TRADE SKIRMISHES AND SAFEGUARDS: A THEORY OF THE WTO DISPUTE SETTLEMENT PROCESS

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Trade Skirmishes and Safeguards: A Theory of the WTO Dispute Settlement Process*

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Abstract

I model the World Trade Organization as an impartial arbitrator with no enforcement power which issues public signals correlated with the state of the world in the disputing countries. Such public signals, by mitigating the information asymmetry among the negotiating governments, make it easier to write an incentive-compatible agreement. The reciprocity principle embodied in the GATT Article XIX ensures an incentive compatible agreement by allowing occasional trade skirmishes. The WTO Safeguard Agreement, when supported with impartial arbitration, can improve political welfare by curbing trade skirmishes while keeping the incentive constraints in check. Impartial arbitration improves the enforceability of trade agreements without providing external enforcement.

JEL: F13, F51, F53, C72, K33, K41.

Keywords **:** Safeguard Agreement, Dispute Settlement, Impartial Arbitration, Trade Agreements.

1 Introduction

Traditionally, international institutions have been viewed as forums through which sovereign governments can coordinate their policies, while relying on the threat of unilateral and/or multilateral sanctions against a deviating party for enforcement of their treaties.[1] This view, however, does not help us understand the "legalization" of the World Trade Organization (WTO) and the increasing use of its Dispute Settlement Process (DSP) which resembles a domestic

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[1] See, for example, Bond and Park (2002).

court of law.[2] In this paper, I model the WTO DSP as an impartial arbitrator that investigates the dispute between two parties and issues a non-binding ruling about the culpability of the defendant. When the negotiating parties posses private information about the culpability of the defendant, this ruling provides a public signal that the parties can use to mitigate their information asymmetry. A reduction in the extent of information asymmetry, which is a source of inefficiency in trade agreements, can potentially improve the welfare of the negotiating parties.

I study the DSP's role as an impartial arbitrator in the context of the WTO Agreement on Safeguards.[3] A novel feature of the WTO is its Agreement on Safeguards which is a modified version of the GATT escape clause (Article XIX). An escape clause allows a contracting party to abandon its obligations under the agreement if some of its domestic industries are injured substantially because of a surge in imports. This policy is intended to safeguard the endangered industries against a sudden disruption in their operation, which is thought to be needed for a smooth structural transition of the economy. The fundamental difference between the GATT Article XIX and the Agreement on Safeguards is in the way that the escape clause is disciplined. Under the GATT Article XIX a country who sought protection in the form of safeguards was expected to compensate other member countries for their loss due to reduced market access. Under the Agreement on Safeguards, however, a safeguard-imposing country can avoid paying compensation in the first three years of implementing the measure if a panel of experts designated by the WTO finds the measure in compliance with the defending country's obligations. This loosening of the safeguard discipline has also been hard to support theoretically, as it motivates parties to employ more protectionist policies.

The loosening of the safeguard discipline has been viewed as an attempt to divert protectionist policies from relying heavily on antidumping measures and Voluntary Export Restraints (VERs) towards safeguard measures. In fact, the use of safeguard measures has been on the rise under the WTO (Figure 1) even though it still remains relatively unpopular compared to antidumping measures. Economists typically prefer that a country resort to safeguard measures which are consistent with the Most-Favored Nation (MFN) principle in lieu of antidumping measures which discriminate among foreign exporters (Bown 2002). Moreover, the use of VERs are criticized as lacking transparency and enabling international cartels with the help of governments (Rosendorff 1996).[4] This paper takes a different view to explain the virtues of the

[2] A major change in the General Agreement on Tariffs and Trade (GATT) in its transition to the WTO has been the strengthening of the DSP which has arguably let member countries rely more on a legalistic process of dispute resolution rather than power politics. For more discussion, see, for example, Jackson (1997) and Trebilcock and Howse (1999).

[3] I use the Safeguard Agreement as a legal framework to discuss the issues regarding dispute settlement and arbitration. However, the use of impartial arbitration is not limited to this specific agreement.

[4] For example, in the case of Japan's voluntary restriction on steel exports to the United State, the Consumers' Union of the United States filed a lawsuit against the US government and Japanese and US steel makers, claiming that there was a conspiracy to divide the US and Japanese markets that violated the Sherman Act (Matsushita et al, 2003, p. 215).

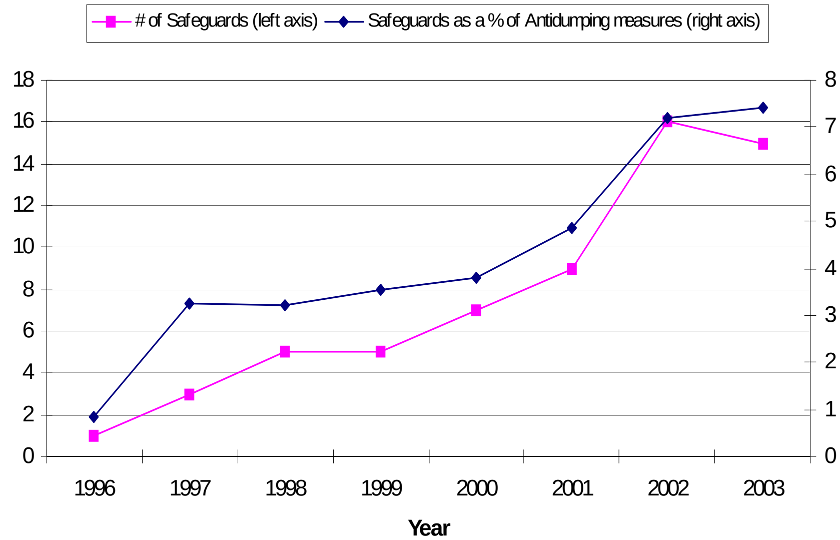

Figure 1: The use of the safeguard measure over time. (Source: The World Bank and the WTO.)

reforms in the escape clause by demonstrating the potential efficiency gains resulting from the new safeguard agreement.

From a contractarian point of view, including an escape clause in an agreement is an attempt towards writing a contingent, or a more *complete*, contract that specifies different actions for different states of the world. In order to implement such contingent agreements successfully, the prevailing state of the world in the implementation stage must be identifiable to the negotiating parties. In practice, however, it is more likely that the negotiating parties have private information about the state of the world, which cannot be used to publicly identify a prevailing contingency unless it is in the best interest of the relevant parties to disclose their private information truthfully. The compensation and retaliation provisions associated with the escape clauses can be viewed as mechanisms to induce truthful revelation of private information on behalf of the negotiating parties.

Using a simple political trade model with private political shocks, I show that the reciprocity principle embodied in GATT Article XIX can ensure truthful revelation of private information on behalf of the negotiating parties. Based on this principle, if a government invokes the escape clause in response to domestic political pressures, the affected negotiating parties will be free to withdraw equivalent concessions immediately, such that an *instantaneous* balance of concession is maintained among parties at all time. Therefore, even though the GATT agreement has been instrumental in ending the pre-GATT trade wars, in periods of high political pressure in one country, it prescribes a small-scale trade war, or *"trade skirmish"*, in order to keep the incentives of the negotiating parties in check. The threat of a trade skirmish following the invocation of the escape clause induces the governments to use the clause only when they are faced with intense protectionist pressures.[5] Therefore, all else equal, eliminating the requirement of instantaneous reciprocity should lead to a failure of the agreement. Based on a similar reasoning, Bagwell and Staiger (2005) criticize the WTO's elimination of the compensation and retaliation provisions associated with escape clause actions for the first three years of their use.

In contrast to Bagwell and Staiger (2005), in this paper I show that if an impartial entity can provide reliable (but not necessarily perfect) judgments about the state of the cooperation, the negotiating parties can coordinate on an incentive-compatible strategy profile that does not require an instantaneous balance of concessions in each period. An impartial arbitrator investigates the state of the world in the defending country and announces its opinion on the legitimacy of the defendant's safeguard action. The judgment of the impartial arbitrator provides a new piece of information that can mitigate the information asymmetry among the negotiating parties. Private investigations by the disputing parties cannot generate the same public signal since the parties may act strategically in disclosing their findings. Therefore, impartiality of the arbitrators, which allows them to disclose their findings truthfully, is vital to the process. A reduction in information asymmetry makes the truth-telling constraints less stringent and, as a result, a milder punishment for imposing a safeguard will be enough to induce parties to reveal their private information truthfully. In particular, it will be possible for the negotiating parties to limit their retaliations against a safeguard imposing country to cases where an impartial arbitrator, e.g., a panel of experts designated by the WTO, has dismissed the legitimacy of the safeguard action. Such agreements can potentially improve welfare by decreasing the frequency of efficiency-reducing retaliations. Under this new setting, instantaneous reciprocity will not be exercised in some periods, but the negotiating parties can maintain an *intertemporal* balance of concessions. It should be emphasized that in this model the WTO plays an informational role only and the agreement must be self-enforcing.

A number of studies have explored the informational role of the WTO. Furusawa (2003) models the WTO as an entity that can observe perfectly the true state of the world in the defending country, while the complainant receives only a noisy signal about it. In his model, obtaining the court's opinion is costly and, therefore, a contracting party initiates a formal dispute only if it receives a signal indicating a high probability of deviation by another member. My model is different in that I assume that the DSP is faced with similar information barriers as the uninformed party in a dispute.

Rosendorff (2005) studies escape clauses in trade agreements, assuming that a dispute panel rules against the defendant with a fixed and publicly known probability which is not correlated

[5] Feenstra and Lewis (1991) also interpret trade skirmishes as a revelation mechanism in a cooperative environment. Bagwell and Staiger (1990) study trade agreements in a non-cooperative but full-information environment where a trade skirmish in periods of high trade volume is required to hold the parties' incentive to defect in check. My model captures both roles of trade skirmishes as I study trade agreements under a non-cooperative and imperfect information environment.

with the true state of the world. Finally, in Maggi (1999), the role of the WTO is to disseminate information on deviations in order to facilitate "multilateral" punishments.

This framework allows me to compare the welfare of countries across the two institutions. In particular, political welfare under the WTO is higher than political welfare under the GATT only if the arbitration service provided by the WTO is sufficiently reliable. Finally, in a repeated-game framework, it is shown that the WTO is particularly helpful when the negotiating parties face enforcement problems due to their low discount factor. This suggests that the legalization of the dispute settlement process under the WTO has in fact improved the enforceability of trade agreements.

This theory can also shed light on the role of non-binding arbitration in other contexts, such as business relationships, where instead of pursuing a dispute in a court of law, independent agents rely on non-binding arbitration by an impartial third party to settle their disputes.

In the next section, I characterize the economic environment under which the trade agreements are implemented. In section 3, I will find the best incentive-compatible agreement in terms of political welfare under the GATT escape clause. In section 4, I introduce a model of dispute settlement in the WTO and find the best incentive-compatible agreement in terms of political welfare under the WTO Safeguard Agreement. Sections 5 and 6, respectively, compare political and social welfare across the two institutions. Finally, in Section 7, a repeated-game framework is employed to deal with the enforcement issue. Proofs are provided in the Appendix.

