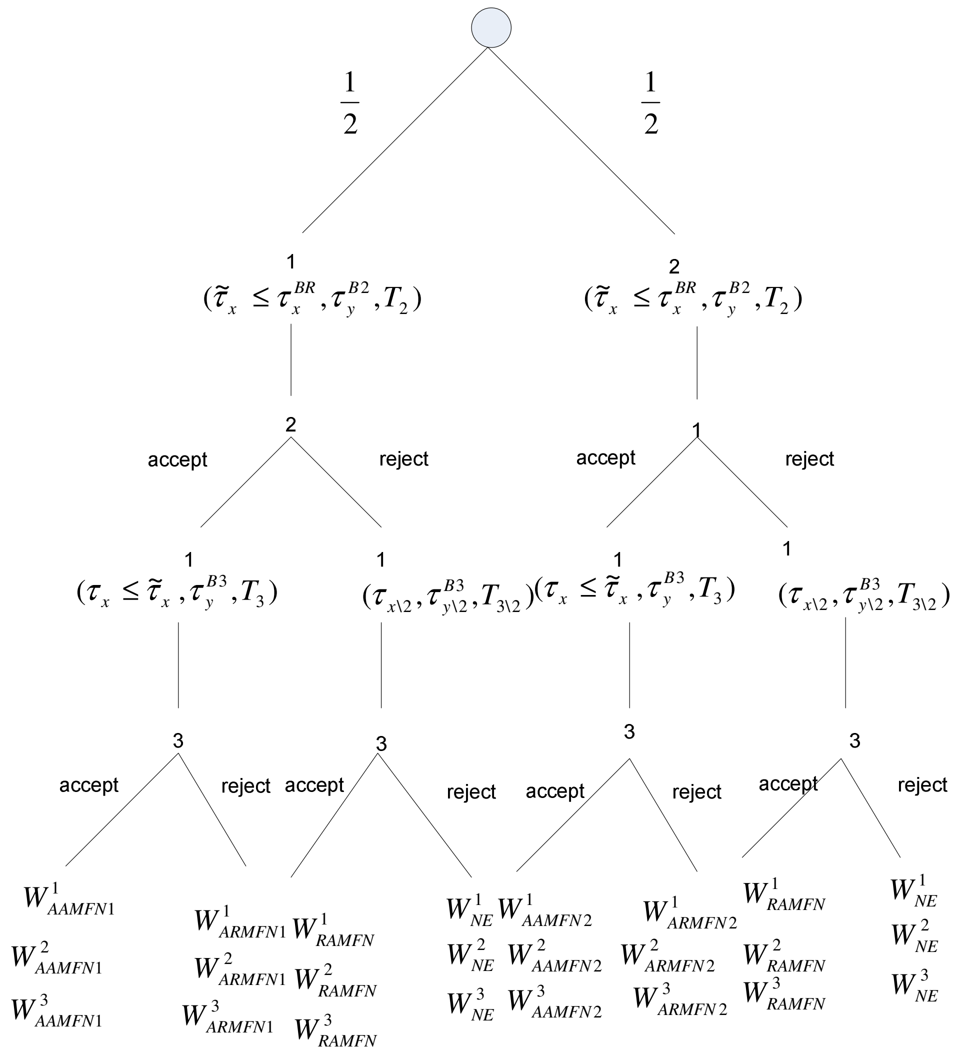
Stage 1: The proposer offers tariff $(\tilde{\tau}_x \le \tau_x^{BR}, \tau_y^{B2})$ and transfers T_2. The other party either accepts or rejects.

Stage 2: If the other party accepts in the first stage, Country 1 offers tariff $\{\tau_x^B \le \tilde{\tau}_x, \tau_y^{B3}\}$ and transfers T_3, which Country 3 accepts or rejects. If the other party rejects, Country 1 offers $\{\tau_{x\backslash 2}^B \tau_{y\backslash 2}^{B3}\}$ and transfer $T_{3\backslash 2}$ which Country 3 accepts or rejects.

Let $\tilde{\tau}_x$ denote the binding tariff of good x, τ_i^{Bj} denote the tariff proposal of good i in Country j, T_j denote transfers from Country 1 to Country j, and $\tau_{i\backslash 2}^{Bj}$ denote the tariff proposal of good i in Country j when Country 2 rejects the proposal in the first stage and set the best-response tariff.

The extensive form of the sequential bargaining game is illustrated in Figure 2. Let W_{AAMFNk}^j be the welfare of Country j when all countries accept the offers and Country k is the first proposer; therefore, $W_{AAMFNk}^j = W^j(\tau_x^B, \tau_y^{B2}, \tau_y^{B3}, T_2, T_3)$. Next, let W_{RA}^j be the welfare of Country j when the offer in the first stage is rejected but Country 3 accepts the offer in the second stage. Therefore, $W_{RA}^j = W^j(\tau_{x\backslash 2}^B, \tau_y^{BR2}(\tau_{y\backslash 2}^{B3}), \tau_{y\backslash 2}^{B3}, T_3)$. Then, let W_{ARMFNk}^j be the welfare of Country j when Country k is the first proposal and the offer is accepted in the first stage but Country 3 rejects it. We have $W_{ARMFNk}^j = W^j(\tilde{\tau}_x, \tau_y^{B2}, \tau_y^{BR3}, .., \tau_y^{BRn+2}, T_2)$. Finally , W_{NE}^j denotes when all countries reject the offers and trigger trade wars. The welfare outcome here is the welfare from Nash equilibirum.

Figure 2: The extensive form game of sequential bargaining with MFN



Solve the bargaining game using the backward induction method. First consider the last stage of the game. When Country 2 is the proposer, following the rejection of Country 1, there is no binding on the tariff of good x. The offer proposed by Country 1 solves the following maximization problem:

(M9) $\max\limits_{\tau_x, \tau_y^3, T_3} (W^1(\tau_x, \tau_y^{BR2}, \tau_y^3, T_3)$

s.t. $(W^3(\tau_x, \tau_y^{BR2}, \tau_y^3, T_3) = W_{NE}^3$

The maximization (M9) implies that Country 1 always makes an acceptable offer to Country 3. Given that Country 1 holds all bargaining power, it can choose the policy instrument that leaves the welfare of Country 3 equal to Nash equilibrium. Starting from Nash equilibrium, it is possible for Country 1 to adjust the policy instrument that improves the total welfare. Therefore, it is better for Country 1 to offer an acceptable proposal.

Next, consider when Country 1 accepts the proposal in the first stage. The threat point for Country 3 is no longer a Nash payoff but a function of the tariff binding $\tilde{\tau}_x$ and τ_y^{B2}. The maximization problem becomes:

(M10) $\max_{\tau_x,\tau_y^3,T_3} (W^1(\tau_x,\tau_y^{B2},\tau_y^3,T_2,T_3)$

s.t. $W^3(\tau_x,\tau_y^{B2},\tau_y^3,T_3) \geq W^3(\tilde{\tau}_x,\tau_y^{B2},\tau_y^{BR3})$

$\tau_x^2 = \tau_x^3 = \tau_x \leq \tilde{\tau}_x$

Using the same argument, Country 1 always makes an acceptable offer here.

Next, turn our attention to the case that Country 1 is chosen to be the proposer. Following the rejection of Country 2, the maximization problem is identical to (M9). By the same logic, Country 1 always makes an acceptable offer to Country 3.

When Country 2 accepts, the threat point becomes a function of the tariff binding $\tilde{\tau}_x$ and τ_y^{B2}, the outcome of the first stage of the game. By the same argument, Country 1 always makes an acceptable offer. Besides, the tariff of good x that Country 1 can offer in this case is constrained by the first-stage policy. The maximization problem becomes:

(M11) $\max_{\tau_x,\tau_y^3,T_3} (W^1(\tau_x,\tau_y^{B2},\tau_y^3,T_2,T_3)$

s.t. $W^3(\tau_x,\tau_y^{B2},\tau_y^3,T_3) \geq W^3(\tilde{\tau}_x,\tau_y^{B2},\tau_y^{BR3})$

$\tau_x^2 = \tau_x^3 = \tau_x \leq \tilde{\tau}_x$

We now turn our attention to the first stage of the game. First consider when Country 2 is chosen by nature to be the proposer. The maximization problem is:

(M12) $\max_{\tilde{\tau}_x\tau_y^2,T_2} (W^2(\tau_x(\tilde{\tau}_x),\tau_y^2,\tau_y^{B3}(\tau_y^2),T_2,T_3)$

s.t. $W^1(\tau_x(\tilde{\tau}_x)\tau_y^2,\tau_y^{B3}(\tau_y^2),T_2,T_3) \geq W_{RA2}^1$

$\tilde{\tau}_x \leq \tau_x^{BR}$

The second constraint defines an upper bound on the tariff binding of good x. The binding needs to be a credible threat in the sense that the binding tariff cannot be higher than the best-response level. The upper bound of the tariff binding is defined so that it can be imposed if no agreement reaches in the second stage.

