

# **Renegotiation in Trade Agreements: The Case of Private Political Shocks**

First draft: July 15, 2004

This draft : October 30, 2007

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## **Abstract**

This paper studies the efficiency of the renegotiation process in the WTO when there is private information. The study considers a game that Home or Foreign has private information. In both cases, the study finds that the renegotiation process cannot attain both politically optimal tariffs and pareto-efficient tariffs regardless a number of instruments. The renegotiation can yield politically optimal tariffs when international transfers between the two countries are allowed.

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## 1. Introduction

The role of the GATT, later included in the World Trade Organization (WTO) established in 1995, in the international trade system is increasingly important nowadays, and its membership has risen to more than 150 countries. The GATT was established in 1947 by 23 nations in an attempt to reduce tariffs among member countries. The creation of the GATT also provides sets of rules that facilitate trade negotiations and cope with trade policy problems. Previous literature suggests that the GATT/WTO creation had two purposes. The first one is that GATT/ WTO agreements help countries avoid the terms-of-trade driven prisoner dilemma and attain contracts that maximize joint gains among members. The second approach points out that the purpose of the GATT/WTO is to make credible commitments to the private sector. Without trade agreements, there is a credibility problem in the way that the government sets its trade policy after a production or investment decision made by the private sector. Therefore, the government sets the trade policy that maximizes its ex-post instead of ex-ante welfare. The private sector can anticipate this and, hence, distort production decision from the efficient level. Trade agreements make the government commit to tariff choices that maximize ex-ante welfare. Our study follows the use of GATT/WTO agreements from the first approach, an escape from term-of-trade externality.

Renegotiation is one of GATT/WTO members' concerns. It is important to consider whether renegotiation rules and procedures in the WTO system can achieve the logic of joint welfare maximization. Article XXVIII gives members the framework for modification or withdrawal of tariff concessions previously negotiated. Since the 1960s, GATT/WTO members have initiated many tariff renegotiations. Table 1-1 shows the renegotiations according to Article XXVIII implemented in each period. After members reach a particular agreement, they might need to modify or nullify it due to changes in circumstances such as the formation of customs unions, the promotion of infant industries in developing countries, or the occurrence of political pressure. Hoda (2001) studies the main features of renegotiation according to Article XXVIII and finds out that tariff renegotiations mostly come from additional protection of agriculture or industry. As a result, political pressure is the most important cause of tariff renegotiation. A question which arises here is whether the renegotiation process leads to an efficient trade agreement when private political shocks occur in one country.

Hoda (2001) shows the outcomes from renegotiation according to Article XXVIII. The renegotiations can either succeed or fail. If renegotiation cannot reach an agreement, withdrawal of tariff concessions might be initiated, which makes tariffs higher. In other cases, both countries commit to the previous tariff agreement. These outcomes govern the tariff renegotiation game in our study.

**Table 1-1 Number of Invocations from Article XXVIII**

<b>Time Period</b>	<b>Number of Successful Invocations<sup>2</sup></b>	<b>Number of Cases Leading to Withdrawal of Concession</b>	<b>Number of Cases that Go Back to the Previous Agreement</b>	<b>Number of Total Invocations</b>
1958-1959	12	-	-	12
1960-1969	58	1	-	59
1970-1979	56	1	-	57
1980-1989	57	1	-	58
1990-1999	19	-	1	20

Source: Hoda (2001)

Next, we consider previous literature regarding renegotiation according to Article XXVIII. Bagwell and Staiger (1999 and 2001) study the renegotiation in the WTO in the case of complete information. In this study, one country requests to renegotiate if the previous agreement causes the country to prefer less trade volume at the original world price. The principle of reciprocity ensures that a proposed modification of tariff concessions in one country leads to an adjustment in tariffs of trading partners so that the original world price is preserved.<sup>3</sup> The renegotiation procedures are such that the home country, called Home from here and after, proposes its tariff rate, and the foreign country, called Foreign from here and after, also names its own tariff simultaneously. If these tariffs agree in accordance with the reciprocity restriction, the proposal will be implemented. Otherwise, the tariffs implemented are those that achieve the greatest trade volume while satisfying the principle of reciprocity and proposed trade volume limits, i.e.,

<sup>2</sup> Successful invocations imply Article XXVIII renegotiations that have resulted in the acceptance of the new tariff proposal and permanent changes in tariffs.

<sup>3</sup> Principle of reciprocity governs tariff renegotiation according to article XXVIII. We will discuss more about this issue in section 3.

trade volumes that are not greater than trade volumes implied by the proposal of each government. The study demonstrates that a politically optimal tariff is the strictly dominant tariff proposed, and an efficient trade agreement could occur under the principle of reciprocity. The study draws the conclusion that the politically optimal tariff is the only renegotiation-proof tariff agreement in the sense that once all countries set politically optimal tariffs, there is no country that needs to offer renegotiation.

Our study is different from Bagwell and Staiger (1999, 2001) in many aspects. First of all, the need for renegotiation in the study comes from an unanticipated change in political pressure in one country. Therefore, this country wants to offer renegotiation even though politically optimal tariffs are set initially. Second, private information exists in our study. The change in political pressure is unknown to its trading partner. Finally, instead of simultaneous offers, we consider a sequential tariff renegotiation game where a country facing the change in political pressure offers new tariffs and its trading partner then decides whether to accept or reject this offer. We also consider the case in which political shocks occur in both countries.

There is some literature regarding private information in trade agreements. Feenstra and Lewis (1991) study optimal trade restrictions when Home faces private political pressure. The study also uses the aggregate welfare function following from Baldwin (1987) to capture political pressure. Feenstra and Lewis (1991) assume that two countries negotiate a long term agreement on import and export levels contingent on a value of political pressure announced by Home. A negotiation begins when both countries do not know the true value of political pressure. An incentive compatible constraint is required to force Home to truthfully report the level of political pressure. The study demonstrates that, with the existence of incentive compatible agreements, a politically optimal trade agreement is achieved when Foreign does not obtain gains from the trade negotiation. However, when some of the rents from a trade agreement accrue to Foreign, there is a deviation from politically optimal trade. The trade restrictions are used so that Home does not exaggerate its political pressure. The more the gains are transferred to Foreign, the less the trade restriction is used so that Home does not exaggerate its political pressures.

Martin and Vergote (2004) examine whether antidumping measures are used for retaliation. To do so, they consider that antidumping is used to compensate for the shift in

political pressure. The political preferences of each country in this study are assumed to be private information. The study also assumes continuum types of political preferences in order to allow communication between governments before tariff setting, i.e., there is an external organization which governments have to inform about their types beforehand. The study shows that trade agreements with more than one instrument, including transfer or export subsidy, can achieve truth-telling and efficient tariffs. However, if import tariff is the only instrument in a trade agreement, some degree of retaliation can increase welfare. Therefore, there is retaliatory use of antidumping measures.

In these two studies, a direct mechanism, in which communication between governments is allowed before policy setting, is used for trade policy negotiation. Precisely, before learning of political shock, both governments set policy instruments contingent on the political pressure. Then, when Home's government announces its political pressure level, the instruments are implemented. Their studies use an incentive compatible mechanism to assure that the government does not have an incentive to report its type wrongly in order to influence terms of trade in its favor.

Our study considers the renegotiation process in two cases. The first case is when Home, the country that offers the new tariff proposal, has private information. In this case, the renegotiation process will follow directly from Article XXVIII of the GATT 1994 without requiring the home government to announce its type before policy setting. However, the tariff proposal might signal Home's type. This case also requires reciprocal tariff outcomes instead of incentive compatible constraints to rule out the externality from terms of trade.<sup>4</sup> The second case is when Foreign, instead, has private information. In this case, Home will offer the menu of proposed tariffs. Then, Foreign has to announce its type. The incentive compatibility is applied in this case. A binary-type space is used for the sake of simplicity.

The purpose of this paper is to examine the efficiency of the renegotiation process according to article XXVIII of the GATT/WTO in the presence of private information. We consider the case in which countries do not anticipate to use Article XXVIII when they initially set trade agreement in the WTO. However, there is unanticipated political shocks occur which lead to the need for Article XXVIII. We begin by constructing the

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<sup>4</sup> There are externalities from political effect and efficiency effect that are not ruled out by reciprocity. See discussion in Bagwell and Staiger (2001, 2002).

general framework. The study uses a quasi-linear model of bilateral trade based on Bagwell and Staiger (2001), modified to include privately observed political pressure. We consider both the case that the import tariff is the only policy instrument, and both import tariff and export subsidy are trade-policy instruments.

After that, we begin to study a tariff renegotiation game. The tariff renegotiation is first considered in the framework of the sequential game. The game allows Home, after observing its private political shock, to decide whether to use Article XXVIII or not. If Home decides to use Article XXVIII, it has to offer a new tariff proposal that complies to reciprocity. Then Foreign can choose whether to accept or reject this proposal. When Foreign rejects its offer, both countries choose whether to commit to the previous agreement or trigger trade wars simultaneously.

We consider the efficiency of the tariff outcomes from the renegotiation game, comparing them with a complete information environment and the case in which international transfers are allowed.

Finally, we will consider the case in which the political shocks occur in both countries. However, Foreign's shock is private information. In this case, Home will offer the menu of proposed tariffs. Foreign announces its type and chooses whether to accept or reject the tariff proposal for its own type. If foreign country chooses to reject, both countries choose whether to commit to the previous agreement or trigger trade wars simultaneously.

## **2. The model for trade agreement**

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

Suppose there are two ex-ante symmetric countries, called Home and Foreign, that trade two goods. Home variables are denoted with no \*, and Foreign variables are denoted with an \*. There are three goods in this model, namely, numeraire ( $v$ ) and two traded goods ( $x$  and  $y$ ). Suppose that numeraire good  $v$  is sufficiently abundant in each country so that we can consider only partial equilibrium analysis of the two traded goods. The existence of numeraire is for the sake of overall trade balance.

We assume that the consumer in each country possesses quasi-linear utility functions in the form of

$$u = v + \phi(x) + \phi(y) \quad (1)$$

$$u^* = v^* + \phi(x^*) + \phi(y^*) \quad (2)$$

where  $\phi(\cdot)$  is a quadratic function so that demand function is linear. Letting  $p_x$  and  $p_y$  denote home prices of good  $x$  and  $y$ , demand functions are represented by function  $D(p_i)$ ,  $i = x, y$ . The supply functions are represented by increasing function  $Q_x(p_x)$  and  $Q_y(p_y)$ . Suppose further that Home is the net importer of good  $x$  and Foreign is the net importer of good  $y$ . By symmetry,  $Q_x(p_x) = Q_y^*(p_y^*) < Q_y(p_y) = Q_x^*(p_x^*)$ . Assume that the production functions in Home are  $Q_x = \sqrt{L_x}$  and  $Q_y = \sqrt{2L_y}$ . Then we have  $Q_x(p_x) = \frac{p_x}{2}$  and  $Q_y(p_y) = p_y$ . The associated profit functions are  $\pi_x(p_x) = \frac{p_x^2}{4}$ ,  $\pi_y(p_y) = \frac{p_y^2}{2}$ ,  $\pi_x^*(p_x^*) = \frac{p_x^{*2}}{2}$  and  $\pi_y^*(p_y^*) = \frac{p_y^{*2}}{4}$ . Finally, let the linear demand functions take terms:  $D(p_i) = 10 - p_i$ .