2 The Model

2.1 The Economic Environment

Consider a pair of distinct goods x and y with demand functions in the home country (no *) and the foreign country (*) given by:

$$\begin{aligned} D_x(p_x) &= 1 - p_x,\ D_y(p_y) = 1 - p_y, \\ D_x^*(p_x^*) &= 1 - p_x^*,\ D_y^*\left(p_y^*\right) = 1 - p_y^*, \end{aligned} \tag{1}$$

where p (with the appropriate index) represents the price of a good in a certain country. Specific import tariffs, τ and τ^*, chosen by countries as the only trade policy instrument, create a gap between domestic and foreign prices. In particular, $p_x = p_x^* + \tau$ and $p_y = p_y^* - \tau^*$.

Both countries produce both goods using the following supply functions:

$$\begin{aligned} Q_x(p_x) &= p_x,\ Q_y(p_y) = bp_y, \\ Q_x^*(p_x^*) &= bp_x^*,\ Q_y^*\left(p_y^*\right) = p_y^*. \end{aligned} \tag{2}$$

Assuming $b > 1$, the home country will be a natural importer of x and a natural exporter of y.

For reasons that will be clear later, I assume that there is another pair of goods which countries produce and consume in an identical manner as above. Finally, there is a numeraire good, z, which is abundant in each country and is used either as a consumption good or as an input to the production of other goods.

Under this model, the market-clearing price of x (y) depends only on the home (foreign) tariff. Let $p_x(\tau)$ and $p_y(\tau^*)$ respectively denote the equilibrium prices of x and y in the home country. If import tariffs are non-prohibitive (i.e., if they are sufficiently small) trade occurs between the countries and the home consumers' surplus from the consumption of x and y will be given by

$$\psi_x(\tau) \equiv \int_{p_x(\tau)}^{1} D_x(u)\,du,\;\; \psi_y(\tau^*) \equiv \int_{p_y(\tau^*)}^{1} D_y(u)\,du.$$

Moreover, the home producers' surplus from the sale of x and y will be given by

$$\pi_x(\tau) \equiv \int_0^{p_x(\tau)} Q_x(u)\,du,\;\; \pi_y(\tau^*) \equiv \int_0^{p_y(\tau^*)} Q_y(u)\,du.$$

The government's tariff revenue is given by

$$T(\tau) \equiv \tau M_x(p_x(\tau)),$$

where $M_x(p_x) \equiv D_x(p_x) - Q_x(p_x)$, is the import demand for good x in the home country.

2.2 A Political Objective Function

Following Baldwin (1987), I assume that each government maximizes a weighted sum of its producers' surplus, consumers' surplus, and tariff revenues with a relatively higher weight on the surplus of its import-competing sector. The higher weight given to the welfare of a sector might be the result of political pressure, through lobbying for example, that a government faces. Denoting the political weight on the welfare of the import-competing sector in the home (foreign) country by θ (θ^*), where $\theta, \theta^* \geq 1$, I assume that the home government's welfare drawn from sector x as a function of the home import tariff is given by

$$u(\tau;\theta) \equiv \psi_x(\tau) + \theta\pi_x(\tau) + T(\tau),$$

and the home government's welfare from sector y as a function of the foreign import tariff is given by

$$v(\tau^*) \equiv \psi_y(\tau^*) + \pi_y(\tau^*).$$

Therefore, $u(\tau;\theta) + v(\tau^*)$ represents the political welfare of the home government, which is additively separable in functions of the home and foreign tariffs.

Lemma 1 *$u(\tau;\theta)$ is a concave function of τ and is increasing for sufficiently small τ. In contrast, $v(\tau^*)$ is a convex function and is decreasing for sufficiently small τ^*.*

This Lemma implies that the home government's welfare is increasing in the home tariff and decreasing in the foreign tariff when these tariffs are sufficiently low.

If the home government were to set its policies unilaterally, it would choose τ to maximize $u(\tau;\theta) + v(\tau^*)$. This is tantamount to choosing a tariff rate that maximizes the home government's welfare from its import-competing sector, $u(\tau;\theta)$. Therefore, the non-cooperative (Nash) tariff as a function of political pressure is given by

$$\tau^N(\theta) \equiv \arg\max_{\tau} u(\tau;\theta). \tag{3}$$

In setting its policy unilaterally, the home government ignores the impact of its tariff on the welfare of the foreign government which is captured by $v(\tau)$. Had governments managed to set tariffs cooperatively, the politically-efficient home tariff, τ^{PE}, should maximize $u(\tau;\theta) + v(\tau)$, which is the joint payoff of the home and foreign governments from an import tariff at home. Namely,

$$\tau^{PE}(\theta) = \arg\max_{\tau} u(\tau;\theta) + v(\tau). \tag{4}$$

Lemma 2 *$\tau^{PE}(\theta)$ and $\tau^N(\theta)$ are increasing in θ and $\tau^{PE}(\theta) < \tau^N(\theta)$.*

In the above analysis, I relied on the assumption that any tariffs that governments may rationally choose are non-prohibitive. Since setting a tariff higher than $\tau^N(\theta)$ is not individually rational, this assumption is satisfied if $\tau^N(\theta)$ is not prohibitive. Denoting the lowest prohibitive tariff rate by $\tau_{proh.}$, the following assumption ensures that no prohibitive tariff will be chosen by any government:

Assumption 1. $\theta < \theta_{proh.}$, where $\theta_{proh.}$ is defined by $\tau^N(\theta_{proh.}) = \tau_{proh.}$.[6] ■

If the governments were able to transfer cash as side payments between themselves, they could achieve politically-efficient tariffs through bilateral negotiations and split the efficiency gains. However, a cash transfer is rarely observed under the GATT/WTO. That may be because a cash transfer to foreign countries should be funded by raising domestic taxes which are usually distortive and efficiency-reducing. In other words, even though cash transfers can improve the efficiency of trade agreements, they cause inefficiency in the domestic markets. This makes the governments hesitant about using cash transfers as part of their trade agreements.

When side payments are not practical, countries with different realizations of political pressure may fail to reach an efficient agreement if they want to maintain a balance of concessions.

[6] As shown in the Appendix, when the specific supply and demand functions introduced above are used, this assumption reduces to $\theta < \frac{3b-1}{b+1}$.

That is because a balance of concessions between symmetric countries requires equal tariffs,[7] while efficient tariffs are not equal across countries when they experience different political pressures. In other words, if the home country increases its tariff in response to high political pressures, the foreign country will have to reciprocate by raising its respective tariff in order to maintain an *instantaneous* balance of concessions. This resembles the tariff schedule suggested by the GATT escape clause (Article XIX) based on which countries are supposed to maintain reciprocity in setting their tariffs at all times. However, in a changing environment where political pressures are swinging over time, the countries can maintain an *intertemporal* balance of concessions without requiring equal tariffs across countries in each period. In particular, if θ and θ^* are drawn independently from the same distribution function, the countries can maintain an intertemporal balance of concessions by negotiating fully-contingent and politically-efficient tariffs, i.e., $\tau = \tau^{PE}(\theta)$ and $\tau^* = \tau^{PE}(\theta^*)$. Such a tariff agreement is reminiscent of the Safeguard Agreement of the WTO, which under certain conditions authorizes a country to raise its tariffs without suffering retaliation from affected countries.

2.3 Private Political Pressures, Monitoring, and Contingent Agreements

I assume that political pressures can take two levels, i.e., low and high, denoted respectively by $\underline{\theta}$ and $\overline{\theta}$. Remember that each country has two import-competing industries which may exert political pressure in order to restrict imports of the like products. I assume that these pressures are realized according to the following probability distribution:

$$\begin{aligned} \Pr(\text{high pressure from both industries}) &= 0, \\ \Pr(\text{high pressure from only one industry}) &= \rho, \\ \Pr(\text{no high pressure}) &= 1-\rho, \end{aligned}$$

where, $0 < \rho < 1$. This probability distribution ensures that in each country there is at least one import-competing industry which exerts low political pressure. The availability of such an industry will make the analysis of the retaliation provisions in trade agreements much simpler. I also maintain the following assumption throughout the paper.

Assumption 2. $\underline{\theta}$ and $\overline{\theta}$ are such that $\tau^{PE}\left(\overline{\theta}\right) < \tau^{N}\left(\underline{\theta}\right)$. ■

This assumption ensures that if an agreement sets a tariff binding equal to or smaller than $\tau^{PE}\left(\overline{\theta}\right)$, the governments will always choose the highest tariff authorized under the agreement.

I assume that the realization of θ (θ^*) is private information of the the home (foreign) government. Therefore, the agreement cannot be contingent on political pressures unless the governments have the proper incentives to reveal their private information truthfully. Using

[7] Two countries maintain a balance of concessions if, as a result of the exchange of concessions, the terms of trade remains unaffected. Assuming that the reference terms of trade for a pair of symmetric countries is 1, governments have to set reciprocal tariffs in order to keep the terms of trade at its reference level.

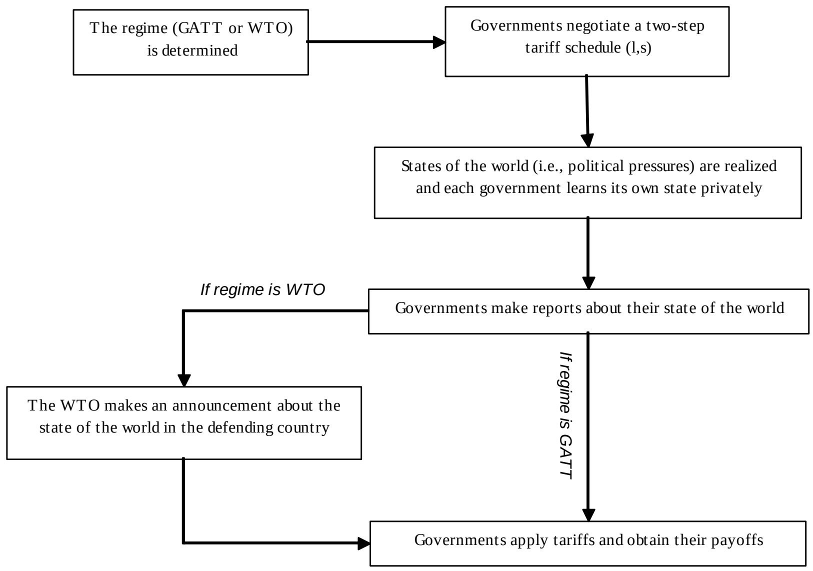

Figure 2: The sequence of events under the GATT and the WTO.

the revelation principle, one might be able to design a mechanism that induces governments to reveal truthfully the political pressure that they face at home. In particular, an agreement can be designed contingent upon the countries' announcements regarding their respective political pressure. In this paper, however, I am interested in analyzing the best agreements that can be written under two alternative institutional settings, namely, the GATT and the WTO. Therefore, I will take the rules under these institutions as given and solve for the best incentive-compatible agreement under each institution.