Country 2 always induces acceptance in the first stage. Country 2 gains no benefit from inducing rejection here since it cannot affect Country 1's threat point. Instead, the total welfare improves when Country 2 induces acceptance and it can extract surplus via transfers.

Finally, consider when Country 1 is chosen by nature to be the proposer. Using the same argument, Country 1 always offers an acceptable proposal for Country 2. The maximization problem can be written as follows:

(M12) $\max_{\tilde{\tau}_x \tau_y^2, T_2} (W^1(\tau_x(\tilde{\tau}_x), \tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T_3)$

s.t. $W^2(\tau_x(\tilde{\tau}_x)\tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T_3) \geq W_{RA1}^2$

$\tilde{\tau}_x \leq \tau_x^{BR}$

<u>Lemma 2</u>: Regardless of the first proposer, $\tilde{\tau}_x = \tau_x^B$.

<u>Proof</u>: *See appendix.*

The proposer in the first stage faces a tradeoff. On one side, it pushes $\tilde{\tau}_x$ up to lower the threat point of Country 3 and extracts the greater surplus from the bargaining in the second stage. On the other, $\tilde{\tau}_x$ has to be a sub-optimal in equilibrium. If Country 3 rejects the offer in the second stage, $\tilde{\tau}_x$ cannot be reversed. The sub-optimal level of $\tilde{\tau}_x$ in this case is when $\tilde{\tau}_x = \tau_x^B$. Therefore, Country 1 needs to enter the second stage of bargaining with the optimal tariff against Country 3 and has to make transfers to Country 3 to compensate for Country 3's lower tariff.

The outcome of the sequential bargaining game with MFN is summarized in the following proposition.

<u>Proposition 2</u>: The tariff outcome of the sequential bargaining game with MFN is:

i) the tariff outcome $\{\tau_x, \tau_y^2\}$ that maximizes $W^1(\tau_x^B, \tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T3) + W^2(\tau_x, \tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T_3)$, and τ_y^3 that maximizes $W^1(\tau_x^B, \tau_y^{B2}, \tau_y^3, T_3) + W^3(\tau_x^B, \tau_y^{B2}, \tau_y^3, T_3)$.

ii) and transfers from Country 1 are equal to:

$$E(T_2) = \frac{1}{2}(W^2(\tau^B_{x\backslash 2}, \tau^{BR2}_y(\tau^{B3}_{y\backslash 2}), \tau^{B3}_{y\backslash 2}) - W^2(\tau^B_x, \tau^{B2}_y, \tau^{B3}_y)) + \frac{1}{2}(W^1(\tau^B_{x\backslash 2}, \tau^{BR2}_y(\tau^{B3}_{y\backslash 2}), \tau^{B3}_{y\backslash 2}, T_3) - W^1(\tau^B_x, \tau^{B2}_y, \tau^{B3}_y, T_3))$$

and $T_3 = W^3(\tau^B_x, \tau^{B2}_y, \tau^{BR3}_y(\tau^{B2}_y)) - W^3(\tilde{\tau}_x, \tau^{B2}_y, \tau^{B3}_y) > 0$.

Proof: See Appendix.

Lemma 3: The outcome of the bargaining game with MFN is not efficient.

The sequential bargaining game with MFN exhibits the backward stealing problem discussed in Bagwell and Staiger (2004). Backward stealing occurs in sequential bargaining when the welfare of Country 2 is higher if the game in the second stage reaches the disagreement point than the welfare from the outcome of the game. Therefore, Country 2 hurts when Country 1 furthers negotiation in the second stage with Country 3. Country 1 benefits at the expense of Country 2 because the negotiation in the second stage forces Country 2 to have a lower export volume and set lower tariffs against Country 1.

4.1.3. Sequential bargaining game with MFN and reciprocity

In this section, we consider when the reciprocity restriction is introduced into the bargaining game. As discussed earlier, reciprocity is the norm for downward negotiations, i.e., when countries participate in bargaining to lower their tariffs. Reciprocity is the norm that provides reciprocal changes in market access that preserve the terms of trade. Bagwell and Staiger (2004) formally model a sequential bargaining in which the negotiating parties can enforce reciprocity via a non-violation-nullification-or-impairment provision.

When reciprocity is introduced, we can structure the bargaining game as follows: in stage 0, nature picks the proposer with equal probability. In stage 1, the proposer offers a proposal consisting of the binding MFN tariff of good x, the tariff of good y imposed by Country 2, and transfers to Country 2. In the second stage, Country 1 furthers negotiation with Country 3 by making an offer containing the MFN tariff of good x, the tariff of good y imposed by Country 3, and a transfer to Country 3 with the constraint that the MFN tariff cannot higher than the binding level and that the reciprocity restriction has to be satisfied.

Now we need to define the reciprocity restriction. The general meaning of reciprocity as a norm of downward negotiations implies that when valued at existing world prices, the proposed set of tariff reductions together creates equal increases in the volume of each country's imports and exports.[13] Given that $\tau_i^{'}$, $i \in I$ is the proposed tariff, τ_i is the original tariff, $M_v^j(\tau_x, \tau_y^2, \tau_y^3)$ is the import of numeraire goods in Country j, and $E_v^j(\tau_x, \tau_y^2, \tau_y^3)$ is the export of numeraire goods in Country j, reciprocity provides the following conditions:[14]

$$\begin{aligned}&[P_y^w(\tau_y^2, \tau_y^3)[M^3(\tau_y^2, \tau'^3_y) - M^3(\tau_y^2, \tau_y^3] + M_v^3(\tau_x^{'}, \tau_y^2, \tau_y^{'3}) - M_v^3(\tau_x, \tau_y^2, \tau_y^3) = \\ &P_x^w(\tau_x)[E_x^3(\tau'_x) - E_x^3(\tau_x) + E_v^3(\tau_x^{'}, \tau_y^2, \tau_y^{'3}) + T_3 - E_v^3(\tau_x, \tau_y^2, \tau_y^3)\end{aligned} \quad (11)$$

The requirement of balanced trade at original world price eliminates trade in numeraire goods under the original tariff setting, while the requirement of balanced trade at the set of world prices under proposed tariffs eliminates trade in numeraire good under the proposed tariffs and transfers. Then we can rewrite the reciprocity condition as:

$$[P_y^w(\tau_y^2, \tau_y^{'3}) - P_y^w(\tau_y^2, \tau_y^3)]M^3(\tau_y^2, \tau'^3_y) = [P_x^w(\tau_x^{'}) - P_x^w(\tau_x)]E_x^3(\tau'_x)^{15} \quad (12)$$

Given $\tau_x, \tau_y^2, \tau_y^3$, we can solve $\tau_y^{'3}$ in terms of $\tau_x^{'}$.

The implication of reciprocity is that, when including trade in numeraire goods, without loss of generosity, we can exclude transfers from the bargaining in Stage 2.[16]

Now we can formalize the sequential bargaining game with MFN and reciprocity as follows:

Stage 0: Nature chooses either Country 1 or Country 2 to be the first proposer with equal probability.

Stage 1: The proposer offers the binding tariff $(\tilde{\tau}_x \leq \tau_x^{BR}, \tau_y^{B2})$ and transfers T_2. The other party either accepts or rejects.

Stage 2: If the other party accepts in the first stage, Country 1 offers tariff $\{\tau_x^B \leq \tilde{\tau}_x, \tau_y^{B3}\}$ s.t. the reciprocity restriction in (11), which Country 3 accepts or rejects. If the other party rejects, Country 1 offers $\{\tau_{x\backslash 2}^B \tau_{y\backslash 2}^{B3}\}$ s.t. the reciprocity restriction in (11) which Country 3 accepts or rejects.

The extensive form game is similar to the last section except that the reciprocity restriction is added.

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[13] See Bagwell and Staiger (2001)

[14] MFN is applied.

[15] This condition derived (11) together with the trade balance conditions.

[16] Using the trade balanced condition at the current world price together with the market clearing condition of numeraire goods and the reciprocity condition (12), we can exclude transfers when reciprocity condition is imposed.