## 2.1 One instrument

In this section, we suppose that there is only one trade-policy instrument for each country, which is the import tariff. Now let  $p_x^w$  be world price (exporter price) of good  $x$ ,  $\tau$  is home tariff, and  $\tau^*$  is foreign tariff. Then we have domestic and foreign prices as follows:

$$\begin{aligned} p_x &= p_x^w + \tau & p_y &= p_y^w \\ p_x^* &= p_x^w & p_y^* &= p_y^w + \tau^* \end{aligned}$$

As a result, market clearing condition requires:

$$Q_i(p_i) + Q_i^*(p_i^*) = D(p_i) + D(p_i^*). \quad (3)$$

(3) brings about equilibrium price  $p_x^w(\tau)$ ,  $p_x(\tau)$ ,  $p_x^*(\tau)$ ,  $p_y^w(\tau^*)$ ,  $p_y(\tau^*)$  and  $p_y^*(\tau^*)$ .

Next, from demand functions and supply functions, we can define import functions as  $M(\tau) = d(p_x(\tau)) - Q(p_x(\tau))$  for Home, and  $M^*(\tau^*) = D(p_y^*(\tau^*)) - Q(p_y^*(\tau^*))$  for Foreign. Then we have associated tariff revenue in forms of  $TR(\tau) = \tau M(\tau)$  and  $TR^*(\tau^*) = \tau^* M^*(\tau^*)$ .

Using the specific forms of demand and supply functions we mentioned above, we have the restriction to assure that trade volumes are positive:<sup>5</sup>

$$M(p_x(\tau)) \geq 0 \quad \text{iff} \quad \tau \leq \frac{10}{6} \quad (4)$$

$$M^*(p_y^*(\tau^*)) \geq 0 \quad \text{iff} \quad \tau^* \leq \frac{10}{6}.$$

The consumer surplus comes from  $\int_{p_1}^{10} D(p)dp$ . Let consumer surplus in good  $x$  and  $y$  equal  $CS_x(p_x(\tau))$  and  $CS_y(p_y(\tau^*))$  for Home, and  $CS_x^*(p_x^*(\tau))$  and  $CS_y^*(p_y^*(\tau^*))$  for Foreign respectively.

### 2.1.1 Government Objectives

We now define a government objective function. In order to include political pressure into the government's consideration, this study follows the government welfare function in Baldwin (1987). In this model, governments can put different weights on producer surplus.

Let  $\gamma_0^m$  and  $\gamma_0^{*m}$  be the political weights on producer surplus when there is no political shock in the importing industry in Home and Foreign respectively, and  $\gamma_0^e$  and  $\gamma_0^{*e}$  be those in the exporting industry. Suppose further that  $\gamma_0^i = \gamma_0^{*i}$  for  $i = \{m, e\}$  in order

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<sup>5</sup> Substitute the market-clearing prices, and from the assumption of demand and supply functions, we have

$$M(\tau^*) = \frac{10}{7} - \frac{6\tau^*}{7}.$$



to have symmetry of the model. The aggregate welfare function in each country can be expressed as follows:

$$W(\tau, \tau^*; \gamma_0^m, \gamma_0^e) = v + CS_x(\tau) + CS_y(\tau^*) + TR(\tau) + \gamma_0^m \pi_x(\tau) + \gamma_0^e \pi_y(\tau^*) \quad (5)$$

$$W^*(\tau, \tau^*; \gamma_0^{*m}, \gamma_0^{*e}) = v^* + CS_x^*(\tau) + CS_y^*(\tau^*) + TR^*(\tau^*) + \gamma_0^{*e} \pi_x^*(\tau) + \gamma_0^{*m} \pi_y^*(\tau^*).$$

From linear demand function it is direct to verify that :

$$\begin{aligned} \frac{dp_x^w}{d\tau} < 0 & \qquad \qquad \frac{dp_x}{d\tau} > 0 \\ \frac{dp_y^w}{d\tau^*} < 0 & \qquad \qquad \frac{dp_y^*}{d\tau^*} > 0. \end{aligned} \quad (6)$$

Then from the conditions for positive trade volumes, we have<sup>6</sup>

$$\begin{aligned} \frac{dW}{d\tau} > 0 & \quad \text{if } \tau < \frac{50 - 80\gamma_0^m}{68 - 8\gamma_0^m} & \frac{dW}{d\tau^*} < 0 & \quad \text{if } \tau^* < \frac{120\gamma_0^e - 90}{9 + 9\gamma_0^e} \\ \frac{dW^*}{d\tau^*} > 0 & \quad \text{if } \tau^* < \frac{50 - 80\gamma_0^{*m}}{68 - 8\gamma_0^{*m}} & \frac{dW^*}{d\tau} < 0 & \quad \text{if } \tau < \frac{120\gamma_0^{*e} - 90}{9 + 9\gamma_0^{*e}} \end{aligned} \quad (7)$$

### 2.1.2 Nash Equilibrium

Consider that when each government sets its tariff policy unilaterally, it chooses a tariff in order to maximize its own aggregate welfare function. Therefore, the outcome becomes the best-response tariffs, i.e.,  $(\tau^N, \tau^{*N})$  such that:

$$W_\tau(\tau^N, \tau^{*N}) = 0 \quad (8)$$

and  $W_{\tau^*}(\tau^N, \tau^{*N}) = 0$

The trade policy in this situation possesses properties similar to the prisoner-dilemma game. When governments unilaterally set tariffs, they try to influence term-of-trade in their favor. With term-of-trade externality, tariffs are higher than efficient.

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<sup>6</sup>  $\frac{dW}{d\tau} = \frac{50 - 68\tau + 2\gamma_0^m(40 + 4\tau)}{49}$   
 $\frac{dW}{d\tau^*} = \frac{90 + 9\tau^* - 3\gamma_0^e(40 - 3\tau^*)}{49}$

Rewrite the aggregate welfare function in equation (5) in terms of domestic and world price:

$$W(p_x, p_x^w, p_x^w; \gamma_0^m, \gamma_0^e) = v + CS_x(p_x) + CS_y(p_y^w) + \gamma_0^m \pi_x(p_x) + \gamma_0^e \pi_y(p_y^w) + (p_x - p_x^w)M(p_x) \quad (9)$$

$$W^*(p_x^w, p_y^*, p_y^w; \gamma_0^{*m}, \gamma_0^{*e}) = x_0^* + CS_x^*(p_x^w) + CS_y^*(p_y^*) + \gamma_0^{*e} \pi_x^*(p_x^w) + \gamma_0^{*m} \pi_y^*(p_y^*) + (p_y - p_y^w)M^*(p_y^*)$$

Then we can write the first order condition for Nash tariff setting as follows:

$$W_{p_1^w} \frac{dp_x^w}{d\tau} + W_{p_1} \frac{dp_x}{d\tau} = 0 \quad (10)$$

$$W_{p_2^w}^* \frac{dp_y^w}{d\tau^*} + W_{p_2}^* \frac{dp_y^*}{d\tau^*} = 0 .$$

These conditions reflect the term-of-trade effect on policy setting. An increase in tariff yields a favorable effect on terms of trade. However, it also increases the domestic price which redistributes surplus from consumers to producers while incurring a welfare loss. The higher weight put on producer surplus makes a higher best-response tariff.

From (8), the best-response tariffs in our model are:

$$\tau^N(\gamma^m) = \frac{5(8\gamma^m - 5)}{2(17 - 2\gamma^m)} \quad (11)$$

$$\tau^{*N}(\gamma^{*m}) = \frac{5(8\gamma^{*m} - 5)}{2(17 - 2\gamma^{*m})} .$$

Then from the restriction for positive trade volumes that  $\tau \leq \frac{10}{6}$  and  $\tau^* \leq \frac{10}{6}$ , we have :

$$\gamma^m \leq \frac{49}{28} \quad \text{and} \quad \gamma^{*m} \leq \frac{49}{28} . \quad (12)$$

This condition implies that, in order to have positive trade volumes in the best-response tariff setting, the political influence of the import sector cannot be too large. Otherwise, the government sets a tariff too high and international trade cannot occur.

### 2.1.3 Trade Agreement

In the last section, we consider tariff policies in a case where each government unilaterally set its own tariffs. In this section, trade agreement is introduced to bring about an efficient tariff policy.<sup>7</sup>

Letting  $(\tau^c, \tau^{*c})$  denote the tariff policy that maximizes the joint welfare function, then  $(\tau^c, \tau^{*c})$  is such that:

$$W_{\tau}(\tau^c, \tau^{*c}) + W_{\tau^*}(\tau^c, \tau^{*c}) = 0 \quad (13)$$

and  $W_{\tau^*}(\tau^c, \tau^{*c}) + W_{\tau}(\tau^c, \tau^{*c}) = 0.$

With the model specification, we have:

$$\tau^c(\gamma^m, \gamma^{*e}) = \frac{40(1 + 2\gamma^m - 3\gamma^{*e})}{59 - 8\gamma^m - 9\gamma^{*e}} \quad (14)$$

$$\tau^{*c}(\gamma^{*m}, \gamma^e) = \frac{40(1 + 2\gamma^{*m} - 3\gamma^e)}{59 - 8\gamma^{*m} - 9\gamma^e}.$$

From (14), the most cooperative tariff leads to reciprocal free trade when there are no political influences (e.g.  $\gamma^m = \gamma^e = \gamma^{*m} = \gamma^{*e} = 1$ ). Otherwise, there is an import tariff in the trade policy that maximizes the joint welfare function.

**Claim 1 (Bagwell and Staiger 2001)** : *The best response tariffs are not efficient.*

Since the terms-of-trade effect influences the Nash tariff policies, but not efficient trade policies, the best-response tariffs are not efficient.

Bagwell and Staiger (1999) introduce the concept of politically optimal tariffs. These tariffs are what governments choose when they do not take term-of-trade effect into account. Therefore, the politically optimal tariffs are tariff pair  $(\tau^{PO}, \tau^{*PO})$  such that:

$$W_{p_x} = 0 = W_{p_y} \quad (15)$$

$$W_{p_x}^* = 0 = W_{p_y}^*$$

**Proposition 1**: *Under quasi-linear utility model with only one policy instrument (import tariff), the tariff policy maximizes the joint welfare function if and only if it is politically optimal.*

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<sup>7</sup> We consider the case that transfers are allowed in the original negotiation. Later in trade renegotiation, we will consider both the case when transfers are allowed and not allowed.