Even though domestic political pressures are private information of the government, outsiders (e.g., other governments and WTO arbitrators) can obtain a noisy signal about it by investigating the state of the world in the country. If the signal that outsiders receive is publicly observable and sufficiently informative, then a contract contingent upon the signal could provide some efficiency improvement over a non-contingent contract that ignores the signal. However, political pressure is a *subjective* concept that is hard to quantify using a verifiable measure. In fact, different parties may reach different conclusions (i.e., observe different signals) regarding the true state of the world, while their conclusions are their respective private information. While the negotiating parties would act strategically in revealing their private information, an impartial third-party, by definition, has no incentive to distort the truth. Thus, an impartial arbitrator will be able to provide a public signal that can be used, along with the parties' announcements, to write a contingent agreement.

The sequence of events is depicted in Figure (2). After adopting a regime (i.e., GATT or WTO), the governments negotiate a two-step tariff schedule (l, s), where $l < s$. The governments are supposed to adopt the negotiated low tariff, l, for their low-pressure industries, and to use the negotiated safeguard tariff, s, for their high-pressure industries. Each country privately observes its domestic state of the world and makes a public announcement about it, denoted by $\widehat{\theta}$ and $\widehat{\theta}^*$ where $\widehat{\theta}, \widehat{\theta}^* \in \{\underline{\theta}, \overline{\theta}\}$. By announcing high political pressure, a government claims that one (and only one) of its import-competing industries is exerting high pressure. Announcing low pressure, on the other hand, implies that no import-competing industry is exerting high pressure. As will be seen in detail, the GATT and the WTO differ in the way they regulate further steps. The tariff agreement under the GATT is contingent on the reports of the governments about their respective state of the world. However, under the WTO, the tariff agreement is contingent on the combination of the governments' and the WTO's reports about the state of the world.

3 Trade Agreements under GATT: No Public Monitoring

According to the GATT escape clause (Article XIX), if any product is being imported into the territory of a negotiating party in such increased quantities and under such conditions as to cause or threaten serious injury to domestic producers in that territory, the negotiating party will be free to suspend its obligation by putting in place protectionist measures to help its endangered industry. In response, the affected exporting countries will be free to withdraw some of their previously-granted concessions in a way that is substantially equivalent to concessions withdrawn by the safeguard-imposing country. In other words, the GATT escape clause requires the negotiating parties to maintain a balance of concessions at each point in time.

I model the GATT escape clause as follows. If both governments announce low political pressures they should choose l for all of their imports. If the home government announces high political pressure, i.e., $\widehat{\theta} = \overline{\theta}$, it will impose the negotiated safeguard tariff, s, on the import of the good that according to the home government has resulted in high political pressure. In response to the announcement $\widehat{\theta} = \overline{\theta}$, the foreign government will also impose s on the imports of a good that is in competition with a *low*-pressure industry. Other combinations can be obtained due to symmetry. The following table summarizes the strategy profile, referred to as the GATT strategy profile, to be employed by the governments:

		Foreign	
		$\overline{\theta}$	$\underline{\theta}$
Home	$\overline{\theta}$	$\{s, s\}, \{s, s\}$	$\{s, l\}, \{s, l\}$
	$\underline{\theta}$	$\{s, l\}, \{s, l\}$	$\{l, l\}, \{l, l\}$

In this table the set of tariffs to be chosen by each government for each combination of announcements is given.

If both countries announce their state of the world truthfully, the expected per-period payoff to the home government is given by:

$$
\begin{array}{ll}
\rho^2 \left\{ \left[u\left(s;\overline{\theta}\right) + u\left(s;\underline{\theta}\right) \right] + \left[v\left(s\right) + v\left(s\right) \right] \right\} & \left(\theta = \theta^* = \overline{\theta}\right) \\
+ \left(1-\rho\right)^2 \left\{ \left[u\left(l;\underline{\theta}\right) + u\left(l;\underline{\theta}\right) \right] + \left[v\left(l\right) + v\left(l\right) \right] \right\} & \left(\theta = \theta^* = \overline{\theta}\right) \\
+ \left(1-\rho\right)\rho \left\{ \left[u\left(s;\overline{\theta}\right) + u\left(l;\underline{\theta}\right) \right] + \left[v\left(s\right) + v\left(l\right) \right] \right\} & \left(\theta = \overline{\theta}, \theta^* = \underline{\theta}\right) \\
+ \left(1-\rho\right)\rho \left\{ \left[u\left(s;\underline{\theta}\right) + u\left(l;\underline{\theta}\right) \right] + \left[v\left(s\right) + v\left(l\right) \right] \right\}. & \left(\theta = \underline{\theta}, \theta^* = \overline{\theta}\right)
\end{array}
$$

The expression on the first line above represents the welfare of the home government (weighted by ρ^2) when both countries are experiencing high political pressure, where ρ^2 is the probability of this contingency. Under this contingency, both countries impose s on all of their imports. As a result, the home government receives $u\left(s;\overline{\theta}\right) + u\left(s;\underline{\theta}\right)$ from its importing sectors and $v\left(s\right) + v\left(s\right)$ from its exporting sectors. Welfare under other contingencies can be calculated similarly. Simplifying the above expression gives the expected per-period welfare of a country under the GATT as a function of the negotiated tariffs, l and s:

$$
P^G\left(l,s\right) = \rho\left[u\left(s;\overline{\theta}\right) + v\left(s\right) + u\left(s;\underline{\theta}\right) + v\left(s\right) \right] + 2\left(1-\rho\right)\left[u\left(l;\underline{\theta}\right) + v\left(l\right) \right]. \tag{5}
$$

$P^G\left(l,s\right)$ can be also interpreted as the expected joint welfare of the home and foreign governments as a function of the home tariffs.

The best incentive-compatible negotiated agreement under the GATT rules will be one that maximizes $P^G\left(l,s\right)$ subject to some incentive constraints that ensure truthful revelation of private information by the negotiating parties. To construct the incentive compatibility constraints, note that when a government is faced with low pressure, its expected payoff from claiming low pressure is

$$
u\left(l,\underline{\theta}\right) + v\left(l\right) + \left(1-\rho\right)\left[u\left(l,\underline{\theta}\right) + v\left(l\right) \right] + \rho\left[u\left(s,\underline{\theta}\right) + v\left(s\right) \right],
$$

while its expected payoff from lying is

$$
u\left(s,\underline{\theta}\right) + v\left(s\right) + \left(1-\rho\right)\left[u\left(l,\underline{\theta}\right) + v\left(l\right) \right] + \rho\left[u\left(s,\underline{\theta}\right) + v\left(s\right) \right].
$$

Therefore, truth-telling requires

$$
u\left(l,\underline{\theta}\right) + v\left(l\right) \geq u\left(s,\underline{\theta}\right) + v\left(s\right). \tag{6}
$$

Similarly, truthful revelation of high pressure is ensured if

$$
u\left(s,\overline{\theta}\right) + v\left(s\right) \geq u\left(l,\overline{\theta}\right) + v\left(l\right). \tag{7}
$$

In short, the negotiators' problem under the GATT can be summarized as

$$\max_{l,s} P^G(l,s) \tag{8}$$
$$\text{subject to incentive constraints (6) and (7).}$$

Ignoring the incentive constraints, the solution to the unconstrained maximization of $P^G(l,s)$ can be written as

$$\begin{aligned} l^G &= \arg\max_l \left[u(l,\underline{\theta}) + v(l)\right] \equiv \tau^{PE}(\underline{\theta}), \\ s^G &= \arg\max_s \left[u\left(s;\overline{\theta}\right) + v(s) + u(s;\underline{\theta}) + v(s)\right]. \end{aligned}$$

Also, it is straightforward to show that $\tau^{PE}(\underline{\theta}) < s^G < \tau^{PE}\left(\overline{\theta}\right)$. Thus,

$$\tau^{PE}(\underline{\theta}) = l^G < s^G < \tau^{PE}\left(\overline{\theta}\right). \tag{9}$$

But (9) is also a sufficient condition for (6) and (7) to be satisfied. To see this, recall that according to Lemma 2, $u(\tau,\theta) + v(\tau)$ is concave and attains its maximum at $\tau = \tau^{PE}(\theta)$. This implies that (6) and (7) are satisfied as long as $\tau^{PE}(\underline{\theta}) \leq l \leq s \leq \tau^{PE}\left(\overline{\theta}\right)$.

Proposition 1 *The incentive compatibility constraints are not binding in the GATT negotiators' problem* (8)*, and the best incentive-compatible negotiated tariff schedule under the GATT is given by* $\left(l^G, s^G\right)$*. Moreover,* $\tau^{PE}(\underline{\theta}) = l^G < s^G < \tau^{PE}\left(\overline{\theta}\right)$*.*

The fact that these incentive constraints are not binding suggests that the GATT's instantaneous reciprocity principle is too restrictive as a mechanism for truthful revelation of private information. In other words, a 100-percent probability of a trade skirmish following the imposition of a safeguard measure is not necessary to ensure truth-telling. For example, if the negotiating parties can make their actions contingent on the outcome of a *public randomizing device*, they can improve their political welfare by choosing a probability of retaliation that is only high enough to keep the incentive constraints satisfied. Such a public randomizing device enables the negotiating parties to choose the *right* severity of punishment – strong enough to ensure truth-telling, but not so strong that it causes excessive occurrence of trade skirmishes. Reinhardt (2001) and Rosendorff (2005) view international trade institutions as public randomizing devices where retaliation against a deviating party is authorized with a fixed probability.[8]

Modelling the WTO as a randomizing device ignores the ability of this institution to investigate the disputed actions. By investigating a dispute case, an expert may obtain valuable information regarding the true state of the world, which can be used to mitigate the information

[8]They also take this probability as exogenous and, therefore, they do not characterize the optimal randomizing device.

asymmetry among the disputing parties. In the next Section, the WTO is modeled as an impartial arbitrator that investigates a dispute case and truthfully reveals its (possibly imperfect) findings about the state of the world (i.e., the culpability of the defendant). Similar to the case of a public randomizing device, the negotiating parties make their post-dispute actions contingent on the arbitrator's findings.