In the reciprocity game, the maximization problem (M10) is added with the reciprocity restriction, which can be written as follows:

(M14) $\max_{\tau_x,\tau_y^3,T_3} (W^1(\tau_x, \tau_y^{B2}, \tau_y^3, T_2, T_3)$

s.t. $W^3(\tau_x, \tau_y^{B2}, \tau_y^3, T_3) \geq W^3(\tilde{\tau}_x, \tau_y^{B2}, \tau_y^{BR3})$

$\tau_x^2 = \tau_x^3 = \tau_x \leq \tilde{\tau}_x$

$[P_y^w(\tau_y^{B2}, \tau_y^3) - P_y^w(\tau_y^{B2}, \tau_y^{BR3})]M^3(\tau_y^{B2}, \tau_y^3) = [P_x^w(\tau_x) - P_x^w(\tilde{\tau}_x)]E_x^3(\tau_x)$

In the equilibrium of sequential bargaining, in order to maintain the reciprocity restriction, Country 1 has to reduce its tariff in return when it asks Country 3 to lower the tariff of good y. Country 1 cannot ask Country 3 to lower its tariff and compensate via transfers. Also, there is no room for compensatory transfers in the last stage of the game when reciprocity is governed and trade of numeraire good is taken into account.. Transfers are used in stage 1 only.

The maximization problem in the first stage is identical to (M11)-(M12). We can use the same argument in Section 4.2 to define the subgame perfect equilibrium of the game in which all countries accept the offers.

The outcome from the sequential tariff bargaining game with MFN and reciprocity can be summarized in the following proposition.

<u>Proposition 3</u>: The outcome from tariff bargaining with MFN and reciprocity is:

i) the tariff outcome $\{\tilde{\tau}_x, \tau_y^2\}$ that maximizes $W^1(\tau_x^B(\tilde{\tau}_x), \tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T3) + W^2(\tau_x(\tilde{\tau}_x), \tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T_3)$, and $\{\tau_x, \tau_y^3\}$ that maximizes $W^1(\tau_x^B, \tau_y^{B2}, \tau_y^3, T_3) + W^3(\tau_x^B, \tau_y^{B2}, \tau_y^3, T_3)$ s.t. $[P_y^w(\tau_y^{B2}, \tau_y^3) - P_y^w(\tau_y^{B2}, \tau_y^{BR3})]M^3(\tau_y^{B2}, \tau_y^3) = [P_x^w(\tau_x) - P_x^w(\tilde{\tau}_x)]E_x^3(\tau_x)$.

ii) and transfers from Country 1 are equal to:

$$E(T_2) = \frac{1}{2}(W^2(\tau_{x\backslash 2}^B, \tau_y^{BR2}(\tau_{y\backslash 2}^{B3}), \tau_{y\backslash 2}^{B3}) - W^2(\tau_x^B, \tau_y^{B2}, \tau_y^{B3})) + \frac{1}{2}(W^1(\tau_{x\backslash 2}^B, \tau_y^{BR2}(\tau_{y\backslash 2}^{B3}), \tau_{y\backslash 2}^{B3}, T_3) - W^1(\tau_x^B, \tau_y^{B2}, \tau_y^{B3}, T_3))$$

Proof: See Appendix.

<u>Lemma 4</u> : The outcome from sequential bargaining with reciprocity is not efficient.

The tariff outcome from the sequential bargaining game with MFN and reciprocity, though not efficient, is lower than the sequential game, both without MFN and with only MFN. Because reciprocity is enforced in this game, Country 3 has to lower its tariff in order to get the MFN tariff. Therefore, the tariff outcome is lower than when only MFN is imposed. As discussed in Bagwell and Staiger (2004) The reciprocity rule, in the combination with MFN, solves the backward stealing problem. When the reciprocity is imposed, the welfare of Country 2 does not deteriorate from the negotiation in the second stage. The reciprocity rule solves the backward stealing problem.

4.1.4 Sequential Bargaining with the Enabling Clause

In this section, we will consider the sequential tariff bargaining game with the presence of the Enabling Clause. In this case, Country 3 can still enjoy the MFN tariff from Country 1 even though it does not participate in the tariff bargaining game. So the bargaining game can be written as follows:

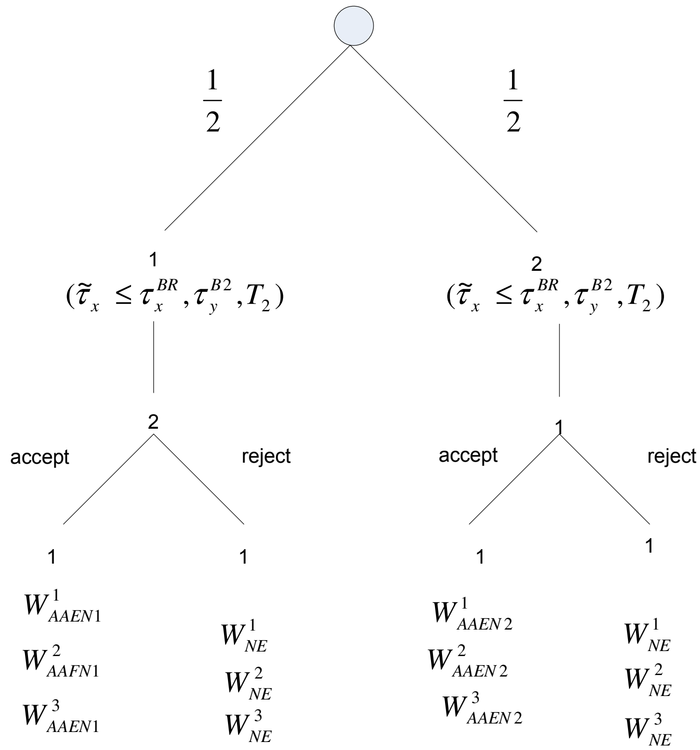
Stage 0: Nature chooses either Country 1 or Country 2 to be the first proposer with equal probability.

Stage 1: The proposer offers tariff (τ_x, τ_y^{B2}) and transfers T_2. The other party either accepts or rejects. Country 3 always chooses the best-response tariff regardless of other countries' choices.

The sequential bargaining game with the Enabling Clause is depicted in Figure 3.

Let W_{AAENk}^{j} be the welfare of Country j Country k is the first proposer and the other country accepts; therefore, $W_{AAMFNk}^{j} = W^{j}(\tau_x^{B}, \tau_y^{B2}, \tau_y^{BR3}, T_2)$. Next , W_{NE}^{j} denotes when the other party reject the offers and triggers trade wars. The welfare outcome here is the welfare from Nash equilibrium. In any case, Country 3 always chooses to play the best-response tariff.

Figure 3: The extensive form game of sequential bargaining with enabling Clause



The maximization problem when Country $j,k \in \{1,2\}$, $j \neq k$ is chosen to be the proposer is:

(M15) $\max_{\tau_x^2 \tau_y^2, T_1} (W^j(\tau_x, \tau_y^2, \tau_y^{BR3}(\tau_y^2), T_2)$

s.t. $W^k(\tau_x \tau_y^2, \tau_y^{BR3}(\tau_y^2), T_2) \geq W_{NE}^k$

Starting from Nash equilibrium, there exists policy adjustment that increases the total welfare. As a result, the proposer always makes an acceptable offer in the first stage. The result of sequential bargaining with the Enabling Clause can be summarized in the following proposition.

Proposition 4: The outcome from tariff bargaining with the Enabling Clause is the tariff outcome $\{\tau_x, \tau_y^2\}$ that maximizes $W^1(\tau_x, \tau_y^2, \tau_y^{BR3}(\tau_y^2)) + W^2(\tau_x, \tau_y^2, \tau_y^{BR3}(\tau_y^2))$, and $\tau_y^3 = \tau_y^{BR3}$ and transfers from Country 1 are equal to

$$E(T_2) = \frac{1}{2}(W_{NE}^2 - W^2(\tau_x^B, \tau_y^{B2}, \tau_y^{BR3})) + \frac{1}{2}(W^1(\tau_x^B, \tau_y^{B2}, \tau_3^{BR3}) - W_{NE}^1).$$

Proof: See Appendix

The outcome of sequential bargaining with the Enabling Clause is not efficient. With Country 3 being a free rider, both τ_y^2 and τ_y^3 are set higher than the efficient level.

4.1.5 Welfare Comparison

Consider the welfare of a developing country (Country 3). When it is big but has lower bargaining power, it attains the highest welfare under sequential bargaining with reciprocity. Given that τ_i^{Brec} is the tariff outcome from sequential bargaining with reciprocity of good i, Country 3 attains the welfare of $W^3(\tau_x^{Brec}, \tau_y^{B2rec}, \tau_y^{B3rec})$ when reciprocity is imposed. Country 1 has to lower its tariff when it offers to decrease τ_y^3 for Country 3. Since Country 3 faces lower τ_x and higher τ_y^3, it attains the higher welfare here.[17] The reciprocity restriction prevents Country 3 from being forced to accept a non-reciprocal offer in the second stage when it has no bargaining power.