*Proof:* From the aggregate welfare functions in equation (9), we have joint welfare function  $J(p_x, p_y) = W + W^*$ , independent of world prices from the requirements of market clearing:  $M(p_x) = E^*(p_x^*)$  and  $E(p_y) = M^*(p_y^*)$ . As a result, the most cooperative tariff in this case can be rewritten from

$$W_{p_x} \frac{dp_x}{d\tau} + W_{p_x^w} \frac{dp_x^w}{d\tau} + W_{p_x^*}^* \frac{dp_x^w}{d\tau} \quad \text{and} \quad W_{p_y^*}^* \frac{dp_y^*}{d\tau^*} + W_{p_y^w}^* \frac{dp_y^w}{d\tau^*} + W_{p_y^w} \frac{dp_y^w}{d\tau^*}$$

to  $W_{p_x} \frac{dp_x}{d\tau} = 0$  and  $W_{p_y^*}^* \frac{dp_y^*}{d\tau^*} = 0$

which means that  $W_{p_x} = 0$  and  $W_{p_y^*}^* = 0$ . *Q.E.D.*

## 2.2 Two instruments

In this section, suppose that both governments can use the import tariffs and export subsidies. Let  $\tau_x$  and  $\tau_y$  be the import tariff and export subsidy of Home. Also, let  $\tau_x^*$  and  $\tau_y^*$  be the export subsidy and import tariff of Foreign respectively. Then we can define local prices as follows:

$$\begin{aligned} p_x &= p_x^* + \tau_x - \tau_x^* \\ p_y &= p_y^* + \tau_y - \tau_y^* \end{aligned}$$

Moreover, the world prices can be defined as:

$$\begin{aligned} p_x^w &= p_x - \tau_x \\ p_y^w &= p_y - \tau_y \end{aligned}$$

Next, the domestic import function is defined as  $M(p_x(\tau_x, \tau_x^*)) = D(p_x(\tau_x, \tau_x^*)) - Q_x(p_x(\tau_x, \tau_x^*))$  and the domestic export function is  $E(p_y(\tau_y, \tau_y^*)) = Q_y(p_y(\tau_y, \tau_y^*)) - D(p_y(\tau_y, \tau_y^*))$ . The restriction to assure that trade volumes are positive is:

$$\begin{aligned} M(p_x(\tau_x, \tau_x^*)) > 0 & \quad \text{iff } \tau_x - \tau_x^* < \frac{10}{6} \\ E(p_y(\tau_y, \tau_y^*)) > 0 & \quad \text{iff } \tau_y^* - \tau_y < \frac{10}{6}. \end{aligned} \tag{16}$$

Foreign import and export functions  $M^*(p_y^*(\tau_y, \tau_y^*))$  and  $E^*(p_x^*(\tau_x, \tau_x^*))$  can be defined symmetrically with  $M(p_x(\tau_x, \tau_x^*)) = E^*(p_x^*(\tau_x, \tau_x^*))$  and  $E(p_y(\tau_y, \tau_y^*)) = M^*(p_y^*(\tau_y, \tau_y^*))$ .

### 2.2.1 Government objectives

We still use the government welfare function in Baldwin (1987). The government welfare function is similar to the one-instrument case except that there is an export subsidy included in the welfare function. The welfare functions are:

$$W(p_x, p_y, p_x^w, p_y^w; \gamma_0^m, \gamma_0^e) = x_0 + CS_x(p_x) + CS_y(p_y) + \gamma_0^m \pi_x(p_x) + \gamma_0^e \pi_y(p_y) + (p_x - p_x^w)M(p_x) - (p_y - p_y^w)E(p_y)$$

$$W^*(p_x^*, p_y^*, p_x^{*w}, p_y^{*w}; \gamma_0^{*m}, \gamma_0^{*e}) = x_0^* + CS_x^*(p_x^*) + CS_y^*(p_y^*) + \gamma_0^{*e} \pi_x^*(p_x^*) + \gamma_0^{*m} \pi_y^*(p_y^*) + (p_y^* - p_y^{*w})M^*(p_y^*) - (p_x^* - p_x^{*w})E^*(p_x^*).$$

The best-response tariffs are set to maximize each country's welfare. Therefore, it is tariff policy  $(\tau_x, \tau_y)$  that maximizes Home's welfare and  $(\tau_x^*, \tau_y^*)$  that maximizes Foreign's welfare. As both countries are ex-ante symmetrical,  $\tau_x^N = \tau_y^{*N} = \tau_m^N$  and  $\tau_y^N = \tau_x^{*N} = \tau_e^N$  where

$$\tau_x^N(\gamma^m, \gamma^{*e}) = \frac{5(51\gamma^{*e} + 104\gamma^m - 24\gamma^m\gamma^{*e} - 113)}{3(101 - 8\gamma^m - 9\gamma^{*e})}$$

$$\tau_y^N(\gamma^{*m}, \gamma^e) = \frac{5(56\gamma^{*m} + 123\gamma^e - 24\gamma^{*m}\gamma^e - 179)}{3(101 - 8\gamma^{*m} - 9\gamma^e)} \quad (17)$$

$$\tau_x^{*N}(\gamma^m, \gamma^{*e}) = \frac{5(56\gamma^m + 123\gamma^{*e} - 24\gamma^m\gamma^{*e} - 179)}{3(101 - 8\gamma^m - 9\gamma^{*e})}$$

$$\tau_y^{*N}(\gamma^{*m}, \gamma^e) = \frac{5(51\gamma^e + 104\gamma^{*m} - 24\gamma^{*m}\gamma^e - 113)}{3(101 - 8\gamma^{*m} - 9\gamma^e)}.$$

### 2.2.3 Trade agreement

When there are export subsidies, all efficient tariff agreements maximize the joint welfare function.<sup>8</sup> The joint welfare function  $W + W^*$  is independent of world prices. Therefore, it is a function of net tariffs  $\tau_x - \tau_x^*$  and  $\tau_y - \tau_y^*$ . The efficient tariff agreements are  $(\tau_x^c, \tau_y^c, \tau_x^{*c}, \tau_y^{*c})$  such that:

$$\tau_x^c - \tau_x^{*c} = \frac{40 + 80\gamma^m - 120\gamma^{*e}}{59 - 8\gamma^m + 9\gamma^{*e}} \quad (18)$$

$$\tau_y^c - \tau_y^{*c} = \frac{40 + 80\gamma^{*m} - 120\gamma^e}{59 - 8\gamma^{*m} + 9\gamma^e}$$

which are not unique.

Next, consider the politically optimal tariffs according to (15). Given that Home and Foreign are symmetrical, the politically optimal tariffs are the import tariff and export subsidy  $\tau_m^{PO}$  and  $\tau_e^{PO}$  such that

$$\tau_m^{PO} = \frac{40(\gamma^m - 1)(3 - \gamma^e)}{59 - 8\gamma^m - 9\gamma^e} \quad (19)$$

$$\tau_e^{PO} = \frac{40(\gamma^e - 1)(4 - \gamma^m)}{59 - 8\gamma^m - 9\gamma^e}.$$

With the absent of political pressure, politically optimal tariff policy is reciprocal free trade.

### 3. The legal framework for renegotiation in the WTO

There are two provisions of the WTO agreement that allow WTO members to change or withdraw a previously agreed-to tariff concession. The first one is Article XIX, an escape clause, allowing WTO members to change or withdraw tariffs temporarily. This provision gives WTO members the right to take a safeguard action to protect a specific domestic industry facing an unforeseen injury from an increase in import competition (Article XIX, supra note 1). The escape clause only provides temporary safeguard measures. All existing safeguard measures taken under Article XIX have to be

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<sup>8</sup> Export subsidies can be substituted for transfers between two countries

terminated not later than eight years after the date on which they were applied, or five years after the date of entry into force of the agreement establishing the WTO (Article XIX, *supra* note 3).

The provision we are concerned with here is the second one, Article XXVIII of the GATT 1994, the modification of schedules, provided for on January 1, 1951. This article governs the renegotiation to change tariffs permanently. The article allows WTO members to modify or withdraw a tariff concession previously negotiated after the termination of a successive three-year period.

Unlike Article XIX, Article XXVIII does not specify the circumstances under which deviation from concessions is permissible. Instead it sets up a procedure, subject to certain constraints, under which any tariff concession can be withdrawn or modified for an indefinite period of time.<sup>9</sup> However, this provision has a limitation for the retaliatory withdrawal of concessions to satisfy the principle of reciprocity. If the renegotiation is not successful, a member who proposed renegotiation is free to withdraw or modify its concessions, but all other members involved in negotiations are allowed to withdraw “substantially equivalent concessions” initially negotiated, not later than six months afterward (Article XXVIII 3(a)). Furthermore, when agreement on the renegotiation can be reached among the members primarily concerned, but not the members having substantial interest<sup>10</sup>, the latter is free to retaliate by withdrawing a “substantially equivalent concession” not later than six months (Article XXVIII 3(b)). The word “substantially equivalent concessions” requires the use of the principle of reciprocity in Article XXVIII when negotiating parties cannot reach an agreement.<sup>11</sup> The reciprocity restriction implies that the renegotiation process in the WTO limits the level of retaliation

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<sup>9</sup> Schwartz and Sykes (2002)

<sup>10</sup> A member with substantial interest is a member that has a significant share of the market of which the member primarily concerned is asking for renegotiation (The understanding on the interpretation of Article XXVIII of the GATT 1994).

<sup>11</sup> Article XXVIII *supra* note 2 provides that in the renegotiation, which may include a provision for compensation with respect to other products, the negotiating parties concerned shall endeavor to maintain a general level of reciprocal and mutually advantageous concessions not less favorable to trade than that provided for in this agreement prior to such negotiations. However, according to Article XXVIII *supra* note 1, when both members primarily concerned, and the members having substantial interest, all reach agreement, the schedules are modified accordingly. This implies that when an agreement is reached, the negotiated tariffs do not need to be reciprocal ones. The reciprocity is required only when members cannot reach an agreement.

up to the point at which world prices or each government's welfare are unaffected.<sup>12</sup> We will explain more about the principle of reciprocity in section 4.<sup>13</sup>

#### 4. The tariff renegotiation game

In this section, we will describe a renegotiation game according to Article XXVIII and examine whether the renegotiation process brings about efficient tariffs or not. We will first consider the one-instrument case and later extends to the two-instrument case.

Suppose that in the first period, both countries commit to a politically optimal trade agreement following tariffs in (14). In the next period, there is an unanticipated permanent political shock<sup>14</sup> in Home so that the weight  $\gamma^m$  on the importing industry increases from  $\gamma^m = 1$  to  $\gamma^m > 1$  and Home would like to modify its tariff rate. The weight on the importing country can either change to  $\gamma_1^m$  (low type) or  $\gamma_2^m$  (high type) where  $\gamma_1^m < \gamma_2^m$ . Therefore, Home would like to increase its tariff.<sup>15</sup> Section 5 considers the case in which value of  $\gamma^m$  is publicly known while section 6 studies the case in which only Home knows the new value of  $\gamma^m$ .

Before describing a renegotiation game, reciprocity in our model is described.

##### 4.1 Reciprocity

The principle of reciprocity has been a feature of tariff negotiation under the GATT/WTO since the inception of the GATT 1947. Although the GATT does not

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<sup>12</sup> Bagwell and Staiger (2001)

<sup>13</sup> An example of a case in which reciprocity is applied in the WTO is the US Anti-dumping Act of 1916. The European Communities (EC) made a request on January 7, 2002 to the dispute settlement body (DSB) that the 1916 Act should not be allowed under the WTO agreements. The 1916 Act was found to be WTO-inconsistent, and the United States has not complied with the DSB recommendations to bring its measure into conformity with the WTO obligations. Therefore, the EC has a right to suspend obligations under the GATT 1994 subject to the important proviso that whatever obligations the EC suspends, the overall quantified level of suspension cannot exceed the quantified level of nullification and impairment. See more The Decision by the Arbitrators on *United States – Anti-Dumping Act of 1916* (February, 2004).

<sup>14</sup> See 13.

<sup>15</sup> The reason why a political weight of both types is greater than one is that if the political weight of one type is equal to one, it will not offer renegotiation. As a result, private information has no effect on the renegotiation process. Since we consider only the case in which the reciprocity condition is required, reciprocal free trade maximizes Home's welfare when  $\gamma^m = 1$ . Therefore, Home has no need to offer renegotiation.



require the reciprocal tariff as the outcome of negotiation directly, it is when countries fail to reach an agreement under renegotiation that the GATT requires reciprocal and mutually advantageous concessions.<sup>16</sup> To be precise, when negotiating parties cannot reach an agreement, one 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. In other words, the negotiation must lead to tariffs that make two countries have equal changes in trade values. To formalize the principle of reciprocity under partial equilibrium of a quasi-linear model, we follow the definition that Bagwell and Staiger (2001) provide.