4 Trade Agreement under WTO: Public Monitoring Provided by DSP

In contrast to the GATT Article XIX, the Safeguard Agreement of the WTO does not require a safeguard-imposing country to compensate the affected exporting countries if the surge in imports has caused or threatened serious injury to the domestic industries. Obviously, if there is no consequence to imposing safeguards, all governments will have an incentive to act opportunistically by claiming a bad shock to their respective economies. However, to implement safeguard measures with impunity, a country has to prove that its domestic situations meet the requirements set out in the agreement for a legitimate safeguard. If a dispute arises among the parties on whether some prevailing situations legitimize the use of safeguards by one country, a *panel of experts* appointed by the WTO would issue its opinion on the prevailing state of the world. In this paper, I take the view that the parties regard the panel's opinion as a public signal which is correlated with the true state of the world in the defending country. Letting $\widetilde{\theta} \in \{\underline{\theta}, \overline{\theta}\}$ ($\widetilde{\theta}^* \in \{\underline{\theta}, \overline{\theta}\}$) denote the panel's opinion about the state of the world in the home (foreign) country, I assume that the panel can recognize the true state of the world in either country with probability $\gamma \in [0, 1]$, i.e.,

$$\Pr\left(\widetilde{\theta} = \underline{\theta} | \theta = \underline{\theta}\right) = \Pr\left(\widetilde{\theta} = \overline{\theta} | \theta = \overline{\theta}\right) = \gamma.$$

If the home country announces high political pressure, i.e., $\widehat{\theta} = \overline{\theta}$, which also indicates its intention to implement a safeguard measure on one of its imports, it should defend its case before the dispute panel. The dispute panel investigates the truthfulness of the announcement and issues its opinion about the state of the world in the home (i.e., defending) country. If the panel upholds the defendant's claim, that is, if $\widetilde{\theta} = \widehat{\theta} = \overline{\theta}$, then the complaining country is not authorized to retaliate against the defending country. However, if the panel dismisses the defendant's claim, the complaining country can retaliate against the defending country by adopting a safeguard-level tariff, s, on one of its imports that is not currently eligible for a safeguard. The availability of such an importing good in the complaining country is ensured by the assumption that in a given period, protectionist pressures may be present in at most one of the two importing sectors.

4.1 Payoffs under WTO

In this subsection I calculate the expected payoffs of the home government (which is equal to that of the foreign government due to symmetry), given that both countries follow the strategy profile laid out above. First consider the case where both countries face low political pressures, which happens with a probability of $(1-\rho)^2$. In this situations both countries set the negotiated low tariff, l, on all imports, and the home government obtains $2\left[u\left(l;\underline{\theta}\right)+v\left(l\right)\right]$.

With probability $\rho\left(1-\rho\right)$ we have $\theta=\underline{\theta}$, and $\theta^*=\overline{\theta}$. The panel will approve the foreign country's decision to implement safeguards with probability γ, in which case the home country should choose low tariffs on all imports. With probability $1-\gamma$, the panel will disapprove the foreign government's decision, in which case the home government will be authorized to retaliate by choosing s on one import. Therefore, the expected payoff to the home government (before the panel's decision is announced) is given by:

$$\left[\gamma u\left(l;\underline{\theta}\right)+\left(1-\gamma\right)u\left(s;\underline{\theta}\right)+v\left(s\right)\right]+\left[u\left(l;\underline{\theta}\right)+v\left(l\right)\right].$$

Similarly, the case where $\theta=\overline{\theta}$ and $\theta^*=\underline{\theta}$ can happen with probability $\rho\left(1-\rho\right)$, and the payoff to the home government will be:

$$\left[u\left(s;\overline{\theta}\right)+\gamma v\left(l\right)+\left(1-\gamma\right)v\left(s\right)\right]+\left[u\left(l;\underline{\theta}\right)+v\left(l\right)\right].$$

When both countries receive high pressure, which happens with probability ρ^2, the payoff to the home government is:

$$\begin{aligned}
&\gamma^2\left\{\left[u\left(s;\overline{\theta}\right)+v\left(s\right)\right]+\left[u\left(l;\underline{\theta}\right)+v\left(l\right)\right]\right\}\\
&+\left(1-\gamma\right)^2\left\{\left[u\left(s;\overline{\theta}\right)+v\left(s\right)\right]+\left[u\left(s;\underline{\theta}\right)+v\left(s\right)\right]\right\}\\
&+\gamma\left(1-\gamma\right)\left\{\left[u\left(s;\overline{\theta}\right)+v\left(s\right)\right]+\left[u\left(s;\underline{\theta}\right)+v\left(l\right)\right]\right\}\\
&+\gamma\left(1-\gamma\right)\left\{\left[u\left(s;\overline{\theta}\right)+v\left(s\right)\right]+\left[u\left(l;\underline{\theta}\right)+v\left(s\right)\right]\right\}
\end{aligned}$$

The expression on the first line above reflects the case where the panel makes a correct judgment on both countries' claims. The second line is for the case where the panel's judgments are both wrong. The third line represents the case where the panel approves the home government's claim but not that of the foreign government. The last line represents the case where the panel approves the foreign government's claim but not that of the home government. Taking the expectation of these contingent payoffs (with respect to θ and θ^*) and simplifying yields the ex ante expected payoff of the home government (before the realization of political pressures) as follows:

$$P^W\left(l,s\right)=\rho\left[u\left(s;\overline{\theta}\right)+v\left(s\right)\right]+\rho\left(1-\gamma\right)\left[u\left(s;\underline{\theta}\right)+v\left(s\right)\right]+\left(2\left(1-\rho\right)+\rho\gamma\right)\left[u\left(l;\underline{\theta}\right)+v\left(l\right)\right].\quad(10)$$

Lemma 3 *Denoting the solution to the unconstrained maximization of* $P^W(l,s)$ *by* l^{Wu} *and* s^{Wu}*, we have* $l^{Wu} = \tau^E(\underline{\theta}) < s^{Wu} \leq \tau^{PE}(\overline{\theta})$*. Moreover,* s^{Wu} *is an increasing function of* γ*, which is equal to* l^G *when* $\gamma = 0$ *and is equal to* $\tau^{PE}(\overline{\theta})$ *when* $\gamma = 1$.

4.2 Incentive constraints

In this subsection I lay out the home government's incentive constraints assuming that the foreign government tells the truth. Due to symmetry, the foreign government's incentive constraints will be identical to those of the home government.

When $\theta = \underline{\theta}$, the home government's payoff from lying is $[u(s,\underline{\theta}) + \gamma v(s) + (1-\gamma)v(l)]$. That is because by claiming a high shock, when it is actually low, the government receives $u(s,\underline{\theta})$ from its protected sector, while it will face retaliation against one of its exporting sectors with probability γ, resulting in an expected payoff of $\gamma v(s) + (1-\gamma)v(l)$ from the exporting sector. By telling the truth, on the other hand, the government will receive $[u(l,\underline{\theta}) + v(l)]$. Therefore, the incentive constraint under this contingency is

$$u(s,\underline{\theta}) + \gamma v(s) + (1-\gamma)v(l) \leq u(l,\underline{\theta}) + v(l),$$

or, equivalently

$$u(s,\underline{\theta}) + \gamma v(s) \leq u(l,\underline{\theta}) + \gamma v(l). \tag{11}$$

When $\theta = \overline{\theta}$, the government's expected payoff from invoking a safeguard measure (i.e., claiming high pressure) is $u(s,\overline{\theta}) + \gamma v(l) + (1-\gamma)v(s)$, and its payoff without invoking a safeguard measure is $u(l,\overline{\theta}) + v(l)$. Therefore, the incentive constraint when $\theta = \overline{\theta}$ is given by

$$u(s,\overline{\theta}) + \gamma v(l) + (1-\gamma)v(s) \geq u(l,\overline{\theta}) + v(l),$$

or, equivalently, by

$$u(s,\overline{\theta}) + (1-\gamma)v(s) \geq u(l,\overline{\theta}) + (1-\gamma)v(l). \tag{12}$$

In short, the negotiators' problem under the WTO can be summarized as

$$\begin{aligned} &\max_{l,s} P^W(l,s) \qquad (13)\\ &\text{subject to incentive constraints (11) and (12).} \end{aligned}$$

The following Lemma will be useful in analyzing these incentive constraints.

Lemma 4 *Assuming that* $0 \leq \alpha \leq 1$, $u(\tau,\theta) + \alpha v(\tau)$ *is a concave function of* τ *and is symmetric*

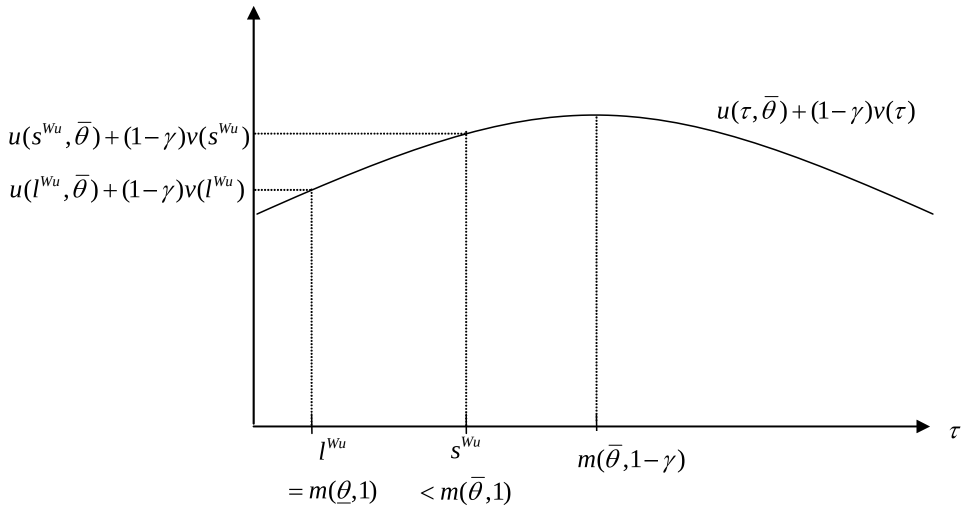

Figure 3: The incentive constraint (12) is non-binding.

around $\tau = m(\theta, \alpha)$, *where*

$$m(\theta, \alpha) \equiv \arg\max_{\tau} \left[u(\tau, \theta) + \alpha v(\tau)\right].$$

Moreover, $m(\theta, \alpha)$ *is increasing in* θ *and decreasing in* α.

The concave function $u(\tau, \theta) + \alpha v(\tau)$, is the general functional form of the expressions on each side of the incentive constraints, such that in the incentive constraint (11) we have $\alpha = \gamma$ and $\theta = \underline{\theta}$, and in the incentive constraint (12) we have $\alpha = 1 - \gamma$ and $\theta = \overline{\theta}$. Also the function $m(\theta, \alpha)$ given in this Lemma can be used to rewrite the politically efficient tariffs as $\tau^{PE}(\underline{\theta}) = m(\underline{\theta}, 1)$ and $\tau^{PE}\left(\overline{\theta}\right) = m\left(\overline{\theta}, 1\right)$.