Sequential bargaining with MFN and with the Enabling clause bring about equal welfare for Country 3. Under sequential bargaining with MFN, Country 1 extracts all surplus from tariff negotiation and leaves Country 3's payoff equal to its threat point, which is $W^3(\tilde{\tau}_x, \tau_y^{B2}, \tau_y^{BR3})$. Since Country 1 enters the second stage with the optimal tariff against Country 3, $\tilde{\tau}_x = \tau_x^B$, the welfare of Country 3 under sequential bargaining with MFN after transfers is $W^3(\tau_x^B, \tau_y^{B2}, \tau_y^{BR3})$, identical to the welfare from sequential bargaining with the Enabling clause. Therefore, the Enabling clause does not improve a developing country's welfare when it is big but has lower bargaining power.

Next, sequential bargaining without MFN attains the lowest welfare for Country 3 alone and for the world's total welfare. The threat point of Country 3 is worst in this case. Also, without MFN, Country 1 tries to steal backward from Country 2 using both τ_x and τ_y, at the expense of the world's total welfare.

The welfare outcomes of developing countries can be summarized in the following table.

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[17] For τ_y^2, as τ_y^{B3} is higher, τ_y^{B2} is higher since $\frac{\partial \tau_y^{B2}}{\partial \tau_y^{B3}} > 0$. Also, $\frac{\partial W^3}{\partial \tau_y^{B2}} > 0$, so the welfare of Country 3 improves when τ_y^{B3} increase and τ_x decreases.

Table 1: The welfare outcomes of developing countries when they have low bargaining power[18]

The bargaining protocol	Welfare
Sequential bargaining without MFN	$\frac{1058\overline{X^2}}{3969}+\frac{25\overline{Y^2}}{529}+(a-\frac{46\overline{X}}{63})\overline{X}$
Sequential bargaining with MFN	$\frac{25\overline{X^2}}{98}+\frac{25\overline{Y^2}}{529}+(a-\frac{5\overline{X}}{7})\overline{X}$
Sequential bargaining with MFN and reciprocity	$\frac{361\overline{X^2}}{1458}+\frac{25\overline{Y^2}}{529}+(a-\frac{19\overline{X}}{27})\overline{X}$
Sequential bargaining with the Enabling Clause	$\frac{25\overline{X^2}}{98}+\frac{25\overline{Y^2}}{529}+(a-\frac{5\overline{X}}{7})\overline{X}$

Corollary 1: Country 3 attains the highest welfare under sequential bargaining with reciprocity.

4.2 Case II: n+2 country model

In this section, Country 3 is partitioned into n small countries. We examine the same four bargaining methods that we considered in the previous section.

4.2.1 Sequential bargaining without MFN

The sequential bargaining game with MFN is identical to the game in part 4.1.1 except that in the second stage, Country 1 makes a take-it-or-leave-it offer consisting of the tariff of good x, τ_x^j, the tariff of good y imposed by Country j, τ_y^j and transfers T_j , $j \in S = \{3,4,.....,n+2\}$, to small countries at the same time.

Given that N = {1,2,…….,n+2} is the set of countries, we define C_i as a subset of N with C_1 = {1,2}, C_2 = {1,3,….,n+2} C_i is a set of countries participating in each tariff bargaining round.

The game can be written as follows:

[18] See the tariff outcomes from each bargaining protocol in the appendix.

Stage 0: Nature chooses either Country 1 or Country 2 to be the first proposer with equal probability.

Stage 1: The proposer offers tariff $(\tau_x^{B2}, \tau_y^{B2})$ and transfers T_2. The other party either accepts or rejects.

Stage 2: Country 1 offers tariff $(\tau_x^{B3}, \tau_x^{B4}, ..., \tau_x^{Bn+2}, \tau_y^{B3}, ..., \tau_y^{Bn+2})$ and transfers $\{T_3, ..., T_{n+2}\}$, which small countries accept or reject.

Solve the game using the backward induction method. First, consider when Country 2 is chosen to be a proposer. Following the rejection of Country 1, the threat point for a small country is Nash payoffs. The maximization problem becomes:

(M16) $\max_{\tau_x^3,..,\tau_x^{n+2}, \tau_y^3,...,\tau_y^{n+2}, T_{3j},..,T_{n+2}} (W^1(\tau_x^{BR2}, \tau_x^3, ..\tau_x^{n+2}, \tau_y^{BR2}, \tau_y^3, ..., \tau_y^{n+2}, T_3, ...T_{n+2})$

s.t. $W^j(\tau_x^{BR2}, \tau_x^3, ..\tau_x^{n+2}, \tau_y^{BR2}, \tau_y^3, ..., \tau_y^{n+2}, T_3, ...T_{n+2}) = W_{NE}^j$

for $\forall j \in S = \{3,4,......,n+2\}$.

Using the same logic as the last section, Country 1 always makes an acceptable offer here.

Following the acceptance of Country 1, the threat points of small countries are a function of τ_x^{B2} and τ_y^{B2} instead. The maximization problem can be written as follows:

(M17) $\max_{\tau_x^3,..,\tau_x^{n+2}, \tau_y^3,...,\tau_y^{n+2}, T_{3j},..,T_{n+2}} (W^1(\tau_x^{B2}, \tau_x^3, ..\tau_x^{n+2}, \tau_y^{B2}, \tau_y^3, ..., \tau_y^{n+2}, T_3, ...T_{n+2})$

s.t.

$W^j(\tau_x^{B2}, \tau_x^3, ..\tau_x^{n+2}, \tau_y^{B2}, \tau_y^3, ..., \tau_y^{n+2}, T_3, ...T_{n+2}) \geq W^j(\tau_x^{B2}, \tau_x^{BR3}, .., \tau_x^{BRn+2}, \tau_y^{B2}, \tau_y^{BR3}, .., \tau_y^{BRn+2})$

for $\forall j \in S = \{3,4,......,n+2\}$.

Again, using the same logic, Country 1 always makes an acceptable offer here.

We turn our attention to the case in which Country 1 is chosen to be the proposer. Following the rejection of Country 2, the maximization problem is identical to (M15). By the same argument, Country 1 always induces acceptance by choosing the policy instrument that leaves the welfare of small countries equal to Nash payoffs.

When Country 2 accepts the offer of Country 1 in the first stage, the threat point is a function of τ_x^{B2} and τ_y^{B2} and the maximization problem is:

(M18) $\max_{\tau_x^3,...,\tau_x^{n+2},\tau_y^3,...,\tau_y^{n+2},T_{3j},...,T_{n+2}} (W^1(\tau_x^{B2},\tau_x^3,..\tau_x^{n+2},\tau_y^{B2},\tau_y^3,...,\tau_y^{n+2},T_3,...T_{n+2})$

s.t.

$W^j(\tau_x^{B2},\tau_x^3,..\tau_x^{n+2},\tau_y^{B2},\tau_y^3,...,\tau_y^{n+2},T_3,...T_{n+2}) \geq W^j(\tau_x^{B2},\tau_x^{BR3},...,\tau_x^{BRn+2},\tau_y^{B2},\tau_y^{BR3},...,\tau_y^{BRn+2})$

for $\forall j \in S = \{3,4,......,n+2\}$.

Again, Country 1 always induces acceptance here using the same logic mentioned above.

Now we examine the outcome of the first stage of the game. When Country 2 is chosen to be the proposer, it chooses the policy that solves:

(M19) $\max_{\tau_x^2 x \tau_y^2, T_2} (W^2(\tau_x^2,\tau_x^{B3}(\tau_x^2),..,\tau_x^{Bn+2}(\tau_x^2),\tau_y^2,\tau_y^{B3}(\tau_y^2),..,\tau_y^{Bn+2}(\tau_y^2)T_2, T_3,..,\mathrm{T}_{n+2})$

s.t. $W^1(\tau_x^2,\tau_x^{B3}(\tau_x^2),..,\tau_x^{Bn+2}(\tau_x^2),\tau_y^2,\tau_y^{B3}(\tau_y^2),..,\tau_y^{Bn+2}(\tau_y^2)T_2, T_3,..,\mathrm{T}_{n+2}) \geq W_{RA2}^1$

Since Country 2 gains nothing from inducing rejection here, it always makes an acceptable offer.