The general meaning of reciprocity refers to a balance of concessions, i.e., mutual changes in tariff policy bring about equal changes in the trade volumes of each country.

Let  $(\tau, \tau^*)$  be the proposed tariffs, and  $(\tau^c(\gamma_0^m, \gamma_0^{*e}), \tau^{*c}(\gamma_0^{*m}, \gamma_0^e))$  be previously agreed-to tariffs, and then reciprocity provides the following condition:

$$\begin{aligned} & p_x^w(\tau^c(\gamma_0^m, \gamma_0^{*e}))[M(\tau) - M(\tau^c(\gamma_0^m, \gamma_0^{*e}))] + M_v(\tau) - M_v(\tau^c(\gamma_0^m, \gamma_0^{*e})) \\ & = p_y^w(\tau^{*c}(\gamma_0^{*m}, \gamma_0^e))[M^*(\tau^*) - M^*(\tau^{*c}(\gamma_0^{*m}, \gamma_0^e))] \end{aligned} \quad (20)$$

where  $m_0$  denotes domestic imports of numeraire good  $v$ . The requirement of balanced trade at original world prices eliminates trade in numeraire 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.<sup>17</sup> Then we can rewrite the reciprocity condition as:

$$[p_x^w(\tau) - p_x^w(\tau^c(\gamma_0^m, \gamma_0^{*e}))]M(\tau) = [p_y^w(\tau^*) - p_y^w(\tau^{*c}(\gamma_0^{*m}, \gamma_0^e))]M^*(\tau^*). \quad (21)$$

For given  $\tau^c(\gamma_0^m, \gamma_0^{*e})$  and  $\tau^{*c}(\gamma_0^{*m}, \gamma_0^e)$ , we can solve  $\tau^*$  in terms of  $\tau$ . With the symmetric model such that  $M(x) = M^*(x)$ ,  $p_x^w(x) = p_y^w(x)$  and  $\tau^c(\gamma_0^m, \gamma_0^{*e}) = \tau^{*c}(\gamma_0^{*m}, \gamma_0^e)$ , then the reciprocity restriction according to (21) implies that  $\tau^* = \tau$ .

<sup>16</sup> See Bagwell and Staiger (1999, 2001, 2002)

<sup>17</sup> Bagwell and Staiger (2001)

## 4.2 The Structure of the renegotiation game

Following from Article XXVIII of the GATT 1994 that establishes procedures for withdrawal or modification of tariff concessions, we consider the tariff renegotiation process in a four-stage sequential game. Suppose that Home and Foreign initially agree upon politically optimal tariffs and there is a change in Home political weight in the importing country as described before.

According to Article XXVIII, Home makes a tariff proposal  $(\tau, \tau^*)$ . Next, Foreign considers whether to accept or reject the proposal  $(\tau, \tau^*)$ . If Foreign accepts, this tariff  $(\tau, \tau^*)$  is implemented. However, when Home and Foreign cannot reach an agreement, the reciprocity restriction governs renegotiation. Home can offer another proposal that satisfies the reciprocity restriction. Foreign chooses whether to accept the offer or not. If Foreign accepts, both countries choose whether to commit the agreement or defect and trigger trade wars. If not, Home and Foreign simultaneously choose whether to commit to the previous agreement or trigger trade wars.<sup>18</sup>

However, for now, we consider the renegotiation for which the reciprocity restriction is required. In the first stage, Home determines whether to use Article XXVIII or not. If not, Home decides whether to commit to the previous agreement or trigger trade wars.<sup>19</sup> If it chooses to call for Article XXVIII, Home has to decide what level of a tariff rate it should propose. Once the Home tariff is determined, the Foreign tariff is one that satisfies the reciprocity restriction such that  $\tau = \tau^*$ . After that, Foreign has to decide whether it should accept or reject the proposed tariffs from Home. If Foreign accepts, Home can either commit to the new tariff agreement or trigger trade wars. Otherwise, in the final stage, Home and Foreign simultaneously choose whether to follow the previously agreed-to tariffs (reciprocal free trade) or to deviate to choose best-response tariffs.

In summary, there are three possible outcomes from the tariff renegotiation game. First, both countries commit to proposed tariffs from Home. Second, both countries

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<sup>18</sup> In this study, we consider the case that the political shocks are unanticipated. If political shocks are anticipated, Home and Foreign would negotiate the initial trade agreement contingent on the value of political shocks and there is no need for renegotiation.

<sup>19</sup> In case that Home decides not to use Article XXVIII and triggers trade wars, Article XXIII: Nullification or impairment is called for in which any other contracting party can withdraw from the original agreement.

implement previously agreed tariffs. Finally, Home or Foreign deviates to choose the best response tariffs. Considering the results from renegotiation in the GATT/WTO, Hoda (2001) surveys renegotiations in the GATT/WTO from 1974-1999 and finds that proposed tariffs were committed to after renegotiation in most cases. In some cases, the renegotiation invoked withdrawal of tariff concessions. In other cases, members implemented tariff rates from negotiations held earlier.<sup>20</sup> There is no evidence that Article XXVIII leads to trade wars. This might come from the fact that if members want to trigger trade wars, they can do so immediately without calling for Article XXVIII. Later, we will find that the results of our renegotiation game support the outcomes from renegotiation in the GATT/WTO.

During the period from 1958 to 1994, renegotiations under Article XXVIII were generally successful. There were three cases in which a principal supplying the interest invoked withdrawal of concessions and its trading partner withdrew a substantially equivalent concession. During the period from 1995 to 1999, there was one case in which the renegotiation brought about a tariff from a negotiation held earlier.

Considering tariff renegotiations which occurred during the years 1957-1999, we can see that the renegotiations were mostly successful. There were only a few cases in which tariff proposals were rejected. The first explanation for this is that according to Article XXVIII, if Home anticipates that the tariff proposal will be rejected, it will commit to the previous agreement or trigger trade war immediately in the first period. The second explanation is that, with an MFN basis, an initial withdrawal of concessions brings about a chain of retaliatory withdrawals from other trading partners. As a result, a country tries to avoid retaliatory withdrawals and accepts a tariff proposal. In our study, we focus on the two-country model. Therefore, the MFN principle does not affect our renegotiation game. The extension to a model with more than two countries would be an interesting topic for further study. We will mention this point in the last section.

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<sup>20</sup> See Table 1-1.

The renegotiation game can be formally defined as follows:

Stage 0: Home decides whether to use article XXVIII or not. If not, both Home and Foreign will choose whether to commit to the previous agreement,  $(\tau^c(\gamma_0^m, \gamma_0^{*e}), \tau^{*c}(\gamma_0^{*m}, \gamma_0^e))$  or trigger trade wars,  $(\tau^N(\gamma_i^m), \tau^{*N}(\gamma_0^{*m}))$  simultaneously. If Home calls for Article XXVIII, the game will move on to the next stage.

Stage 1: Home offers modified tariffs,  $\tau$ , the Foreign tariff comes from one that satisfies the principle of reciprocity mentioned in (19), i.e.,  $\tau = \tau^*$ .

Stage 2: Foreign updates its prior belief ( $\rho$ ) after seeing Home's proposed tariff,  $\tau$ . Foreign chooses whether to accept or reject the modified tariffs that Home has offered.

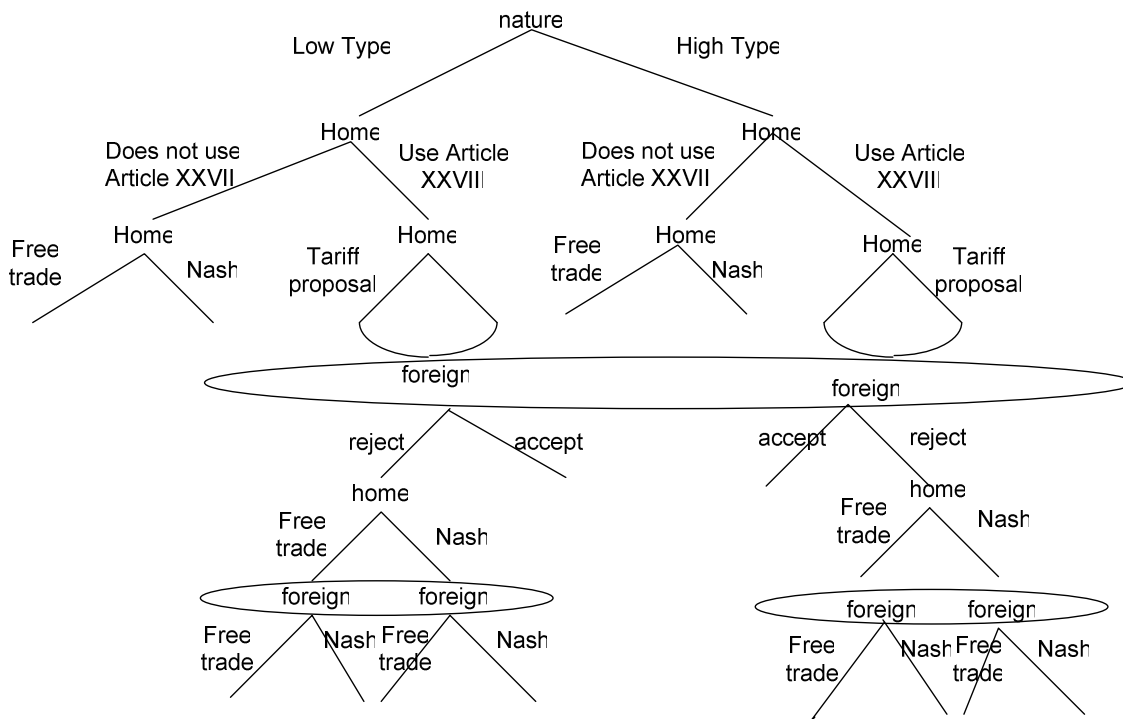
Stage 3: If Foreign chooses to reject in the second stage, Home and Foreign choose whether to commit to the previous agreement or to play their best-response tariffs simultaneously and separately. The game in the rejecting path becomes the repeated prisoner-dilemma game.

The equilibrium concept applied in this game is a perfect Bayesian equilibrium. To find the equilibrium of the renegotiation game, we use the backward induction method. The repeated scenario mentioned in the last section is included in the renegotiation game to consider the effect of trade wars on the outcome of the game.

Now let Home offer a tariff proposal satisfying the reciprocity condition. The proposed tariff might be used as a signal indicating Home's type when each type proposes a different tariff. After learning Home's proposed tariff, Foreign will update its prior probability  $\rho$ . Also, let  $\tau^M(\gamma_i^m) = \arg \max_{\tau} W(\tau, \tau; \gamma_i^m, \gamma_0^e)$ .  $\tau^M(\gamma_i^m)$  is the tariff that maximizes Home's welfare under the reciprocity restriction,  $\tau = \tau^*$ .

Before considering the case in which there is private information, we study the outcome of the tariff renegotiation game in a complete information environment as a benchmark case.

**Figure 4-1 : The structure of the tariff renegotiation game**



**5. The tariff renegotiation game (complete information)**

**5.1 The reciprocity restriction is imposed**

We will first consider the outcome of the tariff renegotiation game in a complete information environment and the reciprocity restriction is required.