It is now straightforward to show that the unconstrained optimal negotiated tariffs, l^{Wu} and s^{Wu}, satisfy (12) and thus (12) is not a binding incentive constraint. To see this, note that since $m(\theta, \alpha)$ is increasing in θ and decreasing in α, we have

$$m(\underline{\theta}, 1) < m\left(\overline{\theta}, 1\right) < m\left(\overline{\theta}, 1 - \gamma\right),$$

or, equivalently,

$$\tau^{PE}(\underline{\theta}) < \tau^{PE}\left(\overline{\theta}\right) < m\left(\overline{\theta}, 1 - \gamma\right).$$

Now recall from Lemma 3 that $l^{Wu} = \tau^{PE}(\underline{\theta}) < s^{Wu} \leq \tau^{PE}\left(\overline{\theta}\right)$, and rewrite the above inequalities as follows:

$$l^{Wu} < s^{Wu} < m\left(\overline{\theta}, 1 - \gamma\right).$$

But since $u\left(\tau, \overline{\theta}\right) + (1 - \gamma) v(\tau)$ is a concave function that attains its maximum at $m\left(\overline{\theta}, 1 - \gamma\right)$,

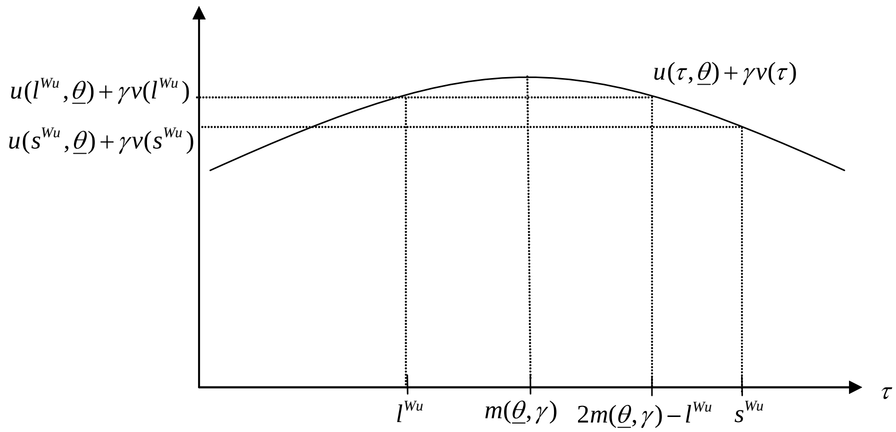

Figure 4: An example where the incentive constraint (11) is satisfied, i.e., when $s^{Wu} \geq 2m\left(\underline{\theta}, \gamma\right) - l^{Wu}$.

this inequality implies that:

$$u\left(l^{Wu}, \overline{\theta}\right) + (1-\gamma)\, v\left(l^{Wu}\right) < u\left(s^{Wu}, \overline{\theta}\right) + (1-\gamma)\, v\left(s^{Wu}\right).$$

Therefore, the incentive constraint (12) is not binding. (See Figure 3 for a graphical representation.)

Now consider the incentive constraint (11). Since $l^{Wu} < s^{Wu}$ for all $\gamma \in [0,1]$, and $u\left(\tau, \underline{\theta}\right) + \gamma v\left(\tau\right)$ is concave and symmetric around $m\left(\underline{\theta}, \gamma\right)$, the incentive constraint (11) is non-binding if and only if

$$s^{Wu} + l^{Wu} \geq 2m\left(\underline{\theta}, \gamma\right).$$

Figure 4 depicts a situation where this inequality, and hence, the incentive constraint (11), is satisfied. This inequality is violated if $\gamma = 0$ (because $l^{Wu} < s^{Wu}\left(\gamma = 0\right) < m\left(\underline{\theta}, 0\right)$)[9] and is satisfied if $\gamma = 1$ (because $l^{Wu} = m\left(\underline{\theta}, 1\right) < s^{Wu}\left(\gamma = 1\right) = m\left(\overline{\theta}, 1\right)$). Moreover, the left-hand side of this inequality is increasing in γ (Lemma 3) while its right-hand side is decreasing in γ (Lemma 4). Therefore,

Lemma 5 *There exists $\gamma_2 \in (0,1)$ such that l^{Wu} and s^{Wu} are incentive compatible and thus are optimal solutions to the WTO negotiators' problem* (13)*, if and only if $\gamma \geq \gamma_2$.*

In other words, if the dispute panel's judgment is sufficiently accurate, i.e., if $\gamma > \gamma_2$, the incentive constraints are not binding. However, if $\gamma < \gamma_2$, we have $s^{Wu} < 2m\left(\underline{\theta}, \gamma\right) - l^{Wu}$ and the incentive constraint (11) is binding. The following Lemma characterizes the optimal negotiated

[9] We know from Assumption 2 that $\tau^{PE}\left(\overline{\theta}\right) < \tau^{N}\left(\underline{\theta}\right)$ and from Lemma 3 that $s^{Wu}\left(\gamma\right) \leq \tau^{PE}\left(\overline{\theta}\right)$. Therefore, $s^{Wu}\left(\gamma = 0\right) < m\left(\underline{\theta}, 0\right) = \tau^{N}\left(\underline{\theta}\right)$.

tariffs under the WTO when this incentive constraint is binding.

Lemma 6 *There exists* $\gamma_1 \in (0, \gamma_2)$ *such that the optimal solution to the WTO negotiators' problem* (13) *satisfies* $l + s = 2m(\underline{\theta}, \gamma)$ *if* $\gamma_1 \leq \gamma \leq \gamma_2$*, and satisfies* $l = s$ *if* $\gamma \leq \gamma_1$.

Therefore, for very low qualities of judgment, i.e., when $\gamma \leq \gamma_1$, the optimal solution to (13) is a non-contingent tariff schedule, denoted by τ^{nc}. Letting (l^{Wr}, s^{Wr}) denote the optimal solution to (13) when $\gamma_1 < \gamma < \gamma_2$, the best incentive-compatible tariff schedule under the WTO for different levels of γ can be summarized by (l^W, s^W), where

$$l^W \equiv \begin{cases} l^{Wu} & \text{if} \quad \gamma \geq \gamma_2 \\ l^{Wr} & \text{if} \quad \gamma_1 < \gamma < \gamma_2 \\ \tau^{nc} & \text{if} \quad \gamma \leq \gamma_1 \end{cases} \text{ and } s^W \equiv \begin{cases} s^{Wu} & \text{if} \quad \gamma \geq \gamma_2 \\ s^{Wr} & \text{if} \quad \gamma_1 < \gamma < \gamma_2 \\ \tau^{nc} & \text{if} \quad \gamma \leq \gamma_1. \end{cases}$$

In the Appendix, it is shown that these tariffs can be ordered as follows:

Lemma 7 $l^{Wu} < l^{Wr} < \tau^N(\underline{\theta})$ *and* $s^{Wu} < s^{Wr} < \tau^N(\overline{\theta})$.

That is, a binding incentive compatibility constraint results in higher agreement tariffs, namely, $l^{Wr} > l^{Wu}$ and $s^{Wr} > s^{Wu}$. In either case, the low and safeguard tariffs under the WTO are less than the non-cooperative (Nash) tariffs.

5 Political Welfare under WTO vs. GATT

A potential source of political welfare improvement in transition from the GATT to the WTO is the reduced rate of trade skirmishes under the WTO. The frequency of trade skirmishes under the WTO, $2\rho(1-\gamma)$, is less than its frequency under the GATT, 2ρ. The reduced rate of retaliations under the WTO can benefit the negotiating parties in two ways. First, since retaliatory tariffs are less efficient than normal tariffs, all else equal, fewer invocations of retaliatory provisions will improve the welfare of the governments. In other words, restrictions on the use of the retaliation provision under the WTO reduces the pain to the governments from protecting their industries in periods of high political pressures. Second, note that in setting safeguard tariff rates, negotiators should take into account the inefficiency created by retaliations against the safeguard-imposing country. In fact, the prospect of inefficient retaliations may lead the negotiators to choose a safeguard tariff rate below the politically efficient tariff in periods of intense political pressures.[10] Therefore, the second channel through which governments may benefit from the reduced rate of retaliation is that they can agree on a politically more efficient, i.e., higher, tariff rate for periods of intense political pressures.

[10]Lemma 3 states that $s^{Wu} < \tau^{PE}(\overline{\theta})$.

A drawback of the WTO safeguard agreement, however, is that the condition for truthful revelation of private information is binding for low qualities of DSP judgment in which case negotiators have to choose a less efficient tariff schedule (l, s) to ensure incentive compatibility of the agreement. In what follows, I show that for low levels of judgment quality, the costs to the governments of switching to the WTO Safeguard Agreement outweighs its benefits. Therefore, a high-quality dispute settlement process is the key to a successful transition from the GATT to the WTO.

The political payoffs under the WTO are increasing in the accuracy of judgment, γ, achieving full political efficiency when $\gamma = 1$. To show this, I use the envelope theorem. For $\gamma \in [\gamma_1, \gamma_2]$, the government's optimization problem is given by $\max_{s^{Wr}} P^W\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}, s^{Wr}\right)$. Apply the envelope theorem to get:

$$\begin{aligned} & \frac{dP^W\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}, s^{Wr}\right)}{d\gamma} \\ = \;& -\rho\left[u\left(s^{Wr}; \underline{\theta}\right) + v\left(s^{Wr}\right)\right] + \rho\left[u(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}; \underline{\theta}) + v\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}\right)\right] \\ & + \left(2\left(1-\rho\right) + \rho\gamma\right)\left[u'\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}; \underline{\theta}\right) + v'\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}\right)\right] \times 2\frac{dm\left(\underline{\theta}, \gamma\right)}{d\gamma} \end{aligned}$$

The expression on the second line is positive because

$$u(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}; \underline{\theta}) + v\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}\right) = u\left(l^{Wl}; \underline{\theta}\right) + v\left(l^{Wl}\right) > u(s^{Wr}; \underline{\theta}) + v\left(s^{Wr}\right).$$

The expression on the third line is also positive because

$$u'(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}; \underline{\theta}) + v'\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}\right) = u'\left(l^{Wl}; \underline{\theta}\right) + v'\left(l^{Wl}; \underline{\theta}\right) < 0,$$

and $\frac{dm(\underline{\theta}, \gamma)}{d\gamma} < 0$. For $\gamma > \gamma_2$, the government's optimization problem is given by $\max_{l^{Wu}, s^{Wu}} P^W(l^{Wu}, s^{Wu})$. Applying the envelope theorem yields

$$\frac{dP^W(l^{Wu}, s^{Wu})}{d\gamma} = \rho\left[u(l^{Wu}; \underline{\theta}) + v(l^{Wu}) - u(s^{Wu}; \underline{\theta}) - v\left(s^{Wu}\right)\right] > 0.$$

Political welfare under the WTO for different levels of γ is depicted in Figure (5). The upper curve depicts $P^W(l^{Wu}, s^{Wu}(\gamma))$, which is the political welfare under the WTO as a function of γ assuming that the incentive constraint (11) is not binding. The lower curve, $P^W\left(l^{Wr}(\gamma), s^{Wr}(\gamma)\right)$, represents the political payoff under the WTO when the incentive constraint (11) is binding. These two curves are tangent at $\gamma = \gamma_2$. Furthermore, as was noted in Lemma 6, for $\gamma < \gamma_1$ the negotiated agreement under the WTO is a non-contingent contract which is represented by the line segment ab on the graph. Therefore, political welfare under the WTO is depicted by the segments ab (when tariffs are non-contingent), bc (when the incentive