Finally, consider when Country 1 is chosen to be the proposer. It chooses the policy that solves:

(M20) $\max_{\tau_x^2 x \tau_y^2, T_2} (W^1(\tau_x^2,\tau_x^{B3}(\tau_x^2),..,\tau_x^{Bn+2}(\tau_x^2),\tau_y^2,\tau_y^{B3}(\tau_y^2),..,\tau_y^{Bn+2}(\tau_y^2)T_2, T_3,..,\mathrm{T}_{n+2})$

s.t. $W^2(\tau_x^2,\tau_x^{B3}(\tau_x^2),...,\tau_x^{Bn+2}(\tau_x^2),\tau_y^2,\tau_y^{B3}(\tau_y^2),..,\tau_y^{Bn+2}(\tau_y^2)T_2, T_3,..,\mathrm{T}_{n+2}) \geq W_{RA1}^2$

Using the same argument, Country 1 always makes an acceptable offer. The subgame perfect equilibrium is that, regardless of the first proposer, all countries accept the offers. The outcome of the sequential bargaining game without MFN can be summarized in the following proposition.

<u>Proposition 5</u>: The outcome of the sequential bargaining game without MFN is:

i) the tariff outcome $\{\tau_x^{B2},\tau_y^{B2}\}$ that maximizes $W^1(\tau_x^2,..\tau_x^{Bn+2}(\tau_x^2),\tau_y^2,..,\tau_y^{Bn+2}(\tau_y^2),T_2, T_3.T_{n+2})+$ $W^2(\tau_x^2,..,\tau_x^{Bn+2}(\tau_x^2)\tau_y^2,..,\tau_y^{Bn+2}(\tau_y^2),T_2,..,T_{n+2})$, and $\{\tau_x^{B3},\tau_x^{B4},......,\tau_x^{Bn+2},\tau_y^{B3},.....,\tau_y^{Bn+2}\}$ that maximizes $\sum_{j\in C_2} W^j$, taken $\{\tau_x^{B2},\tau_y^{B2}\}$ as given.

ii) and transfers from Country 1 are equal to:

$$E(T_2) = \frac{1}{2}(W^2(\tau_{x\backslash 2}^{BR2},..,\tau_{x\backslash 2}^{Bn+2},\tau_y^{BR2}(\tau_{y\backslash 2}^{B3}),..,\tau_{y\backslash 2}^{Bn+2}) - W^2(\tau_{x,}^{B2},..,\tau_x^{Bn+2},\tau_y^{B2},..,\tau_y^{Bn+2})) +$$

$$\frac{1}{2}(W^1(\tau_{x\backslash 2}^{BR2},..,\tau_{x\backslash 2}^{Bn+2},\tau_y^{BR2}(\tau_{y\backslash 2}^{B3}),..,\tau_{y\backslash 2}^{Bn+2},T_3,...T_{n+2}) - W^1(\tau_x^{B2},..,\tau_x^{Bn+2},\tau_y^{B2},..,\tau_y^{Bn+2},T_3,..,T_{n+2}))$$

and

$$T_j = W^j(\tau_x^{B2},\tau_x^{BR3}(\tau_x^{B2}),..\tau_x^{BRn+2}(\tau_x^{B2}),\tau_y^{B2},\tau_y^{BR3}(\tau_y^{B2}),,.\tau_y^{BRn+2}(\tau_y^{B2})) - W^j(\tau_x^{B2},..,\tau_x^{Bn+2}\tau_y^{B2},..,\tau_y^{Bn+2}) < 0$$

Proof: See Appendix.

The main difference from the last section is that when developing countries are small, they need to make transfers to a big country ($T_j < 0$) when participating in tariff negotiation as their threat points are originally worse than when they are big countries.

Lemma 6: The tariff outcome is not efficient.

In the sequential bargaining game without MFN, the result still confirms Bagwell and Staiger (1999). The bargaining game shows bilateral opportunism in the way that Country 1 lowers the tariff of good x applied on small countries in exchange for lower tariffs from small countries which causes welfare loss for Country 2. The only difference here is that, as the initial tariffs of small countries are set at the efficient level, small countries have to compensate Country 1 via transfers in Stage 2.

4.2.2 Sequential bargaining with MFN

In this section, we consider the case that only MFN is imposed on tariff negotiations. In this case, in the first stage, the proposer makes a take-it-or-leave-it offer consisting of the binding MFN tariff of good x, tariff of good y imposed by Country 2, and transfers to Country 2. In the second stage, the MFN tariff of good x that Country 1 offers to small countries has to be lower than or equal to the binding tariff set in the first stage. The bargaining game with MFN can be formalized as follows:

Stage 0: Nature chooses either Country 1 or Country 2 to be the first proposer with equal probability.

Stage 1: The proposer offers tariff ($\tilde{\tau}_x \leq \tau_x^{BR},\tau_y^{B2}$) and transfers T_2. The other party either accepts or rejects.

Stage 2: If the other party accepts in the first stage, Country 1 offers tariff $\{\tau_x^B \le \tilde{\tau}_x, \tau_y^{B3}, .., \tau_y^{Bn+2}\}$ and transfers $\{T_3, ..T_{n+2}\}$, which small countries accept or reject. If the other party rejects, Country 1 offers $\{\tau_{x\backslash 2}^B, \tau_{y\backslash 2}^{B3}, ...\tau_{y\backslash 2}^{Bn+2}\}$ and transfers $\{T_{3\backslash 2}, .., T_{n+2\backslash 2}\}$ which each small country accepts or rejects.

First, consider the last stage of the game. When Country 2 is chosen to be the proposer in the first stage, following the rejection of Country 1, the threat point is Nash equilibrium. The maximization problem is :

(M21) $$\max_{\tau_x, \tau_y^3, ..., \tau_y^{n+2}, T_1, T_{3j}, ..., T_{n+2}} (W^1(\tau_x, \tau_y^{BR2}, \tau_y^3, ..., \tau_y^{n+2}, T_3, ...T_{n+2})$$

s.t. $(W^j(\tau_x, \tau_y^{BR2}, \tau_y^3, ..., \tau_y^{n+2}, T_3, ...T_{n+2}) = W_{NE}^j$

for $\forall j \in S = \{3,4,.....,n+2\}$.

Again, (M21) implies that Country 1 always makes acceptable offers to all small countries that guarantee small countries' welfares equal to Nash payoffs.

Next, following Country 1's acceptance, the threat points for small countries are no longer Nash payoffs but a function of the binding tariff $\tilde{\tau}_x$ and τ_y^{B2}. The maximization problem becomes:

(M22) $$\max_{\tau_x, \tau_y^3, ..., \tau_y^{n+2}, T_1, T_{3j}, ..., T_{n+2}} (W^1(\tau_x, \tau_y^{B2}, \tau_y^3, ..., \tau_y^{n+2}, T_2, T_3, ...T_{n+2})$$

s.t. $W^j(\tau_x, \tau_y^{B2}, \tau_y^3, ..., \tau_y^{n+2}, T_3, ...T_{n+2} \ge W^j(\tilde{\tau}_x, \tau_y^{B2}, \tau_y^{BR3}, ..., \tau_y^{BRn+2})$

$\tau_x^2 = \tau_x^3 = ... = \tau_x^{n+2} = \tau_x \le \tilde{\tau}_x$

for $\forall j \in S = \{3,4,.....,n+2\}$.

Following the same logic mentioned above, Country 1 still offers acceptable proposals for all small countries.

Consider when Country 1 is the proposer in the first stage. Following the rejection of Country 2, the policy Country 1 chooses in the last stage solves (M21). By the same logic, Country 1 always induces acceptance. Also, when Country 2 accepts the proposal in the first stage, the maximization problem is (M22); hence, Country 1 always makes acceptable offers.

Now we turn our attention to the first stage of the game. Consider when Country 2 is the proposer. The maximization problem can be written as follows:

(M23) $\max_{\tau_x^2,\tau_y^2,T_1} (W^2(\tau_x^2, \tau_x^{B3}(\tau_x^2), \tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T_3, ..., T_{n+2})$

s.t. $W^1(\tau_x^2, \tau_x^{B3}(\tau_x^2)\tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T_3, ..., T_{n+2}) \geq W_{RA2}^1$

$\tilde{\tau}_x \leq \tau_x^{BR}$

The second constraint means that the binding MFN tariff set in the first stage has to be credible in the sense that it can be implemented if the game in the last stage reaches the disagreement point.

Using the same logic, Country 2 always makes an acceptable offer to Country 1. Inducing rejection here cannot improve the welfare of Country 2. Even though Country 2 can be a free rider when it induces the rejection, with the acceptance, the total welfare improves and Country 2 can extract all surplus via transfers. Therefore, Country 2 always makes an acceptable offer.