From now on,  $(\tau^c, \tau^{*c})$  is the shorter notation for  $(\tau^c(\gamma_0^m, \gamma_0^{*e}), \tau^{*c}(\gamma_0^{*m}, \gamma_0^e))$ . Solve the game using the backward induction method. In the last stage of the renegotiation game, once Foreign rejects proposed tariffs, Home and Foreign have to decide simultaneously whether they should commit to previously agreed tariffs, or trigger trade wars. This brings about the repeated prisoner-dilemma game in the rejecting path, with the payoff as follows:

One-shot payoff		Foreign	
		Cooperative	Best-Response
Home	Cooperative	$W(\tau^c, \tau^{*c}), W^*(\tau^c, \tau^{*c})$	$W(\tau^c, \tau^{*N}), W^*(\tau^c, \tau^{*N})$
	Best-Response	$W(\tau^N, \tau^{*c}), W^*(\tau^N, \tau^{*c})$	$W(\tau^N, \tau^{*N}), W^*(\tau^N, \tau^{*N})$

Continuation Payoff		Foreign	
		Cooperative	Best-Response
Home	Cooperative	$W(\tau^c, \tau^{*c}), W^*(\tau^c, \tau^{*c})$	$W(\tau^c, \tau^{*N})(1-\delta) + W(\tau^N, \tau^{*N})\delta$ $, W^*(\tau^c, \tau^{*N})(1-\delta) + W^*(\tau^N, \tau^{*N})\delta$
	Best-Response	$W(\tau^N, \tau^{*c})(1-\delta) + W(\tau^N, \tau^{*N})\delta$ $, W^*(\tau^N, \tau^{*c})(1-\delta) + W^*(\tau^N, \tau^{*N})\delta$	$W(\tau^N, \tau^{*N}), W^*(\tau^N, \tau^{*N})$

**Assumption 1:**  $W(\tau^c, \tau^{*c}; \gamma_1^m, \gamma_0^e) > W(\tau^N(\gamma_1^m), \tau^{*N}(\gamma_0^{*m}); \gamma_1^m, \gamma_0^e)$  but

$$W(\tau^c, \tau^{*c}; \gamma_2^m, \gamma_0^e) < W(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_2^m, \gamma_0^e).$$

Assumption 1 implies that the high type always chooses to trigger trade wars whenever Foreign rejects its proposal. Only the low type might commit to the previous tariff agreement, i.e. reciprocal free trade.

When Foreign rejects Home's proposal, the low type and Foreign to commit the previous agreement  $(\tau^c, \tau^{*c})$  if:

$$W(\tau^c, \tau^{*c}; \gamma_1^m, \gamma_0^e) \geq (1-\delta)W(\tau^N(\gamma_1^m), \tau^{*c}; \gamma_1^m, \gamma_0^e) + \delta W(\tau^N(\gamma_1^m), \tau^{*N}(\gamma_0^{*m}); \gamma_1^m, \gamma_0^e)$$

and (22)

$$W^*(\tau^c, \tau^{*c}; \gamma_0^{*m}, \gamma_0^e) \geq (1-\delta)[W^*(\tau^c, \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_0^e) + \delta W^*(\tau^N(\gamma_1^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_0^e)].$$

From (20), there exists a cut off discount rate  $\bar{\delta}$  such that for  $\delta \in (0, \bar{\delta})$ , Home chooses to trigger trade wars regardless of his type, and for  $\delta \in [\bar{\delta}, 1]$ , low type and Foreign chooses to commit to the previous agreement.

**Assumption 2:**  $\delta \geq \bar{\delta}$

We restrict our study to the case in which  $\delta$  is sufficiently high so that the low type is willing to commit to the previous agreement.

Next, several lemmas are drawn to summarize the outcome of the game in stages 3 and 2 accordingly.

**Lemma 1:** *If Foreign rejects, both countries commit to the previous agreement if Home is of low type, and trigger trade wars if Home is of high type.*

Lemma 1 comes from Assumptions 1 and 2.

**Lemma 2:** *Foreign always rejects any tariff offer other than  $\tau^c$  from the low type.*

With the reciprocity restriction, Foreign welfare is maximized at  $\tau^c$ . Therefore, from Lemma 1, if facing the low type, Foreign rejects any tariff proposal which does not equal  $\tau^c$ .

**Lemma 3:** *Defining  $\bar{\tau}_2$  such that  $W^*(\bar{\tau}_2, \bar{\tau}_2; \gamma_0^{*m}, \gamma_0^{*e}) = W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_0^{*e})$ , Foreign accepts the tariff proposal  $\tau$  from high type if and only if  $\tau \leq \bar{\tau}_2$ .*

From Lemma 1, both countries set the best-response tariffs when Foreign rejects the proposal from the high type. Therefore, Foreign accepts the proposal  $\tau$  if it brings about the higher welfare than trade wars. Since Foreign welfare with the reciprocity restriction is maximized at  $\tau^c(\gamma_0^m, \gamma_0^{*e})$ , the reciprocal free trade, and the welfare is the concave function in  $\tau$ , its welfare is decreasing in  $\tau$  for  $\tau > 0$ . Therefore, Foreign rejects any tariff higher than  $\bar{\tau}_2$ .

Consider the first stage; the maximization problem of the low type is that:

$$\begin{aligned} \max_{\tau} W(\tau, \tau; \gamma_1^m, \gamma_0^e) \\ \text{s.t. } W^*(\tau, \tau; \gamma_0^{*m}, \gamma_0^{*e}) \geq W^*(\tau^c, \tau^c) \end{aligned} \tag{M1}$$

The optimal tariff proposal for the low type is then  $\tau^c(\gamma_0^m, \gamma_0^{*e})$ .

As for the high type, the maximization problem is that:

$$\begin{aligned} \max_{\tau} W(\tau, \tau; \gamma_2^m, \gamma_0^e) \\ \text{s.t. } W^*(\tau, \tau; \gamma_0^{*m}, \gamma_0^{*e}) \geq W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m})) \end{aligned} \tag{M2}$$

**Lemma 4:** *Given that there are positive trade volumes, i.e.  $\gamma_2^m < \frac{49}{28}$ , Foreign always accepts the tariff from a high type that maximizes the high type's welfare s.t. reciprocity ( $\tau^M(\gamma_2^m)$ ).*

*Proof:* See appendix.

Intuitively, when the political pressure is not so high,  $\tau^M(\gamma_2^m)$  is more attractive for Foreign than triggering trade wars.

**Lemma 5:** *Home uses Article XXVIII if and only if its tariff proposal will be accepted.*

If Home anticipates that Foreign will reject its tariff proposal, Home country can either commit the previous agreement or trigger trade wars immediately at the stage 0. There is no need to use Article XXVIII.

From Lemmas 1 to 5, and Assumptions 1 and 2 given above, the outcomes of the tariff renegotiation game are that the low type does not use Article XXVIII and continues to commit to the previous agreement. The high type uses Article XXVIII and offers  $\tau^M(\gamma_2^m)$  and Foreign accepts. The tariff outcomes are summarized in the following proposition.

**Proposition 3:** *The outcome of the tariff renegotiation game in a complete information environment is that:*

- i) *The low type never uses Article XXVIII. It continues to commit to the previous agreement.*
- ii) *The high type offers the tariff that maximizes the high type's welfare ( $\tau^M(\gamma_2^m)$ ) and Foreign accepts.*

*Proof:* See appendix.

Next, we consider the efficiency of the outcome from the tariff renegotiation game. Obviously, the outcome is not the politically optimal tariffs defined in (14). However, the outcome is pareto-efficient constrained with the reciprocity condition,  $\tau = \tau^*$ . The maximization problems (M1) and (M2) bring about pareto-efficient tariffs.

**Proposition 4:** *The efficiency of the tariff renegotiation game (complete information)*

- i) *The tariff outcome from the renegotiation game is not politically optimal.*
- ii) *The tariff outcome is pareto-efficient constrained with the reciprocity condition.*



## 5.2 Reciprocity is not imposed

In this section, we consider the full renegotiation game in which reciprocity restriction may not be required. The renegotiation game is that Home first offers the tariff proposal  $(\tau, \tau^*)$ . Foreign can either reject or accept. If Foreign rejects, Home can offer another tariff proposal  $(\tau, \tau)$  which satisfies reciprocity restriction. Foreign again can choose either to accept or reject. Finally, if Foreign rejects, both countries choose simultaneously either to trigger trade wars or commit to the previous agreement.

The low type's maximization problem is:

$$\begin{aligned} \max_{\tau, \tau^*} W(\tau, \tau^*; \gamma_1^m, \gamma_0^e) \\ \text{s.t. } W^*(\tau, \tau^*; \gamma_0^{*m}, \gamma_0^{*e}) \geq W^*(\tau^c, \tau^{*c}; \gamma_0^{*m}, \gamma_0^{*e}). \end{aligned} \quad (\text{M3})$$

As for the high type, the maximization problem is that:

$$\begin{aligned} \max_{\tau, \tau^*} W(\tau, \tau^*; \gamma_2^m, \gamma_0^e) \\ \text{s.t. } W^*(\tau, \tau^*; \gamma_0^{*m}, \gamma_0^{*e}) \geq W^*(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m); \gamma_0^{*m}, \gamma_0^{*e}). \end{aligned} \quad (\text{M4})$$

Since Foreign knows that the low type will offer  $(\tau^c, \tau^{*c})$  and the high type will offer  $(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m))$  when the renegotiation game reaches the stage that the reciprocity restriction is required, Home has to offer tariffs that at least give Foreign the welfare it can obtain when the reciprocity condition is imposed. The next proposition summarizes the outcome of the renegotiation game.<sup>21</sup>

***Proposition 5:*** *The outcome of the renegotiation game when the reciprocity restriction is not required.*

- i) *The low type does not use Article XXVIII and commits to the reciprocal free trade agreement.*
- ii) *The high type calls for Article XXVIII and offers  $(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m))$  and Foreign accepts.*

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<sup>21</sup> We consider the game when lump-sum transfers are not allowed, However, if we allow lump-sum transfers, the game will end at the stage that reciprocity restriction is not required and the surplus of the renegotiation will be redistributed between countries via transfers. When lump-sum transfers are allowed and reciprocity restriction is not required, the outcome of the game will be politically optimal and pareto efficient. We will discuss more in Section 7.

Intuitively, Foreign always rejects the tariff proposal  $(\tau, \tau^*)$  that maximizes Home's welfare since it gives Foreign the lower welfare than the Nash tariff policy. Therefore, Home has to offer the tariff proposal that binds Foreign's participation constraint. As a result, the tariff outcome does not differ from the case that the reciprocity restriction is required.

### 5.3 Two-instrument case

So far, we consider when the import tariff is the only trade policy instrument. In the last section, we know that the tariff outcome is not unconstrained efficient even in a complete information environment. The lack of policy instruments can be a reason of inefficiencies. In this section, we suppose that governments can set both import tariffs and export subsidies.

The renegotiation game is similar to the last section. First, Home chooses either to call for Article XXVIII or not. Next, if Home wants to use Article XXVIII, it has to decide the tariff proposal  $(\tau_x, \tau_y, \tau_x^*, \tau_y^*)$ . Foreign can either accept or reject this proposal. If Foreign rejects, Home can offer another proposal which satisfies reciprocity restriction. Foreign again can either accept or reject Home's proposal. Finally, if Foreign rejects, both simultaneously choose either to trigger trade wars or commit to the reciprocal free trade agreement.