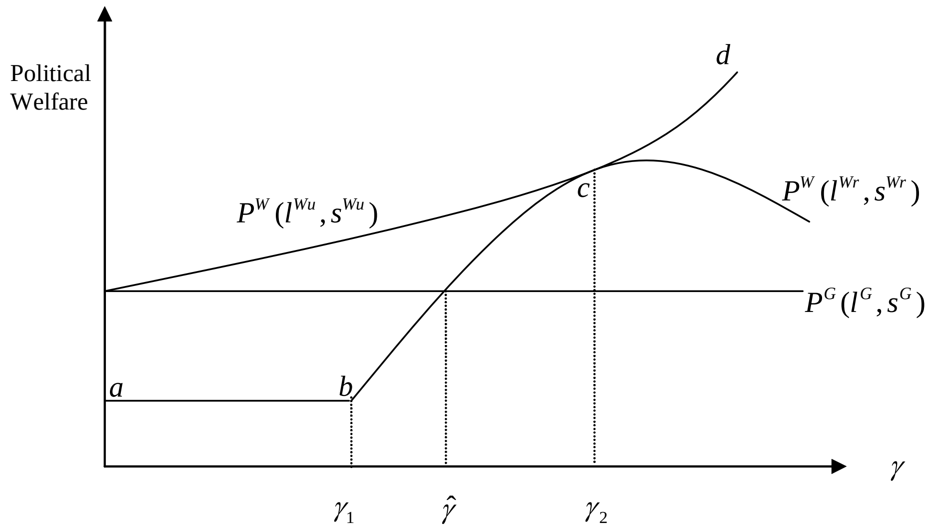

Figure 5: Comparing Expected Political Welfare under WTO and GATT.

constraint (11) is binding), and cd (when the incentive constraints are not binding).

Political welfare under the GATT, $P^G\left(l^G, s^G\right)$, which is independent of γ, is represented by a horizontal line in Figure 5. As depicted on the graph, $P^G\left(l^G, s^G\right)$ always lie below the upper curve, $P^W\left(l^{Wu}, s^{Wu}\right)$, and it intersects with the lower curve, $P^W\left(l^{Wr}, s^{Wr}\right)$, at $\gamma = \widehat{\gamma} \in (\gamma_1, \gamma_2)$. In other words:

Proposition 2 *There exists $\widehat{\gamma} \in (\gamma_1, \gamma_2)$, such that the negotiated tariffs under the WTO Safeguard Agreement generate a higher expected political payoff than does the negotiated tariffs under the GATT escape clause, if and only if $\gamma > \widehat{\gamma}$. Moreover, these expected payoffs are equal if and only if $\gamma = \widehat{\gamma}$.*

6 Social Welfare under WTO vs. GATT

Under the political trade model presented above, trade agreements fall short of social efficiency because governments give unequal weights to the welfare of import competing sectors and consumers. In fact, reforms in the world trading system can be understood as attempts by governments to improve the political efficiency of their trade partnership but it is not clear if such reforms promote social efficiency as well. In this section, I investigate the effect of reforms in the escape clause on social welfare. The social welfare function is defined similar to the political welfare function but with equal weights given to consumers' and producers' surplus.

As was noted in the previous section, the governments' gains from transition to WTO are twofold. First, the safeguard agreement of the WTO reduces the pain to the governments from protecting their industries in periods of high political pressure, by restricting the use of the retaliation provision. Second, under the auspices of the safeguard agreement, the governments will be protecting their troubled industries more vigorously. The latter channel of political gain is certainly bad news from a social welfare point of view, as a higher rate of protection in any situation translates to lower social welfare.[11] However, social welfare is improved through the former channel of political gains, as lower frequency of trade skirmishes reduces the average tariff rates. But it turns out that the social costs of the new escape clause outweigh its social gains and, thus, social welfare is undermined as a result of the reforms in the escape clause:

Proposition 3 *Social welfare is higher under the GATT escape clause (Article XIX) than under the WTO escape clause (the safeguard agreement).*[12]

This result, however, should be viewed in the context of this paper where no alternative protectionist measure is allowed to be taken by the negotiating parties. In practice, there are substitute measures for safeguards, such as antidumping, VERs, and hidden trade barriers, that governments can use to diffuse occasional protectionist pressures generated by domestic interest groups. These substitute measures are usually considered worse than safeguards as they are less transparent, violate the MFN principle and generate inefficiency due to trade diversion, and afford higher trade barriers for a longer period of time (Bown 2002). Therefore, an appropriate framework to analyze the social welfare effect of the Safeguard Agreement is one that recognizes the existence and substitutability of alternative trade barriers. In fact, the new escape clause may be more favorable in terms of social efficiency as it motivates the governments to rely more on safeguard measures in lieu of antidumping, VERs, and hidden trade barriers.

7 Enforcement

Thus far, I have characterized the incentive-compatible trade agreements under the GATT and WTO that maximize the joint political welfare of the negotiating governments. However, a trade agreement should be not only incentive-compatible (in terms of inducing truthful reporting of the state of the world), but also self-enforcing. In this Section, I adopt a repeated-game framework to account for the enforcement issue. If governments are sufficiently patient, the incentive-compatible agreements characterized above are self-enforcing. The minimum level of patience required to sustain an agreement, however, can differ across institutions. Therefore, introducing the enforcement problem can alter our analysis on the relative performance of the GATT and the WTO.

[11] With equal weights on the surplus of consumers and producers (i.e., $\theta = 1$), welfare is decreasing in tariffs and the most efficient cooperative tariff rate is zero.

[12] As will be seen in the next section, in a non-cooperative environment there is another channel through which political as well as social welfare can be improved by switching to the WTO.

Assume that the static games described above are repeated over an infinite number of periods. In each period a new political pressure is realized in each country according to the same random process explained above, i.e., a high (low) pressure is realized with probability ρ ($1-\rho$, respectively). Any observable deviation from the strategy profile prescribed by the agreement will trigger a reversion to Nash tariffs (i.e., a collapse of the agreement) in both sectors and all subsequent periods.

When governments set tariffs non-cooperatively, a government's best option is to set $\tau^N\left(\overline{\theta}\right)$ on the imports of the sector where political pressure is high, and to set $\tau^N\left(\underline{\theta}\right)$ on the imports of the sector with low political pressure. Therefore, the expected per-period welfare of the government when there is no cooperation is given by

$$\begin{aligned} P^N &= \rho\left[u\left(\tau^N\left(\overline{\theta}\right),\overline{\theta}\right)+v\left(\tau^N\left(\overline{\theta}\right)\right)+u\left(\tau^N\left(\underline{\theta}\right),\underline{\theta}\right)+v\left(\tau^N\left(\underline{\theta}\right)\right)\right] \\ &\quad +2\left(1-\rho\right)\left[u\left(\tau^N\left(\underline{\theta}\right),\underline{\theta}\right)+v\left(\tau^N\left(\underline{\theta}\right)\right)\right] \\ &= \rho\left[u\left(\tau^N\left(\overline{\theta}\right),\overline{\theta}\right)+v\left(\tau^N\left(\overline{\theta}\right)\right)\right]+\left(2-\rho\right)\left[u\left(\tau^N\left(\underline{\theta}\right),\underline{\theta}\right)+v\left(\tau^N\left(\underline{\theta}\right)\right)\right]. \end{aligned}$$

The discounted future value of cooperation under agreement $A=\{W,G\}$, can be written as $\frac{\delta}{1-\delta}\left(P^A-P^N\right)$, where δ is the common discount factor of the governments. On the other hand, given a cooperative tariff schedule (l,s), in periods of low political pressure, the value of deviation to a government is $2\left(u\left(\tau^N\left(\underline{\theta}\right),\underline{\theta}\right)-u\left(l,\underline{\theta}\right)\right)$. Similarly, in periods of high political pressures, the value of deviation to a government is $u\left(\tau^N\left(\overline{\theta}\right),\overline{\theta}\right)-u\left(s,\overline{\theta}\right)+u\left(\tau^N\left(\underline{\theta}\right),\underline{\theta}\right)-u\left(l,\underline{\theta}\right)$. Therefore, the enforceability constraints can be written as

$$2\left[u\left(\tau^N\left(\underline{\theta}\right),\underline{\theta}\right)-u\left(l,\underline{\theta}\right)\right]\leq\frac{\delta}{1-\delta}\left(P^A-P^N\right), \tag{14}$$

and

$$u\left(\tau^N\left(\overline{\theta}\right),\overline{\theta}\right)-u\left(s,\overline{\theta}\right)+u\left(\tau^N\left(\underline{\theta}\right),\underline{\theta}\right)-u\left(l,\underline{\theta}\right)\leq\frac{\delta}{1-\delta}\left(P^A-P^N\right). \tag{15}$$

Let δ^G denote the minimum discount factor for which $\left(l^G,s^G\right)$ is self-enforcing under the GATT. Similarly, define δ^W to be the minimum discount factor for which $\left(l^W,s^W\right)$ is self-enforcing under the WTO. Now recall from Proposition 2 that the value of cooperation is the same across the institutions when the WTO judgment quality is at its critical level, $\widehat{\gamma}$. On the other hand, for $\gamma=\widehat{\gamma}$, the value of cheating to a government is lower under the WTO than under the GATT. That is because, as shown in Lemmas 3 and 7, the negotiated tariffs under the WTO are closer to the Nash tariffs than are the negotiated tariffs under the GATT, i.e., $l^G<l^{Wr}<\tau^N\left(\underline{\theta}\right)$ and $s^G<s^{Wr}<\tau^N\left(\overline{\theta}\right)$. Therefore,

Proposition 4 *For $\delta=\delta^G$ and $\gamma=\widehat{\gamma}$, the WTO's enforceability conditions are not binding and the best incentive-compatible tariff schedule under the WTO,i.e., $\left(l^W,s^W\right)$, is self-enforcing. Moreover, $\delta^W<\delta^G$.*

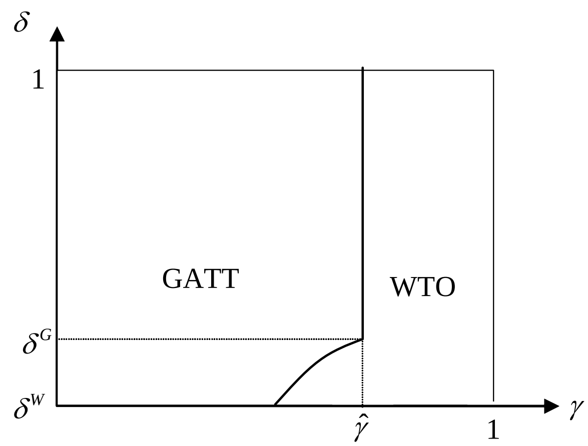

Figure 6: For impatient governments (i.e., when $\delta^W < \delta < \delta^G$), WTO outperforms GATT for a larger range of γ.

This proposition is interesting in that it states when the value of cooperation is equal across the two institutions, sustaining cooperation is easier under the WTO than under the GATT.