Finally, consider when Country 1 is the proposer, it solves:

(M24) $\max_{\tau_x^2,\tau_y^2,T_1} (W^1(\tau_x^2, \tau_x^{B3}(\tau_x^2), \tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T_3, ..., T_{n+2})$

s.t. $W^2(\tau_x^2, \tau_x^{B3}(\tau_x^2)\tau_y^2, \tau_y^{B3}(\tau_y^2), T_2, T_3, ..., T_{n+2}) \geq W_{RA1}^2$

$\tilde{\tau}_x \leq \tau_x^{BR}$

Again, Country 1 always makes an acceptable offer to Country 2. Country 1 will not gain from inducing rejection here, as the first stage policy does not affect Country 2's threat point. Since Country 1 has all bargaining power when it is chosen to be the proposer, it can make an acceptable offer and extract all benefit via transfer.

Lemma 7: In the first stage, $\tilde{\tau}_x = \tau_x^{BR}$.

Regardless of the first proposer, setting the binding tariff $\tilde{\tau}_x$ at the highest level possible will allow the proposer to extract the greatest surplus from small countries. [19] Unlike the previous section when a developing country is big , but has lower bargaining power, small country's threat points are originally worse as their best-response tariffs are efficient. Therefore, it is possible for a big country to extract the greatest surplus from small countries by setting the binding tariff at the highest credible level, which is the best-response tariff.

[19] If there is no credibility constraint, the optimal binding tariff set in the first stage will be higher than the best-response tariff. However, with the credibility constraint, the constraint is binding and the binding tariff is set at the best-response tariff.

The outcome of the sequential bargaining game with MFN is summarized in the following proposition.

Proposition 6: The tariff outcome of the sequential bargaining game with MFN is:

i) the tariff outcome $\{\tau_x^B, \tau_y^{B2}\}$ that maximizes $W^1(\tau_x^B,, \tau_y^2, .., \tau_y^{Bn+2}(\tau_y^2), T_2, T_3..T_{n+2}) + W^2(\tau_x^B, \tau_y^2, .., \tau_y^{Bn+2}(\tau_y^2), T_2, .., T_{n+2})$, and $\{\tau_y^3, .., \tau_y^{n+2}\}$ that maximizes $\sum_{j \in C_2} W^j$, subject to MFN and taking τ_y^{B2} as given.

ii) and transfers from Country 1 are equal to:

$$E(T_2) = \frac{1}{2}(W^2(\tau_{x\backslash 2}^B, \tau_y^{BR2}(\tau_{y\backslash 2}^{B3}), .., \tau_{y\backslash 2}^{Bn+2}) - W^2(\tau_x^B, \tau_x^{Bn+2}\tau_y^{B2}, .., \tau_y^{Bn+2})) +$$

$$\frac{1}{2}(W^1(\tau_{x\backslash 2}^{BR}, \tau_y^{BR2}(\tau_{y\backslash 2}^{B3}), .., \tau_{y\backslash 2}^{Bn+2}, T_3, ...T_{n+2}) - W^1(\tau_x^B, \tau_y^{B2}, .., \tau_y^{Bn+2}, T_3, .., T_{n+2})) \text{ and}$$

$$T_j = W^j(\tau_x^{BR}, \tau_y^{B2}, \tau_y^{BR3}(\tau_y^{B2}), ,.\tau_y^{BRn+2}(\tau_y^{B2})) - W^j(\tau_x^B, \tau_y^{B2}, .., \tau_y^{Bn+2}) < 0.$$

Proof: See Appendix.

When a developing country is small, it is possible for a big country to set the binding MFN tariff of good x at very high but still credible level in order to make a small country agree to lower their tariffs in return in the second stage. Also, the high binding MFN tariff makes a small country's threat point very bad. Therefore, a big country can extract more surplus from negotiation.

Lemma 8: The tariff outcome from the sequential bargaining with MFN is not efficient.

As discussed in Bagwell and Staiger (2004), the sequential bargaining game displays the backward stealing problem in which the welfare of Country 2 when the second stage reaches the disagreement point is higher than when Country 1 furthers the negotiation in the second stage.

The game also demonstrates the forward manipulation problem in which Country 1 sets the tariff of good x at very high level in the first stage to push small countries in the worse position in the bargaining game.

Finally, while the tariff outcome is not efficient, it is lower than that of Nash equilibrium and sequential bargaining without MFN.

4.2.3 Sequential bargaining game with MFN and reciprocity

In this section, we consider when reciprocity is introduced to the downward negotiation. As mentioned in Section 4.1.3, the reciprocity restriction implies that, when valued at existing world prices, the proposed set of tariff reductions together creates equal increases in the volume of each country's imports and exports. Therefore, reciprocity implies:

$$[P_y^w(\tau_y^2,\tau_y^3,..,\tau_y^{'j},..,\tau_y^{n+2})-P_y^w(\tau_y^2,..,\tau_y^{n+2})]M^j(\tau_y^2,\tau_y^3,..\tau_y^{'j},..\tau_y^{n+2})=[P_x^w(\tau_x^{'})-P_x^w(\tau_x)]E_x^j(\tau'_x) \quad (12)$$

for all $j \in S=\{3,4,.....,n+2\}$.

Given $\tau_x,\tau_y^2,..,\tau_y^{n+2}$, we can solve $\tau_y^{'j}$ in terms of $\tau_x^{'}$.

The bargaining game can be formalized as follows:

Stage 0: Nature chooses either Country 1 or Country 2 to be the first proposer with equal probability.

Stage 1: The proposer offers tariff $(\tilde{\tau}_x \le \tau_x^{BR},\tau_y^{B2})$ and transfers T_2. The other party either accepts or rejects.

Stage 2: If the other party accepts in the first stage, Country 1 offers tariff $\{\tau_x^B \le \tilde{\tau}_x,\tau_y^{B3},..,\tau_y^{Bn+2}\}$ and transfers $\{T_3,..T_{n+2}\}$ subject to the reciprocity condition (12), which small countries accept or reject. If the other party rejects, Country 1 offers $\{\tau_{x\backslash 2}^B,\tau_{y\backslash 2}^{B3},...\tau_{y\backslash 2}^{Bn+2}\}$ and transfer $\{T_{3\backslash 2},..,T_{n+2\backslash 2}\}$ which small countries accept or reject.

In the reciprocity game, the maximization problem (M22) is added with the reciprocity restriction, which can be written as follows:

$$\text{(M25)} \quad \max_{\tau_x,\tau_y^3,...,\tau_y^{n+2},T_1,T_{3j},...,T_{n+2}} (W^1(\tau_x,\tau_y^{B2},\tau_y^3,...,\tau_y^{n+2},T_2,T_3,...T_{n+2})$$

$$\text{s.t. } W^j(\tau_x,\tau_y^{B2},\tau_y^3,...,\tau_y^{n+2},T_3,...T_{n+2} \ge W^j(\tilde{\tau}_x,\tau_y^{B2},\tau_y^{BR3},...,\tau_y^{BRn+2})$$

$$\tau_x^2=\tau_x^3=....=\tau_x^{n+2}=\tau_x \le \tilde{\tau}_x$$

$$[P_y^w(\tau_y^{B2},\tau_y^3,..,\tau_y^{'j},..,\tau_y^{n+2})-P_y^w(\tau_y^{B2},..,\tau_y^{n+2})]M^j(\tau_y^2,\tau_y^3,..\tau_y^{'j},..\tau_y^{n+2})=[P_x^w(\tau_x)-P_x^w(\tilde{\tau}_x)]E_x^j(\tau_x)$$

for $\forall j \in S=\{3,4,.....,n+2\}$.

We can use the same argument raised in Section 4.2.2 to demonstrate that Country 1 always makes an acceptable offer here.

In the equilibrium of sequential bargaining with reciprocity, a small country has to lower its tariff from the original efficient level to compensate for the lower MFN tariff of good x from the binding level at the best-response level. Therefore, small countries are worse off from reciprocity. There are no transfers in the second stage when reciprocity governs the negotiation. Transfers are used in the first stage only.[20]

The outcome of the sequential bargaining game with reciprocity can be summarized in the following proposition.