In this case, the low type's maximization problem is

$$\begin{aligned} & \max_{\tau_x, \tau_y, \tau_x^*, \tau_y^*} W(\tau_x, \tau_y, \tau_x^*, \tau_y^*; \gamma_1^m, \gamma_0^e) \\ \text{s.t.} \quad & W^*(\tau_x, \tau_y, \tau_x^*, \tau_y^*; \gamma_0^{*m}, \gamma_0^{*e}) \geq W^*(0, 0, 0, 0; \gamma_0^{*m}, \gamma_0^{*e}). \end{aligned} \tag{M5}$$

As for the high type, the maximization problem is that:

$$\begin{aligned} & \max_{\tau_x, \tau_y, \tau_x^*, \tau_y^*} W(\tau_x, \tau_y, \tau_x^*, \tau_y^*; \gamma_1^m, \gamma_0^e) \\ \text{s.t.} \quad & W^*(\tau_x, \tau_y, \tau_x^*, \tau_y^*; \gamma_0^{*m}, \gamma_0^{*e}) \geq W^*(\tau_x^N(\gamma_2^m, \gamma_0^{*e}), \tau_y^N, \tau_x^{*N}(\gamma_2^m, \gamma_0^{*e}), \tau_y^{*N}; \gamma_0^{*m}, \gamma_0^{*e}). \end{aligned} \tag{M6}$$

As mentioned in the section 2, when there are two instruments, the efficient tariff agreements always maximize the joint welfare function. Therefore, to maximize Home's welfare according to (M5) and (M6), Home will offer the efficient tariffs which satisfy (18) and bind Foreign's participation constraint. The next proposition summarizes the outcome of the tariff renegotiation game.

***Proposition 6:*** *The tariff outcome when there are two instruments*

- i) *Home always offers efficient tariff agreements in (18) regardless of its type.*
- ii) *If Home is of low type, Foreign gains welfare equal to the welfare from the reciprocal free trade. If Home is of high type, Foreign gains welfare equal to the welfare from the Nash tariff policy.*

*Proof:* see appendix.

The outcome of the tariff renegotiation game when there are two instruments is pareto efficient. Therefore, adding a policy instrument can eliminate inefficiencies that occur from the renegotiation process. However, the tariff outcome is not politically optimal. Home has the first-mover advantage when it is the country that initiates renegotiation.

Considering the case that the reciprocity restriction is not required, we can apply the same logic as section 5.2 to conclude that the reciprocity restriction has no effect on the results of the renegotiation game. When the reciprocity is not imposed, Foreign always rejects any tariff proposal that gives Foreign the lower welfare than the tariff proposal when the reciprocity constraint is imposed. Therefore, the tariff outcome is similar to the case that the reciprocity restrict is required.

In the next section, we consider the renegotiation game in the private information environment.

## **6. The tariff renegotiation game (Home possesses private information)**

In this section, the tariff renegotiation game has the same structure as in the last section, except that Foreign does not know the new level of  $\gamma^m$ . Foreign only has a prior belief that  $\gamma_0^m$  changes to  $\gamma_1^m$  with probability  $\rho$  and to  $\gamma_2^m$  with probability  $1 - \rho$  where  $\gamma_1^m < \gamma_2^m$ .

Solve the game using the backward induction method. We will first consider the game in the last stage.

### **6.1 Stage 3**

The last stage of the game is the repeated prisoner-dilemma game mentioned in the last section. Assumption 1 and 2 are still applied in this game. The only difference comes from the fact that Foreign may not know the type of Home.

**Lemma 6:** *Let  $\rho'$  be the posterior probability. After seeing the tariff proposal from Home, the low type and Foreign commit to the previous agreement  $(\tau^c, \tau^{*c})$  if and only if:*

$$W(\tau^c, \tau^{*c}; \gamma_1^m, \gamma_0^e) \geq (1 - \delta)W(\tau^N(\gamma_1^m), \tau^{*c}; \gamma_1^m, \gamma_0^e) + \delta W(\tau^N(\gamma_1^m), \tau^{*N}(\gamma_0^{*m}); \gamma_1^m, \gamma_0^e) \quad (21)$$

$$\text{and } \rho' W^*(\tau^c, \tau^{*c}) \geq (1 - \delta)[\rho' W^*(\tau^c, \tau^{*N}(\gamma_0^{*m})) + (1 - \rho')(W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m})) - W^*(\tau^N(\gamma_2^m), \tau^c))] + \delta \rho' W^*(\tau^N(\gamma_1^m), \tau^{*N}(\gamma_0^{*m})).^{22} \quad (22)$$

If the tariff proposal can signal Home's type perfectly, the posterior belief is:

$$\rho' = 1 \quad \text{if Home is of low type}$$

$$\rho' = 0 \quad \text{if Home is of high type}$$

Otherwise,  $\rho' = \rho$ .<sup>23</sup>

If the tariff proposal can signal Home's type perfectly, there exists a cut off discount rate  $\bar{\delta}$  such that for  $\delta \in (0, \bar{\delta})$ , Home chooses to trigger trade wars regardless of its type, and for  $\delta \in [\bar{\delta}, 1]$ , only the low type chooses to commit to the previous agreement. Note that from (21) and (22), as the cut off discounted rate is an increasing function of political weight, Foreign always wants to commit to the previous agreement if

<sup>22</sup> (22) comes from the condition that committing to the previous agreement is better than defecting and triggering trade wars forever. We can write this condition formally as:

$$\rho' W^*(\tau^c, \tau^{*c}; \gamma_0^{*m}, \gamma_0^{*e}) + (1 - \rho')[W^*(\tau^N(\gamma_2^m), \tau^c; \gamma_0^{*m}, \gamma_0^{*e})(1 - \delta) + W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_0^{*e})\delta] \geq (1 - \delta)[\rho' W^*(\tau^c, \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_0^{*e}) + (1 - \rho')(W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_0^{*e}))] + \delta[\rho' W^*(\tau^N(\gamma_1^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_0^{*e}) + (1 - \rho')W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_0^{*e})]$$

<sup>23</sup> If  $\rho' = 1$ , the condition (20)-(21) becomes the usual repeated prisoner-dilemma game such that Home of type one and Foreign commit to the previous agreement if:

$$W(\tau^c, \tau^{*c}; \gamma_1^m, \gamma_0^e) \geq W(\tau^N(\gamma_1^m), \tau^{*c}; \gamma_1^m, \gamma_0^e)(1 - \delta) + W(\tau^N(\gamma_1^m), \tau^{*N}(\gamma_0^{*m}); \gamma_1^m, \gamma_0^e)\delta$$

and

$$W^*(\tau^c, \tau^{*c}; \gamma_0^{*m}, \gamma_0^{*e}) \geq (1 - \delta)[W^*(\tau^c, \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_0^{*e}) + \delta W^*(\tau^N(\gamma_1^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_0^{*e})]$$

If  $\rho' = 0$ , Foreign always triggers trade wars as  $W^*(\tau^N(\gamma_2^m), \tau^c) < W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}))$ .

Home wants to do so. If the tariff proposal cannot signal types, there exist both a cut-off discount rate  $\bar{\delta}$  and prior belief  $\bar{\rho}$  such that the low type and Foreign will commit to the previous agreement if and only if  $\delta \in [\bar{\delta}, 1]$  and  $\rho \in [\bar{\rho}, 1]$ . Since Assumption 2 is still applied, we consider only the case in which the low type chooses to commit to the previous agreement whenever Foreign rejects its tariff proposal and  $\rho' \geq \bar{\rho}$ .

## 6.2 Stage 2

In the second stage, Foreign has to decide whether to accept or reject Home's tariff proposal. Foreign accepts the tariff proposal  $\tau$  if this tariff leads to higher welfare than the welfare when rejecting.

**Lemma 7:** *if  $\rho > \bar{\rho}$ , Foreign accepts the proposal  $\tau$  if and only if*

$$W^*(\tau, \tau) \geq \rho' W^*(\tau^c, \tau^{*c}) + (1 - \rho') [(1 - \delta) W^*(\tau^N(\gamma_2^m), \tau^{*c}) + \delta W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}))]. \quad (23)$$

*Otherwise, Foreign accepts the proposal  $\tau$  if and only if*

$$W^*(\tau, \tau) \geq \rho' W^*(\tau^N(\gamma_1^m), \tau^{*N}(\gamma_0^{*m})) + (1 - \rho') W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m})). \quad (24)$$

## 6.3 Stage 1

In the first stage, Home has to decide which tariff proposal it should offer. Obviously, if  $\tau^M(\gamma_i^m)$  is accepted, Home of type i will offer  $\tau^M(\gamma_i^m)$ . Otherwise, it has to decide whether to offer  $\tau$  that satisfies Lemma 7 or to offer a tariff proposal that will be rejected and play the renegotiation game in the third stage. Furthermore, each type also needs to decide if it should offer the same tariff as the other type.

**Lemma 8:** *The low type will pretend to be the high type and offer  $\tau^M(\gamma_2^m)$  if and only if*

$$\gamma_1^m \text{ is high enough, i.e. } \gamma_1^m > \bar{\gamma}^m = \frac{25 - 8\gamma_2^m - 17(\gamma_2^m)^2}{50\gamma_2^m - 46 - 4(\gamma_2^m)^2}.$$

*Proof:* See appendix.

**Lemma 9:** *Consider when  $\gamma_1^m \leq \bar{\gamma}^m$ , the high type will pretend to be the low type by offering the reciprocal free trade agreement and defect to play the best-response tariff if and only if*

$$i) \rho > \bar{\rho}$$

$$ii) \delta < \frac{W(\tau^N(\gamma_2^m), \tau^{*c}) - W(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m))}{W(\tau^N(\gamma_2^m), \tau^{*c}) - W(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}))}$$

When Foreign still chooses to commit to the previous agreement at least for one period even though it cannot distinguish between two types and the low type offers the reciprocal free trade agreement, the high type may want to pretend to be the low type and cheat, which triggers trade wars forever, if it is impatient.

The game in stage zero is trivial. Home will call for Article XXVIII if it garners higher welfare than either committing to the previous agreement or triggering trade wars. Therefore, Lemma 5 is applied to the game.

The outcome from the tariff renegotiation game will be described in the next section.

#### 6.4 The outcomes from the tariff renegotiation game (private information)

From Lemmas 4 to 8 and Assumptions 1 and 2, we can find the outcome from the tariff renegotiation. The outcome from the tariff renegotiation game is summarized in the following proposition.

**Proposition 7:** *Recall that  $\tau^M(\gamma_i^m)$  is the tariff that maximizes Home's welfare under the reciprocity restriction; the perfect Bayesian equilibrium of the tariff renegotiation game is that  $\tau^M(\gamma_1^m)$  will always be rejected by Foreign. Therefore,*

i) *If  $\gamma_1^m > \bar{\gamma}^m$ , both types use Article XXVIII and offer  $\tau^M(\gamma_2^m)$ . Foreign accepts.*

ii) *If  $\gamma_1^m \leq \bar{\gamma}^m$  and  $\delta < \frac{W(\tau^N(\gamma_2^m), \tau^{*c}) - W(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m))}{W(\tau^N(\gamma_2^m), \tau^{*c}) - W(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}))}$ , both types do not*

*use Article XXVIII. The low type continues to commit previous agreement. The high type immediately defects and plays the best-response tariff which triggers trade wars from next period on.<sup>24</sup>*

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- iii) If  $\gamma_1^m \leq \bar{\gamma}^m$ , but  $\delta \geq \frac{W(\tau^N(\gamma_2^m), \tau^{*c}) - W(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m))}{W(\tau^N(\gamma_2^m), \tau^{*c}) - W(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}))}$ , the low type does not use Article XXVIII and continues to commit previous agreement. The high type uses Article XXVIII and offers  $\tau^M(\gamma_2^m)$ .

*Proof:* see appendix.