Corollary 8 *If $\delta^W \leq \delta < \delta^G$, the minimum judgment quality for which the political welfare is higher under the WTO than under the GATT is less than $\widehat{\gamma}$.*[13]

This Corollary is shown in Figure (6). For $\delta > \delta^G$, the critical value of γ is what we obtained under full commitment, i.e., $\gamma = \widehat{\gamma}$. However, as δ falls below δ^G the critical value of γ, above which the political welfare is higher under the WTO than under the GATT, decreases. This analysis suggests that the dispute settlement process of the WTO can improve the enforceability of trade agreements despite the fact that it does not provide any external enforcement.

8 Conclusion

I have modeled the WTO dispute settlement process as providing a public signal that is correlated with the true state of the world. Countries can condition their tariff policies on this signal; in contrast, no such signal is available under the GATT. I have found that if this signal involves a sufficiently high level of accuracy, then trade agreements under the WTO Agreement on Safeguards provides higher political welfare than does trade agreements under the corresponding GATT escape clause. This improvement arises through three different channels. First governments are better off by cutting back on the frequency of efficiency-reducing trade skirmishes under the WTO. Second, the governments will be able to coordinate on a more politically

[13] No clear conclusion was obtained for $\delta < \delta^W$. Therefore, I restrict my attention to $\delta > \delta^W$.

efficient tariff schedule under the WTO. Finally, the self-enforceability of trade agreements is improved by the introduction of the dispute settlement process of the WTO. This allows the negotiating countries to coordinate on more cooperative trade policies that improve the political welfare of the governments.

In this paper I assume that a safeguard measure is the only option for the WTO signatories if they want to restrict imports in response to high political pressure from their domestic interest groups. In practice, however, the governments can choose from a variety of policy options including antidumping, VERs, and hidden trade barriers. An interesting extension to this paper would be to consider the existence and substitutability of these alternative trade barriers. This will be particularly helpful in discussing the effect of reforms in the GATT escape clause on social welfare.

This paper has compared models of two actual regimes, namely, the GATT and the WTO. An interesting open question is to characterize an optimal regime using mechanism design. In addition, I have used trigger strategies with Nash reversion to examine the extent to which agreements are self-enforcing. It would be interesting to re-examine enforcement using more complex penalty schemes. Both of these issues are beyond the scope of the current paper, but are the subject of on-going research.

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Appendix

Equilibrium prices. World market clearing condition for good x is

$$D_x(p_x) + D_x^*(p_x - \tau) = Q_x(p_x) + Q_x^*(p_x - \tau).$$

Substituting for the supply and demand functions from (1) and (2), the market clearing condition can be rewritten as:

$$2 - 2p_x + \tau = p_x + b(p_x - \tau).$$

Solving for p_x yields $p_x = \frac{2+(1+b)\tau}{3+b}$. Similarly, using the world market clearing condition for good y, the home market price for good y can be calculated; $p_y = \frac{2(1-\tau^*)}{3+b}$. ■

Producers' surplus, consumers' surplus, and tariff revenues. The consumers' surplus from consumption of good x is

$$\psi_x(\tau) = \int_{p_x}^{1} D_x(u)\,du = \frac{1}{2} - p_x + \frac{1}{2}p_x^2 = \frac{1}{2}\left(\frac{(1+b)(1-\tau)}{3+b}\right)^2$$

Similarly, the consumers' surplus from consumption of good y can be obtained by using p_x:

$$\psi_y(\tau^*) = \frac{1}{2}\left(\frac{1+b+2\tau^*}{3+b}\right)^2.$$

The producers' surplus in sector x of the home country is

$$\pi_x(\tau) = \int_0^{p_x} Q_x(u)\,du = \frac{1}{2}p_x^2 = \frac{1}{2}\left(\frac{2+(1+b)\tau}{3+b}\right)^2.$$

The producers' surplus in sector y of the home country is

$$\pi_y(\tau^*) = \int_0^{p_y} Q_y(u)\,du = \frac{1}{2}bp_y^2 = 2b\left(\frac{1-\tau^*}{3+b}\right)^2.$$

The import demand is given by:

$$M(p_x) = D_x(p_x) - Q_x(p_x) = 1 - 2p_x = \frac{b-1-2(1+b)\tau}{3+b}.$$

Therefore, the government's tariff revenue is

$$T(\tau) = \tau M_x(p_x(\tau)) = \frac{(b-1)\tau - 2(1+b)\tau^2}{3+b}.$$

■

Welfare functions. Politically weighted welfare from the importing sector in home country is given by

$$
\begin{aligned}
u(\tau,\theta) &= \psi_x(\tau)+\theta\pi_x(\tau)+T(\tau) \\
&= \frac{1}{2}\left(\frac{(1+b)(1-\tau)}{3+b}\right)^2+\frac{\theta}{2}\left(\frac{2+(1+b)\tau}{3+b}\right)^2+\frac{(b-1)\tau-2(1+b)\tau^2}{3+b} \\
&= \frac{1}{(3+b)^2}\left\{\frac{1}{2}(1+b)^2(1-\tau)^2+\frac{\theta}{2}(2+(1+b)\tau)^2+(3+b)(b-1)\tau-2(3+b)(1+b)\tau^2\right\} \\
&= \frac{1}{(3+b)^2}\left\{\frac{1}{2}(1+b)^2+2\theta+[2\theta(1+b)-4]\tau+\left[\frac{1+\theta}{2}(1+b)^2-2(3+b)(1+b)\right]\tau^2\right\}.
\end{aligned}
$$

Moreover, the home government's welfare from the exporting sector is:

$$
\begin{aligned}
v(\tau^*) &= \psi_y(\tau^*)+\pi_y(\tau^*)=\frac{1}{2}\left(\frac{1+b+2\tau^*}{3+b}\right)^2+2b\left(\frac{1-\tau^*}{3+b}\right)^2 \\
&= \frac{1}{(3+b)^2}\left\{\frac{(1+b)^2}{2}+2b+2(1-b)\tau^*+2(1+b)\tau^{*2}\right\}.
\end{aligned}
$$

For further use, note that

$$
u'(\tau,\theta)=\frac{1}{(3+b)^2}\left\{[2\theta(1+b)-4]+\left[\theta-11+2(\theta-7)b+(\theta-3)b^2\right]\tau\right\},
$$

$$
u''(\tau,\theta)=\frac{\theta-11+2(\theta-7)b+(\theta-3)b^2}{(3+b)^2}=-\frac{(1+b)(11+3b-\theta(b+1))}{(3+b)^2},
$$

$$
v'(\tau^*)=\frac{2}{(3+b)^2}[(1-b)+2(1+b)\tau^*],
$$

and,

$$
v''(\tau^*)=\frac{4(1+b)}{(3+b)^2}.
$$

■

Nash tariff. Non-cooperative (Nash) tariff, τ^N, as a function of political pressure solves $u'\left(\tau^N,\theta\right)=0$. Rearranging yields

$$
\tau^N=\frac{4-2\theta(1+b)}{(-11-(3-\theta)b+\theta)(1+b)}=\frac{2\theta(1+b)-4}{11-\theta+2(7-\theta)b+(3-\theta)b^2}.
$$

■

Politically efficient tariff. Politically efficient home tariff should maximize the joint welfare of the governments which is given by $u(\tau,\theta)+v(\tau)$. FOC is given by $u'(\tau,\theta)+v'(\tau)=0$, or equivalently, by

$$\frac{1}{(3+b)^2}\left\{[2\theta(1+b)-4]+\left[\theta-11+2(\theta-7)b+(\theta-3)b^2\right]\tau\right\}+\frac{2}{(3+b)^2}[(1-b)+2(1+b)\tau]=0.$$

Solving for τ yields:

$$\tau^{PE}=-\frac{2(1+b)(\theta-1)}{\left[\theta-7+2(\theta-5)b+(\theta-3)b^2\right]}=\frac{2(\theta-1)}{7-\theta+b(3-\theta)}.$$

The SOC is given by $u''(\tau,\theta)+v''(\tau)<0$, or $\theta<\frac{3b+7}{b+1}$. Therefore, the SOC is satisfied since I assume $\theta<\frac{3b-1}{b+1}$. ■

Non-prohibitive tariffs . Import tariffs are non-prohibitive if and only if $M(p_x)=\frac{b-1-2(1+b)\tau}{3+b}>0$,or, equivalently if and only if $\tau<\frac{b-1}{2(1+b)}$. Therefore $\tau^N(\theta)$ is non-prohibitive if and only if

$$\frac{2\theta(1+b)-4}{11-\theta+2(7-\theta)b+(3-\theta)b^2}<\frac{b-1}{2(1+b)}.$$

Simplifying yields the counterpart to the Assumption 1: $\theta<\frac{3b-1}{1+b}$. ■

Proof of Lemma 1. It is sufficient to show that when $\theta<\frac{3b-1}{b+1}$ we have $u''(\tau,\theta)<0$, $u'(0,\theta)>0$, $v''(\tau^*)>0$, and $v'(0)<0$.

$u''(\tau,\theta)$ is negative iff $11+3b-\theta(b+1)>0$, or $\theta<\frac{b+1}{11+3b}$, which holds because $\frac{b+1}{11+3b}=\frac{(3b+7)-(2b+6)}{(b+1)+(2b+10)}<\frac{3b+7}{b+1}$. Also, $u'(0,\theta)=\frac{2\theta(1+b)-4}{(3+b)^2}$ is positive iff $\theta>\frac{2}{1+b}$, which holds since $b>1$ and $\theta>1$. Moreover, $v'(0)=\frac{2(1-b)}{(3+b)^2}<0$ because $b>1$. Finally, $v''(\tau^*)=\frac{4(1+b)}{(3+b)^2}>0$. ■

Proof of Lemma 2. Take the total derivative of the FOC that characterizes $\tau^N(\theta)$, with respect to τ^N and θ, to obtain:

$$\left[\psi_x''\left(\tau^N\right)+\theta\pi_x''\left(\tau^N\right)+T''\left(\tau^N\right)\right]d\tau^N+\pi_x'\left(\tau^N\right)d\theta=0.$$

Rearranging yields

$$\frac{d\tau^N}{d\theta}=\frac{-\pi_x'\left(\tau^N\right)}{\left[\psi_x''(\tau^N)+\theta\pi_x''(\tau^N)+T''(\tau^N)\right]}.$$

This ratio is positive because both the numerator and the denominator have negative values. Similarly, it can be shown that $\frac{d\tau^{PE}}{d\theta}>0$. ■

Proof of Lemma 3. Note that $P^W(l,s)$ is additively separable in functions of l and s, and we can write

$$\begin{aligned}
l^{Wu} &\equiv \arg\max_l\,[u(l;\underline{\theta})+v(l)]=\tau^E(\underline{\theta}),\\
s^{Wu} &\equiv \arg\max_s\left\{\left[u\left(s;\overline{\theta}\right)+v(s)\right]+(1-\gamma)\left[u(s;\underline{\theta})+v(s)\right]\right\}.
\end{aligned}$$