<u>Proposition 7</u>: The tariff outcome of sequential bargaining with MFN and reciprocity is:

i) the tariff outcome $\{\tau_x^B, \tau_y^{B2}\}$ that maximizes $W^1(\tau_x^B, \tau_y^2, \tau_y^{B3}(\tau_y^2),,, \tau_y^{Bn+2}(\tau_y^2)T_2, ..., T_{n+2}) + W^2(\tau_x^B, \tau_y^2, \tau_y^{B3}(\tau_y^2),..\tau_y^{Bn+2}(\tau_y^2), T_2, ..., T_{n+2})$,

and $\{\tau_y^3,..,\tau_y^{n+2}\}$ that maximizes $\sum_{j\in C_2} W^j$, subject to MFN and reciprocity condition (12) and taking τ_y^{B2} as given.

ii) and transfers from Country 1 are equal to:

$$E(T_2) = \frac{1}{2}(W^2(\tau_{x\backslash 2}^B, \tau_y^{BR2}(\tau_{y\backslash 2}^{B3}),..,\tau_{y\backslash 2}^{Bn+2}) - W^2(\tau_x^B, \tau_x^{Bn+2}\tau_y^{B2},..,\tau_y^{Bn+2})) +$$

$$\frac{1}{2}(W^1(\tau_{x\backslash 2}^{BR}, \tau_y^{BR2}(\tau_{y\backslash 2}^{B3}),..,\tau_{y\backslash 2}^{Bn+2}, T_3, ...T_{n+2}) - W^1(\tau_x^B, \tau_y^{B2},..,\tau_y^{Bn+2}, T_3,..,T_{n+2}))$$

Proof: See Appendix.

<u>4.2.4 Sequential bargaining with the Enabling Clause</u>

In this section, we consider the sequential bargaining game when the Enabling clause is granted to small countries. So the bargaining game can be written as follows:

Stage 0: Nature chooses either Country 1 or Country 2 to be the first proposer with equal probability.

Stage 1: The proposer offers tariff (τ_x, τ_y^{B2}) and transfers T_2. The other party either accepts or rejects. Small countries always choose the best-response tariff regardless of other countries' choices.

The maximization problem when Country $j,k \in \{1,2\}$, $j \neq k$ is chosen to be the proposer is :

(M26) $\max_{\tau_{x_x}\tau_y^2, T_1} (W^j(\tau_x, \tau_y^2, \tau_y^{BR3}(\tau_y^2)..,\tau_y^{BRn+2}(\tau_y^2), T_2)$

s.t. $W^k(\tau_x\tau_y^2, \tau_y^{BR3}(\tau_y^2),...,\tau_y^{BRn+2}(\tau_y^2), T_2) \geq W_{NE}^k$

[20] See 16.

By the same argument, the proposer always makes acceptable offers. The result of sequential bargaining with the Enabling Clause can be summarized in the following proposition.

Proposition 8: The outcome from tariff bargaining with the Enabling Clause is the tariff outcome $\{\tau_x, \tau_y^2\}$ that maximizes $W^1(\tau_x, \tau_y^2, \tau_y^{BR3}(\tau_y^2),..\tau_y^{BRn+2}(\tau_y^2)) + W^2(\tau_x, \tau_y^2, \tau_y^{BR3}(\tau_y^2),..,\tau_y^{BRn+2}(\tau_y^2)\ )$, and $\tau_y^3 = \tau_y^{BR3},..,\tau_y^{n+2} = \tau_y^{BRn+2}$ and transfer from Country 1 are equal to

$$E(T_2) = \frac{1}{2}(W_{NE}^2 - W^2(\tau_x^B, \tau_y^{B2}, \tau_y^{BR3},..,\tau_y^{BRn+2})) + \frac{1}{2}(W^1(\tau_x^B, \tau_y^{B2}, \tau_3^{BR3},..,\tau_y^{BRn+2}) - W_{NE}^1).$$

Proof: See Appendix

Lemma 9 : The tariff outcome from sequential bargaining with the Enabling Clause is not efficient.

Even though the outcome of sequential bargaining with the Enabling Clause is not efficient, it is closer to the efficient level than any other case and brings the highest world for the world. Also, small countries attain the highest welfare in this case. They can set their tariffs at the best-response level while still enjoying the MFN tariff of good x.

4.2.5 Welfare Comparison

When a developing country is small, it attains the highest welfare under the Enabling clause. With the Enabling Clause, a developing country is able to be a free rider and receive the MFN tariff while setting the best-response tariff. Sequential bargaining with MFN yields lower welfare than the Enabling Clause in this case, since Country 1 can set the binding tariff at a high level to push the threat point of a small country to the worst position. Under MFN, Country 1 sets the binding tariff $\tilde{\tau}_x = \tau_x^{BR}$. Therefore, the threat points of small countries are $W^j(\tilde{\tau}_x = \tau_x^{BR}, \tau_y^{B2}, \tau_y^{BR3},..,\tau_y^{BRn+2})$. However, with the Enabling Clause, Country 1 does not have a chance to lower the MFN tariff, τ_x, in the second stage. As a result, the proposer sets the MFN tariff, τ_x, at the optimal level in the first stage. Hence, the welfares of small countries from sequential bargaining with the Enabling Clause are equal to $W^j(\tau_x^B, \tau_y^{B2}, \tau_y^{BR3},..,\tau_y^{BRn+2})$, higher than the welfares of small countries from sequential bargaining with MFN, as τ_x is lower while other tariffs do not change.

Reciprocity causes the welfares of developing countries to deteriorate in this case. The small countries enter the bargaining game with efficient tariffs. However, with reciprocity, they are forced to lower their tariffs in order to receive a lower tariff of good x. Therefore, the welfares of small countries are lower than they are when only MFN is imposed. Reciprocity prevents backward stealing at the expense of the total welfare and efficiency.

Nevertheless, sequential bargaining without MFN brings about the lowest welfare to a small country. The threat points of small countries are worst in this case.

The welfare of developing countries when they are small can be summarized in the following table.

Table 2: The welfare outcomes of developing countries when they are small[21]

The bargaining protocol	Welfare
Sequential bargaining without MFN	$\left(\frac{1058\overline{X}^2}{3969}+\frac{2\overline{Y}^2}{49}+(a-\frac{46\overline{X}}{63})\overline{X}\right)\frac{1}{n}$
Sequential bargaining with MFN	$\left(\frac{9\overline{X}^2}{32}+\frac{2\overline{Y}^2}{49}+(a-\frac{3\overline{X}}{4})\overline{X}\right)\frac{1}{n}$
Sequential bargaining with MFN and reciprocity	$\left(\frac{1058\overline{X}^2}{3969}+\frac{25\overline{Y}^2}{529}+(a-\frac{27\overline{X}}{38})\overline{X}\right)\frac{1}{n}$
Sequential bargaining with the Enabling Clause	$\left(\frac{25\overline{X}^2}{98}+\frac{2\overline{Y}^2}{49}+(a-\frac{5\overline{X}}{7})\overline{X}\right)\frac{1}{n}$

<u>Corollary 2</u>: Small countries attain the highest welfare under sequential bargaining with the Enabling Clause.

[21] See the tariff outcomes from each bargaining protocol in the appendix.

6. Conclusion

This study observes the efficiency of four tariff bargaining methods: i) sequential bargaining without MFN, ii) sequential bargaining with MFN, iii) sequential bargaining with MFN and reciprocity, and iv) sequential bargaining with the Enabling Clause. The study also compares the welfare of developing countries that adopt these tariff bargaining methods. When developing countries lack bargaining power, the study finds that the developing countries benefits from reciprocity. Also, the Enabling Clause does not improve welfare compared to when only MFN is imposed. Both MFN and reciprocity benefit developing countries that are big, but lacks bargaining power. The big developing countries do not gain from the Enabling Clause.

In contrast, when developing countries are small, reciprocity hurts them while the Enabling Clause their welfare. In any case, sequential bargaining cannot attain efficient tariffs.

7. Limitations and further studies

In this study, we suppose that big countries will negotiate with all small countries at once. In WTO negotiations, country-by-country negotiations are more common. Thus, the study should, thus, be extended to include the case of a big country negotiating with small countries on a country-by-country basis. Furthermore, the study should generalize parameters and allow asymmetry among the 3 goods. In addition, the study should consider strategic bargaining instead of axiomatic bargaining. Finally, the study should be extended to find the rule-based approach that benefits small developing countries the most.

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Appendix

<u>Proof for Proposition 1</u>:

Given that λ_2, λ_3 are Lagrangian Multipliers, the Kuhn-Tucker conditions for the maximization problem in the second stage are:

$$\lambda_2 = \lambda_3 = 1 \quad \text{(A1)}$$

$$\frac{\partial W^1}{\partial \tau_x} + \lambda_3 \frac{\partial W^3}{\partial \tau_x} = 0 \quad \text{(A2)}$$

$$\frac{\partial W^1}{\partial \tau_y^j} + \lambda_3 \frac{\partial W^3}{\partial \tau_y^j} = 0 \quad \text{(A3)}$$

The maximization in the first stage is:

Using the first order condition:

$$\lambda_2 = 1 \quad \text{(A4)}$$

$$\frac{\partial W^1}{\partial \tau} + \lambda_2 \frac{\partial W^2}{\partial \tau} = 0 \quad \text{(A5)}$$

(A4)-(A5) implies :

$$\frac{\partial W^1}{\partial \tau} + \frac{\partial W^2}{\partial \tau} = 0 \quad \text{(A6)}$$

From our model setting, we have $\tau_x^{2B} = \frac{4\overline{X}}{27}$, $\tau_x^{3B} = \frac{\overline{X}}{27}$ $\tau_y^{2B} = \frac{7\overline{Y}}{31}$, and $\tau_y^{3B} = \frac{9\overline{Y}}{31}$.