From Proposition 7, we can see that if there is not much difference between the political pressure of the low and high type, the outcome from the tariff renegotiation game is the pooling equilibrium that both types offer the same tariff. The logic behind this offer is that if the political pressure of the low type is close enough to that of the high type, the low type prefers the tariff that maximizes the high type's welfare s.t. reciprocity than the tariff from the punishment path. Next, if the political pressures of the low and high type are much different, the outcome is separating equilibrium. The low type always commits the previous agreement. For the high type, if the high type is patient enough, the high type will offer  $\tau^M(\gamma_2^m)$ . Otherwise, the high type will pretend to be the low type and defect to play the best-response tariff according to Lemma 9 and then trigger trade wars forever.<sup>25</sup>

Next, we consider the efficiency of the renegotiation game. As mentioned in the first section, an efficient trade renegotiation leads to tariffs that maximize the joint welfare.

**Proposition 8:** *The efficiency of the renegotiation game*

- i) *The tariff outcome from the renegotiation game is not politically optimal.*
- ii) *The tariff outcome from the renegotiation game is not pareto-efficient.*

The presence of private information brings about the possibility of pooling equilibrium in which both types offer the same tariffs. Therefore, the tariff outcomes from the renegotiation game are not pareto-efficient.

If we consider the full renegotiation game in which Home first offers the tariff proposal in which reciprocity restriction is not required, the outcome will be similar to that of Proposition 5. The argument in a complete information environment can be applied to this case as well.

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<sup>25</sup> This is when the high type trigger trade wars and Article XXIII is called for so that Foreign withdraws from the original tariff agreement as well.

### 6.5 Two-instrument case

Consider when both countries can use both import tariffs and export subsidies. Similar to the complete information case, Home tries to maximize its welfare, subject to Foreign's participation constraint. The Foreign's participation constraint is:

$$W^*(\tau_x, \tau_y, \tau_x^*, \tau_y^*; \gamma_0^{*m}, \gamma_0^{*e}) \geq W^*(0,0,0,0; \gamma_0^{*m}, \gamma_0^{*e})$$

if Foreign faces the low type,

$$W^*(\tau_x, \tau_y, \tau_x^*, \tau_y^*; \gamma_0^{*m}, \gamma_0^{*e}) \geq W^*(\tau_x^N(\gamma_2^m, \gamma_0^{*e}), \tau_y^N, \tau_x^{*N}(\gamma_2^m, \gamma_0^{*e}), \tau_y^{*N}; \gamma_0^{*m}, \gamma_0^{*e})$$

if Foreign faces the high type,

$$W^*(\tau_x, \tau_y, \tau_x^*, \tau_y^*; \gamma_0^{*m}, \gamma_0^{*e}) \geq \rho W^*(0,0,0,0; \gamma_0^{*m}, \gamma_0^{*e}) + (1-\rho)[(1-\delta)W^*(\tau_x^N(\gamma_2^m, \gamma_0^{*e}), \tau_y^N, 0,0; \gamma_0^{*m}, \gamma_0^{*e}) + \delta W^*(\tau_x^N(\gamma_2^m, \gamma_0^{*e}), \tau_y^N, \tau_x^{*N}(\gamma_2^m, \gamma_0^{*e}), \tau_y^{*N}; \gamma_0^{*m}, \gamma_0^{*e})]$$

if Foreign cannot distinguish between two types and  $\rho > \bar{\rho}$ , and

$$W^*(\tau_x, \tau_y, \tau_x^*, \tau_y^*; \gamma_0^{*m}, \gamma_0^{*e}) \geq \rho W^*(\tau_x^N(\gamma_1^m, \gamma_0^{*e}), \tau_y^N, \tau_x^{*N}(\gamma_1^m, \gamma_0^{*e}), \tau_y^{*N}; \gamma_0^{*m}, \gamma_0^{*e}) + (1-\rho)W^*(\tau_x^N(\gamma_2^m, \gamma_0^{*e}), \tau_y^N, \tau_x^{*N}(\gamma_2^m, \gamma_0^{*e}), \tau_y^{*N}; \gamma_0^{*m}, \gamma_0^{*e})$$

if Foreign cannot distinguish between two types and  $\rho \leq \bar{\rho}$ .

**Lemma 10:** *Only the low type might pretend to be the high type.*

Proof: See appendix.

Intuitively, since the efficient tariffs maximize the joint welfare function, Home will gain the highest welfare when Foreign yield the lowest welfare. As Foreign's welfare is lower if the participation constraint binds when facing the high type than when facing the low type, the high type has no incentive to pretend to be the low type.

The outcome of the renegotiation game is that the high type always offers an efficient tariff agreement. However, the low type offers the efficient tariff proposal only when its political pressure is low enough. Otherwise, it pretends to be the high type and offers the same proposal. The outcome of the renegotiation game is summarized in the next proposition.



**Proposition 9:** *The outcome of the renegotiation game when there are two instruments*

- i) *The high type always offers the efficient tariff proposal that binds Foreign's participation constraint.*
- ii) *If  $\gamma_1^m$  is low enough, the low type offers the efficient tariff proposal that has Foreign's welfare equal to a reciprocal free trade agreement. Otherwise, the low type pretends to be the high type and offer the same tariff agreement as the high type.*

*Proof:* See appendix.

From Proposition 9, the outcome of the renegotiation game is not always efficient even though there is an export subsidy. Hence, the export subsidy can not fix inefficiencies from private information. The next section will study the renegotiation game if international transfers between countries are allowed.

Note that So far, Article XXVIII is used only when Home anticipates that the proposed tariff will be accepted. Otherwise, Home will choose to trigger trade wars or continue to commit to the previous agreement in the first stage without calling for Article XXVIII. In other words, unsuccessful renegotiations cannot occur under this model. The result is supported by existing evidence. According to Hoda (2001), most renegotiations according to Article XXVIII are successful. We will study the case in which Foreign has private information in the next section. In this case, unsuccessful renegotiations might occur.

## **7. The tariff renegotiation game (International Transfers)**

The last section shows that the politically optimal tariffs cannot be attained in the renegotiation game. In this section, we consider when two countries can split the gains from renegotiation using international transfers. In this case, the renegotiation game brings about the politically optimal tariffs.

Suppose that the tariff proposal from type  $i$  is  $(\tau_i, \tau_i^*)$ . ( $\tau_i = \tau_i^*$  if the reciprocity restriction is required). International transfers from Home to Foreign are defined by  $T_i = W^*(\tau^c, \tau^{*c}) - W^*(\tau_i, \tau_i^*)$ . The international transfers guarantee that Foreign will have the same level of welfare as before. In this case, Home's maximization problem becomes:

$$\max_{\tau, \tau^*} W(\tau, \tau^*; \gamma_i^m, \gamma_0^e) - T_i \quad (\text{M7})$$

The tariff outcome is summarized in the following proposition.

**Proposition 10:** *The tariff outcome from renegotiation when international transfers are allowed is that:*

- i) *If the reciprocity restriction is not required, the tariff outcome is the politically optimal tariffs defined in (14).*
- ii) *If the reciprocity restriction is required, the tariff outcome maximizes the joint welfare function constrained with  $\tau = \tau^*$ .*

From Proposition 10, the politically optimal tariffs are attained from renegotiation whenever international transfers are allowed even though there is private information. Therefore, international transfers can eliminate inefficiencies from private information.

In the next section, we will consider the renegotiation game when Foreign possesses private information.

## 8. The renegotiation game (Foreign has private information)

In Section 6, we find that Home always uses Article XXVIII only when it anticipates that Foreign will accept its proposal. However, according to Table 1-1, there are a small number of unsuccessful renegotiations. In this section, we assume that Foreign has private information instead of Home. Precisely, assume that there are political shocks in goods  $x$  in both countries. The political weight of the import industry in Home changes to  $\gamma_2^m$ . This change is publicly known. Simultaneously, the political weight of the export industry in Foreign also changes. However, only Foreign knows the new value of the political weight. Home knows only that the political weight changes to  $\gamma_1^{*e}$  (low type) with probability  $\rho$  and  $\gamma_2^{*e}$  (high type) with probability  $1 - \rho$ . Suppose further that shocks in these two countries are independent.

The renegotiation game is still similar to the game in the last section, except for the fact that Home will offer the menu of proposed tariff and Foreign has to announce its type. The game begins with the fact that Home chooses whether to use the Article XXVIII or not. If Home chooses to use Article XXVIII, it has to decide the menu of proposed tariffs. Then Foreign has to announce its type. Foreign considers the proposed

tariffs from Home and decides whether to accept or reject the proposal. If Foreign chooses to reject, both countries choose whether to commit to the previous agreement or to trigger trade wars simultaneously.

The renegotiation game can be formally defined as follows:

Stage 0: Home decides whether to use article XXVIII or not.

Stage 1: Home offers the menu of proposed tariffs  $(\tau_1, \tau_2)$ , for type  $i=1,2$  accordingly, the Foreign tariff comes from one that satisfies the principal of reciprocity mentioned in the last section, i.e.,  $\tau^* = \tau$ .

Stage 2: Foreign announces its type.

Stage 3: Foreign chooses whether to accept or reject the tariff proposal that Home has offered.

Stage 4: If Foreign chooses to reject in the third stage, Home and Foreign choose to commit to the previous agreement or to play their best-response tariffs. The game in the rejecting path becomes the repeated prisoner-dilemma game.

Before considering the equilibrium of the game, two assumptions are imposed to simplify the game.

**Assumption 3:**  $\gamma_1^{*e} < \gamma_2^{*e} \leq \gamma_2^m$ .

This assumption implies that Home has higher political on industry  $x$  than Foreign of both types.

**Assumption 4:**  $W(\tau^c, \tau^{*c}; \gamma_2^m, \gamma_0^e) < W(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_2^m, \gamma_0^e)$

Assumption 4 means that both countries always trigger trade wars in the last stage of the game.

In this game, Home's maximization problem becomes:

$$\text{Max}_{\tau_1, \tau_2} \rho W(\tau_1) + (1 - \rho)W(\tau_2) \quad (\text{M8})$$

$$\text{s.t.} \quad W^*(\tau_1, \tau_1; \gamma_0^{*m}, \gamma_1^{*e}) \geq W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_1^{*e}) \quad (\text{IR}_1)$$

$$W^*(\tau, \tau_2; \gamma_0^{*m}, \gamma_2^{*e}) \geq W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_2^{*e}) \quad (\text{IR}_2)$$

$$W^*(\tau_1, \tau_1; \gamma_0^{*m}, \gamma_1^{*e}) \geq W^*(\tau_2, \tau_2; \gamma_0^{*m}, \gamma_1^{*e}) \quad (\text{IC}_1)$$

$$W^*(\tau, \tau_2; \gamma_0^{*m}, \gamma_2^{*e}) \geq W^*(\tau_1, \tau_1; \gamma_0^{*m}, \gamma_2^{*e}) \quad (\text{IC}_2)$$

The first two constraints are the individual rationality constraints, while the last two are the incentive compatibility constraints.

**Lemma 8:** *Let  $\bar{\tau}(\gamma_i^e; \gamma_2^m, \gamma_0^{*m})$  be such that*

*$W^*(\bar{\tau}, \bar{\tau}; \gamma_0^{*m}, \gamma_1^{*e}) = W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_i^{*e})$ , then  $\bar{\tau}(\gamma_i^e; \gamma_2^m, \gamma_0^{*m})$  is decreasing in  $\gamma_i^e$ .*

As  $W^*(\tau, \tau; \gamma_0^{*m}, \gamma_i^{*e})$  is decreasing in  $\tau$  for  $i=\{1,2\}$  and  $W^*(\tau, \tau; \gamma_0^{*m}, \gamma_i^{*e})$  is concave in  $\tau$ , Lemma 8 implies that the low type is willing to accept a higher tariff offer than the high type.

According to Assumptions 3 and 4, and Lemmas 4 and 8, we can find the tariff outcome of the tariff renegotiation game. The next proposition summarizes the result of the tariff renegotiation game.

**Proposition 11 :** *The following strategies construct a perfect Bayesian equilibrium.*

- i) *If  $W^*(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m); \gamma_0^{*m}, \gamma_i^{*e}) > W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_i^{*m})\gamma_0^{*m}, \gamma_i^{*e})$ , for  $i=1,2$ , Home offers the menu  $(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m))$ . Foreign accepts.*
- ii) *If  $W^*(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m); \gamma_0^{*m}, \gamma_1^{*e}) > W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_1^{*e})$  but  $W^*(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m); \gamma_0^{*m}, \gamma_2^{*e}) < W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_2^{*e})$ , Home offers the menu  $(\tau^M(\gamma_2^m), \tau > \bar{\tau}(\gamma_2^{*e}; \gamma_2^m, \gamma_0^{*m}))$ . The low type accepts and the high type rejects. In the last stage, both countries trigger trade wars.*
- iii) *If  $W^*(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m); \gamma_0^{*m}, \gamma_i^{*e}) < W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_i^{*m})\gamma_0^{*m}, \gamma_i^{*e})$ , for  $i=1,2$ , Home does not use Article XXVIII but triggers trade wars immediately.*

*Proof:* See appendix.

In the case that Foreign possesses private information, we can see that Home might use Article XXVIII even though the outcome of renegotiation may not be successful. The reason is that when Home decides to use Article XXVIII, it does not know Foreign's type. Therefore, Home will offer the menu of tariffs if at least one type decides to accept. This case can explain why unsuccessful tariff renegotiations according to Article XXVIII can happen.

However, in this model, it must be the case that political shocks on the same industry in both countries occur at the same time. If shocks in these countries are

independent, this situation is unlikely to happen. Therefore, there are a small number of unsuccessful renegotiations.

## **9. Conclusion**

This study observes the efficiency of the renegotiation process. While the renegotiation in WTO attains a politically optimal tariff when two countries are symmetrical and information is complete, the study finds that, with the presence of private information, the renegotiation process according to Article XXVIII cannot yield politically optimal or pareto-efficient tariffs. If Home has private information, tariff renegotiations according to Article XXVIII are always successful. However, if Foreign has private information, there might be unsuccessful tariff renegotiations. If international transfers are allowed, the most-cooperative tariffs constrained with the reciprocal condition are yielded from the renegotiation game. Furthermore, if the reciprocity restriction is relaxed, the renegotiation game brings about the politically optimal tariffs.

## **10. Limitations and further studies**

In this study, a reciprocal tariff is required for the renegotiation process. However, proposed tariffs might not satisfy the reciprocity restriction. The study should be extended to the case of a renegotiation game that does not require reciprocity. In addition, other indirect mechanisms should be considered in order to enforce the renegotiation process in WTO to attain an efficient outcome. The three-country model is another extension that should be considered since it faces an additional constraint regarding MFN. As we mentioned earlier, an MFN basis discourages a country from initiating withdrawal of a concession.

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## Appendix

### Proof for Lemma 4:

$$\text{From } \bar{\tau}_2 = \frac{\sqrt{-1895 - 920(\gamma_2^m)^2 + 3040\gamma_2^m}}{2(17 - 2\gamma_2^m)} \quad \text{and} \quad \tau^M(\gamma_2^m) = \frac{40(\gamma_2^m - 1)}{4\gamma_2^m - 25}, \quad \text{we}$$

have  $\tau^M(\gamma_2^m) < \bar{\tau}_2$  when  $\gamma_2^m$  is sufficiently low *Q.E.D.*

### Proof for Lemma 8:

From the maximization problem  $\tau^M(\gamma_2^m) = \frac{40(-1 + \gamma_2^m)}{25 - 4(\gamma_2^m)^2}$ . Then if the low type offers the reciprocal free trade, its welfare is  $\frac{1700 + 400\gamma_1^m}{49}$ . If it offers  $\tau^M(\gamma_2^m)$ , its welfare is  $\frac{100(9425 - 1672\gamma_2^m - 256(\gamma_2^m)^2 + 3364\gamma_1^m - 1856\gamma_1^m\gamma_2^m + 256\gamma_1^m(\gamma_2^m)^2)}{49(-25 + 4\gamma_2^m)^2}$ .

Therefore, it will offer  $\tau^M(\gamma_2^m)$  if and only if  $\gamma_1^m > \bar{\gamma}^m = \frac{25 - 8\gamma_2^m - 17(\gamma_2^m)^2}{50\gamma_2^m - 46 - 4(\gamma_2^m)^2}$  *Q.E.D.*

### Proof for Proposition 6:

The tariff outcome from (M3) and (M4) are efficient; therefore, it maximizes the joint welfare function. To maximize Home's welfare, Foreign's welfare has to set at the minimum level. Therefore, the participation constraint always binds. The participation constraint (which determines Home's and Foreign's welfare) and (18) determine the tariff proposal of Home.

### Proof for Proposition 7:

Since foreign welfare function under the reciprocity condition,  $W^*(\tau, \tau)$  is maximized at  $\tau = \tau^c = 0$ , the function is decreasing in  $\tau$  for  $\tau > 0$ . Also, Foreign can trigger trade wars anytime; therefore, it will not accept any tariff offer  $\tau$  such that  $\tau > \bar{\tau}_i$  when it knows that the offer  $\tau$  comes from type i.



Consider the case that  $\delta \in [\bar{\delta}, 1]$ . In the last stage, if the tariff proposal can signal a type of Home perfectly, the low type and Foreign will commit to the previous agreement. Otherwise, the low type and Foreign commit to the previous agreement if and only if  $\rho$  is high enough, i.e.  $\rho > \bar{\rho}$ .

Consider the game in the second stage, Foreign always rejects the proposal from the low type that differs from  $\tau^c$  since its welfare is maximized at  $\tau = \tau^c$ . For the proposal from the high, Foreign accepts if the offer  $\tau$  is such that  $\tau \leq \bar{\tau}_2$ . In case that both types offer the same tariff proposal  $\tau$ , Foreign accepts if :

$$W^*(\tau, \tau) \geq \rho(W^*(\tau^c, \tau^{*c}) + (1 - \rho)(W^*(\tau^N(\gamma_2^m), \tau^{*c})\delta + W^*(\tau_2^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}))(1 - \delta))$$

when  $\rho > \bar{\rho}$  (A1)

$$W^*(\tau, \tau) \geq \rho(W^*(\tau_1^N(\gamma_1^m), \tau^{*N}(\gamma_0^{*m})) + (1 - \rho)W^*(\tau_2^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}))) \text{ otherwise.}$$

In the first stage, from lemma 4,  $\tau^M(\gamma_2^m) < \bar{\tau}_2$ , if  $W(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m); \gamma_1^m, \gamma_0^{*e}) > W_1(\tau^c, \tau^c; \gamma_1^m, \gamma_0^{*e})$ , the low type prefers to offer  $\tau^c$  than  $\tau^M(\gamma_2^m)$  while the high type might pretend to be the low type. Lemma 9 gives the condition that the high type will pretend to be the low type. However, if  $W(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m); \gamma_1^m, \gamma_0^{*e}) \leq W_1(\tau^c, \tau^c; \gamma_1^m, \gamma_0^{*e})$ , the low type prefers to offer  $\tau_2^M$ . In this case, we have pooling equilibrium that both types offer same tariffs.

In Stage zero, according to Lemma 5, if any type wants to either trigger trade wars or commit to the previous agreement, it will not use Article XXVIII . *Q.E.D.*

### **Proof for Proposition 9:**

From Lemma 10, the high type always offers the efficient tariff proposal that binds Foreign's participation constraint. Given  $J(\tau_1^c - \tau_1^{*c}, \tau_2^c - \tau_2^{*c}, \gamma_1^m, \gamma_0^e, \gamma_0^{*m}, \gamma_0^{*e})$  be the joint welfare function when the trade policy is efficient and Home is of low type, for the low type, if it offers the efficient tariff proposal, it will gain the welfare of

$J(\tau_1^c - \tau_1^{*c}, \tau_2^c - \tau_2^{*c}, \gamma_1^m, \gamma_0^e, \gamma_0^{*m}, \gamma_0^{*e}) - W^*(0, 0, 0, 0)$ . If it pretends to be the high type, it will gain the tariff of

$$J(\tau_1^c - \tau_1^{*c}, \tau_2^c - \tau_2^{*c}, \gamma_2^m, \gamma_0^e, \gamma_0^{*m}, \gamma_0^{*e}) - \rho W^*(0,0,0,0) + (1-\rho)[(1-\delta)W^*(\tau_1^N(\gamma_2^m, \gamma_0^{*e}), \tau_2^N, 0,0) + \delta W^*(\tau_1^N(\gamma_2^m, \gamma_0^{*e}), \tau_2^N, \tau_1^{*N}(\gamma_2^m, \gamma_0^{*e}), \tau_2^{*N})]$$

when  $\rho > \bar{\rho}$ , and

$$J(\tau_1^c - \tau_1^{*c}, \tau_2^c - \tau_2^{*c}, \gamma_2^m, \gamma_0^e, \gamma_0^{*m}, \gamma_0^{*e}) - \rho W^*(\tau_1^N(\gamma_1^m, \gamma_0^{*e}), \tau_2^N, \tau_1^{*N}(\gamma_1^m, \gamma_0^{*e}), \tau_2^{*N};) + (1-\rho)W^*(\tau_1^N(\gamma_2^m, \gamma_0^{*e}), \tau_2^N, \tau_1^{*N}(\gamma_2^m, \gamma_0^{*e}), \tau_2^{*N})$$

$\rho \leq \bar{\rho}$ . Therefore, the low type will pretend to be the high type if its political pressure is high enough. *Q.E.D.*

### **Proof for Proposition 11:**

From Assumption 4, in the last stage, both countries trigger trade wars. In the third stage, both types accept any tariff offer that satisfies their individual rationality constraints. Because of the incentive compatibility constraints, both types announce their types truthfully. In the first stage, If  $W^*(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m); \gamma_0^{*m}, \gamma_i^{*e}) > W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_i^{*m})\gamma_0^{*m}, \gamma_i^{*e})$ , for  $i=1,2$ , Home offers  $\tau^M(\gamma_2^m)$  since this tariff maximizes Home's welfare under the reciprocity restriction. If  $W^*(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m); \gamma_0^{*m}, \gamma_1^{*e}) > W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_1^{*e})$  but  $W^*(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m); \gamma_0^{*m}, \gamma_2^{*e}) < W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_0^{*m}, \gamma_2^{*e})$ , Home wants to offer  $\tau^M(\gamma_2^m)$  for the low type and triggers trade wars with the high type according to Lemma 4. Therefore, Home offers any tariff that high type will reject, which is any  $\tau > \bar{\tau}_2$ . Finally, If  $W^*(\tau^M(\gamma_2^m), \tau^M(\gamma_2^m); \gamma_0^{*m}, \gamma_i^{*e}) < W^*(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_i^{*m})\gamma_0^{*m}, \gamma_i^{*e})$ , for  $i=1,2$ , Home does not use Article XXVIII and triggers trade wars immediately since  $W(\bar{\tau}_2, \bar{\tau}_2; \gamma_2^m, \gamma_0^e) < W(\tau^N(\gamma_2^m), \tau^{*N}(\gamma_0^{*m}); \gamma_2^m, \gamma_0^e)$ . *Q.E.D.*