<u>Proof for Lemma 2</u> :

Given that $\lambda_2, \lambda_{3,} \beta$ are Lagrangian Multipliers, the Kuhn-Tucker conditions for the maximization problem are:

$$\lambda_2 = \lambda_3 = 1 \quad \text{(A7)}$$

$$\frac{\partial W^1}{\partial \tau_x} + \lambda_3 \frac{\partial W^3}{\partial \tau_x} + \beta = 0 \quad \text{(A8)}$$

$$\frac{\partial W^1}{\partial \tau_y^j} + \lambda_3 \frac{\partial W^3}{\partial \tau_y^j} = 0 \quad \text{(A9)}$$

$$\beta(\tilde{\tau}_x - \tau_x) = 0 \quad \text{(A10)}$$

When $\tilde{\tau}_x > \tau_x$, then from (A5) τ_x is such that it maximizes $\sum_{j \in C_2} W^j$.

When $\tilde{\tau}_x = \tau_x$, τ_x is such that it maximizes $\sum_{j \in C_1} W^j$.

Given that β is the Lagrange multiplier, the only possible outcome in the second state is $\tilde{\tau}_x = \tau_x$. Suppose that $\tilde{\tau}_x > \tau_x$, then $\tilde{\tau}_x$ has to simultaneously satisfy the following two equations:

$$W^j(\tau_x = \tau_x^B, \tau_y^2 = \tau_y^{B2}, \tau_y^{Bj}) - T_j \geq W^j(\tau_x = \bar{\tau}_x, \tau_y^2 = \tau_y^{B2}, \tau_y^{BRj}) \quad \text{(A11)}$$

$$\tilde{\tau}_x \leq \tau_x^{BR} \quad \text{(A12)}$$

However, there is no $\tilde{\tau}_x$ that satisfies (A11) and (A12) simultaneously.

In the first stage, the first order condition:

$$\lambda_2 = 1 \quad \text{(A13)}$$

$$\frac{\partial W^1}{\partial \tau} + \lambda_2 \frac{\partial W^2}{\partial \tau} = 0 \quad \text{(A14)}$$

(A13)-(A14) implies:

$$\frac{\partial W^1}{\partial \tau} + \frac{\partial W^2}{\partial \tau} = 0 \quad \text{(A15)}$$

Proof for Proposition 2:

The result comes from (A4) – (A7) in proof for Lemma 2. From our model setting, we have $\tau_x^B = \frac{\overline{X}}{7}$, $\tau_y^{2B} = \frac{7\overline{Y}}{31}$, and $\tau_y^{2B} = \frac{9\overline{Y}}{31}$

Proof for Proposition 3: From the reciprocity restriction, $[P_y^w(\tau_y^2, \tau_y^{'3}) - P_y^w(\tau_y^2, \tau_y^3)]M^3(\tau_y^2, \tau'^3_y) = [P_x^w(\tau_x^{'}) - P_x^w(\tau_x)]E_x^3(\tau'_x)$, we can solve τ_y^3 in terms of τ_x, taking τ_y^2 as given. Then we can solve for optimal τ_y^2 and τ_x from (A15).

Proof for Proposition 4:

Using the first order condition:

$$\lambda_2 = 1 \quad \text{(A16)}$$

$$\frac{\partial W^1}{\partial \tau} + \lambda_2 \frac{\partial W^2}{\partial \tau} = 0 \quad \text{(A17)}$$

(A10)-(A11) implies:

$$\frac{\partial W^1}{\partial \tau} + \frac{\partial W^2}{\partial \tau} = 0 \quad \text{(A18)}$$

(A10) is similar to the outcome of tariff from maximizing $\sum_{j \in C_1} W^j$.

From our model setting, we have $\tau_x^B = \frac{\overline{X}}{7}$, $\tau_y^{2B} = \frac{5\overline{Y}}{49}$, and $\tau_y^{2B} = \frac{11\overline{Y}}{98}$.

Proof for proposition 5:

Given that $\lambda_2,...,\lambda_{n+2}$ are Lagrangian Multipliers, the Kuhn-Tucker conditions for the maximization problem in the second stage are:

$$\lambda_2 = \lambda_3 = ... = \lambda_{n+2} = 1 \qquad \text{(A19)}$$

$$\frac{\partial W^1}{\partial \tau_x} + \lambda_3 \frac{\partial W^3}{\partial \tau_x} + .. + \lambda_{n+2} \frac{\partial W^{n+2}}{\partial \tau_x} = 0 \qquad \text{(A20)}$$

$$\frac{\partial W^1}{\partial \tau_y^j} + \lambda_3 \frac{\partial W^3}{\partial \tau_y^j} + .. + \lambda_{n+2} \frac{\partial W^{n+2}}{\partial \tau_y^j} = 0 \text{ for } j \in S = \{3,4,.....,n+2\} \qquad \text{(A21)}$$

The maximization in the first stage is:

$$\lambda_2 = 1 \qquad \text{(A22)}$$

$$\frac{\partial W^1}{\partial \tau} + \lambda_2 \frac{\partial W^2}{\partial \tau} = 0 \qquad \text{(A23)}$$

(A10)-(A11) implies:

$$\frac{\partial W^1}{\partial \tau} + \frac{\partial W^2}{\partial \tau} = 0 \qquad \text{(A24)}$$

From our model setting, we have $\tau_x^{2B} = \frac{4\overline{X}}{27}$, $\tau_x^{3B} = \frac{\overline{X}}{27}$ $\tau_y^{2B} = \frac{7\overline{Y}}{31}$, and $\tau_y^{jB} = \frac{9\overline{Y}}{31}$.

Proof for Proposition 6:

Given $\lambda_2,...,\lambda_{n+2},\beta$ are Lagrangian Multipliers, the Kuhn-Tucker conditions for the maximization problem are:

$$\lambda_2 = \lambda_3 = ... = \lambda_{n+2} = 1 \qquad \text{(A25)}$$

$$\frac{\partial W^1}{\partial \tau_x} + \lambda_3 \frac{\partial W^3}{\partial \tau_x} + .. + \lambda_{n+2} \frac{\partial W^{n+2}}{\partial \tau_x} + \beta = 0 \qquad \text{(A26)}$$

$$\frac{\partial W^1}{\partial \tau_y^j} + \lambda_3 \frac{\partial W^3}{\partial \tau_y^j} + .. + \lambda_{n+2} \frac{\partial W^{n+2}}{\partial \tau_y^j} = 0 \text{ for } j \in S = \{3,4,.....,n+2\} \qquad \text{(A27)}$$

$$\beta(\tilde{\tau}_x - \tau_x) = 0 \qquad \text{(A28)}$$

When $\tilde{\tau}_x > \tau_x$, then from (A2) τ_x is such that it maximizes $\sum_{j \in C_2} W^j$.

When $\tilde{\tau}_x = \tau_x$, τ_x is such that it maximizes $\sum_{j \in C_1} W^j$. Given that β is the Lagrange multiplier, the only possible outcome in the second state is $\tilde{\tau}_x = \tau_x$. Suppose that $\tilde{\tau}_x > \tau_x$, then $\tilde{\tau}_x$ has to simultaneously satisfy (A11) and (A12). In order to get the highest transfer in the second stage, the big country will set the tariff at the highest level which is the best-response tariff. $\tau_x^B = \frac{\overline{X}}{7}, \tau_y^{2B} = \frac{7\overline{Y}}{31}$, and $\tau_y^{jB} = \frac{9\overline{Y}}{31}$.

In the first stage, the first order condition is (A22)-(A24).

Proof for proposition 7: Similar to Proposition 3, we add the reciprocity restriction. We can solve τ_y^j in terms of τ_x, taking τ_y^2 as given. Then we can solve for optimal τ_y^2 and τ_x from (A24).

Proof for proposition 8: See proof for proposition 4. $\tau_x^B = \frac{\overline{X}}{7}, \tau_y^{2B} = \frac{2\overline{Y}}{63}$, and $\tau_y^{jB} = 0$.