To verify that $\tau^E(\underline{\theta})<s^{Wu}\leq\tau^{PE}\left(\overline{\theta}\right)$, it is sufficient to show that the concave function

$\left[u\left(s;\overline{\theta}\right)+v\left(s\right)\right]+\left(1-\gamma\right)\left[u\left(s;\underline{\theta}\right)+v\left(s\right)\right]$ is increasing when $s=\tau^{PE}\left(\underline{\theta}\right)$ and decreasing when $s=\tau^{PE}\left(\overline{\theta}\right)$. I do this by taking first derivatives:

$$\begin{aligned}&\left[u'\left(\tau^{PE}\left(\overline{\theta}\right);\overline{\theta}\right)+v'\left(\tau^{PE}\left(\overline{\theta}\right)\right)\right]+\left(1-\gamma\right)\left[u'\left(\tau^{PE}\left(\overline{\theta}\right);\underline{\theta}\right)+v'\left(\tau^{PE}\left(\overline{\theta}\right)\right)\right]\\=\;&\left(1-\gamma\right)\left[u'\left(\tau^{PE}\left(\overline{\theta}\right);\underline{\theta}\right)+v'\left(\tau^{PE}\left(\overline{\theta}\right)\right)\right]<0,\end{aligned}$$

and

$$\begin{aligned}&\left[u'\left(\tau^{PE}\left(\underline{\theta}\right);\overline{\theta}\right)+v'\left(\tau^{PE}\left(\underline{\theta}\right)\right)\right]+\left(1-\gamma\right)\left[u'\left(\tau^{PE}\left(\underline{\theta}\right);\underline{\theta}\right)+v'\left(\tau^{PE}\left(\underline{\theta}\right)\right)\right]\\=\;&\left[u'\left(\tau^{PE}\left(\underline{\theta}\right);\overline{\theta}\right)+v'\left(\tau^{PE}\left(\underline{\theta}\right)\right)\right]>0.\end{aligned}$$

To verify that s^{Wu} is increasing in γ, write the first-order condition that characterizes s^{Wu}:

$$\left[u'\left(s^{Wu};\overline{\theta}\right)+v'\left(s^{Wu}\right)\right]+\left(1-\gamma\right)\left[u'\left(s^{Wu};\underline{\theta}\right)+v'\left(s^{Wu}\right)\right]=0,$$

and take its total derivative with respect to s^{Wu} and γ, and rearrange to obtain:

$$\frac{ds^{Wu}}{d\gamma}=\frac{u'\left(s^{Wu};\underline{\theta}\right)+v'\left(s^{Wu}\right)}{\left[u''\left(s^{Wu};\overline{\theta}\right)+v''\left(s^{Wu}\right)\right]+\left(1-\gamma\right)\left[u''\left(s^{Wu};\underline{\theta}\right)+v''\left(s^{Wu}\right)\right]}>0.$$

This ratio is positive because both the numerator and the denominator have negative values. ■

Proof of Lemma 4. Note that

$$u''(\tau,\theta)+\alpha v''(\tau)=-\frac{(1+b)(11+3b-\theta(b+1))}{(3+b^2)^2}+\alpha\frac{4(1+b)}{(3+b)^2}=-\frac{(1+b)[-4\alpha+(11+3b)-\theta(b+1)]}{(3+b)^2}.$$

Thus, to prove the concavity of $u(\tau,\theta)+\alpha v(\tau)$ it is sufficient to show that $-4\alpha+(11+3b)-\theta(b+1)>0$, or, equivalently, $\theta<\frac{11+3b-4\alpha}{b+1}$. But this holds because $0<\alpha<1$ and $\theta<\frac{3b-1}{b+1}$by assumption. Also note that $u(\tau,\theta)+\alpha v(\tau)$ is a quadratic function and, thus, symmetric around $m\left(\theta,\alpha\right)$. ■

Proof of Lemma 6. According to Lemma 5, the incentive constraint (11) is binding for $\gamma<\gamma_2$, i.e.:

$$u\left(s;\underline{\theta}\right)+\gamma v\left(s\right)=u\left(l;\underline{\theta}\right)+\gamma v\left(l\right).$$

Since $u\left(\tau;\underline{\theta}\right)+\gamma v\left(\tau\right)$ is concave in τ and symmetric around $\tau=m\left(\underline{\theta},\gamma\right)$, the above equality holds if and only if one of the following equations hold:

$$\begin{aligned}l+s&=2m\left(\underline{\theta},\gamma\right)&\quad(16)\\l&=s&\quad(17)\end{aligned}$$

Define γ_1 as the solution to $s^{Wu}\left(\gamma\right)=m\left(\underline{\theta},\gamma\right)$ when solving for γ. This equation has a unique solution since $\frac{ds^{Wu}(\gamma)}{d\gamma} > 0$, $\frac{dm(\underline{\theta},\gamma)}{d\gamma} < 0$, $s^{Wu}(0) < m(\underline{\theta}, 0)$, and $s^{Wu}(1) > m(\underline{\theta}, 1)$. In other words, there exists $\gamma_1 \in (0,1)$ such that

$$\begin{aligned} s^{Wu}(\gamma) < m(\underline{\theta},\gamma) \quad &\text{if} \quad \gamma < \gamma_1, \\ s^{Wu}(\gamma) = m(\underline{\theta},\gamma) \quad &\text{if} \quad \gamma = \gamma_1, \\ s^{Wu}(\gamma) > m(\underline{\theta},\gamma) \quad &\text{if} \quad \gamma > \gamma_1. \end{aligned}$$

Moreover, we have $\gamma_1 < \gamma_2$. To show this, it is sufficient to show that $s^{Wu}(\gamma_2) > m(\underline{\theta},\gamma_2)$. But, by the definition of γ_2, we have $s^{Wu}(\gamma_2) = 2m(\underline{\theta},\gamma_2) - l^{Wu}$ which implies that $s^{Wu}(\gamma_2) = 2m(\underline{\theta},\gamma_2) - m(\underline{\theta},1) > m(\underline{\theta},\gamma_2)$.

Finally note that, having fixed γ and ρ, $P^W(l,s)$ increases when $|l - l^{Wu}|$ and/or $|s - s^{Wu}|$ decreases, and $P^W(l,s)$ is maximized when $l = l^{Wu}$ and $s = s^{Wu}$. Now we are ready to prove the Lemma.

First I show that when $\gamma_1 \leq \gamma \leq \gamma_2$, the solution to the negotiators' problem, satisfy $l + s = 2m(\underline{\theta},\gamma)$. On the contrary suppose that $l + s \neq 2m(\underline{\theta},\gamma)$, which implies that $l = s \equiv \tau_0$. Moreover, when $\gamma_1 \leq \gamma \leq \gamma_2$ we have $l^{Wu} < m(\underline{\theta},\gamma) < s^{Wu}(\gamma)$. Therefore, one of the following should hold:

$$\begin{aligned} \tau_0 &\leq l^{Wu} < m(\underline{\theta},\gamma) < s^{Wu}(\gamma), \\ l^{Wu} &< \tau_0 < m(\underline{\theta},\gamma) < s^{Wu}(\gamma), \\ l^{Wu} &< m(\underline{\theta},\gamma) \leq \tau_0 < s^{Wu}(\gamma), \\ l^{Wu} &< m(\underline{\theta},\gamma) < s^{Wu}(\gamma) \leq \tau_0. \end{aligned}$$

In the first two cases, setting $l = \tau_0$ and $s = 2m(\underline{\theta},\gamma) - \tau_0$ will be incentive compatible and will generate a higher political welfare than $l = s = \tau_0$, because $|2m(\underline{\theta},\gamma) - \tau_0 - s^{Wu}| < |\tau_0 - s^{Wu}|$. In the latter cases, setting $s = \tau_0$ and $l = 2m(\underline{\theta},\gamma) - \tau_0$ will be incentive compatible and will generate a higher political welfare than $l = s = \tau_0$, because $|2m(\underline{\theta},\gamma) - \tau_0 - l^{Wu}| < |\tau_0 - l^{Wu}|$.

Finally, when $\gamma < \gamma_1$ the solution to the WTO negotiators' problem must satisfy $l = s$. On the contrary, suppose that $l \neq s$ which implies that $l + s = 2m(\underline{\theta},\gamma)$. I will show that (l,l) generates a higher payoff than (l,s) by proving that $|l - s^{Wu}| < |s - s^{Wu}|$. Since $l^{Wu} < s^{Wu}(\gamma) < m(\underline{\theta},\gamma)$ and $l + s = 2m(\underline{\theta},\gamma)$, one of the following should hold:

$$\begin{aligned} l &< s^{Wu} < m(\underline{\theta},\gamma) < s, \\ \text{or } s^{Wu} &< l < m(\underline{\theta},\gamma) < s. \end{aligned}$$

If the former holds, we have $|l - s^{Wu}| < |s - s^{Wu}|$ because $0 < s^{Wu} - l < m(\underline{\theta},\gamma) - l + m(\underline{\theta},\gamma) - s^{Wu} = s - s^{Wu}$. If the latter holds, again we have $|l - s^{Wu}| < |s - s^{Wu}|$ because $0 < l - s^{Wu} < s - s^{Wu}$. ■

Proof of Lemma 7. According to Lemma 6, when $\gamma_1 < \gamma < \gamma_2$, the optimal solution to (13) is given by $\left(l^{Wr}, s^{Wr}\right)$, where $l^{Wr} + s^{Wr} = 2m\left(\underline{\theta}, \gamma\right)$. Therefore, problem (13) can be written as

$$\begin{aligned} & \max_s P^W\left(2m\left(\underline{\theta}, \gamma\right) - s, s\right) \\ = \quad & \rho\left[u\left(s; \overline{\theta}\right) + v\left(s\right)\right] + \rho\left(1-\gamma\right)\left[u\left(s; \underline{\theta}\right) + v\left(s\right)\right] + \left(2\left(1-\rho\right) + \rho\gamma\right)\left[u\left(2m\left(\underline{\theta}, \gamma\right) - s; \underline{\theta}\right) + v\left(2m\left(\underline{\theta}, \gamma\right) - s\right)\right], \end{aligned}$$

and the FOC is given by

$$\begin{aligned} & \frac{dP^W\left(2m\left(\underline{\theta}, \gamma\right) - s, s\right)}{ds} \\ = \quad & \rho\left[u'\left(s; \overline{\theta}\right) + v'\left(s\right)\right] + \rho\left(1-\gamma\right)\left[u'\left(s; \underline{\theta}\right) + v\left(s\right)\right] - \left(2\left(1-\rho\right) + \rho\gamma\right)\left[u'\left(2m\left(\underline{\theta}, \gamma\right) - s; \underline{\theta}\right) + v'\left(2m\left(\underline{\theta}, \gamma\right) - s\right.\right. \end{aligned}$$

It is sufficient to show that an optimal solution cannot contain $s^{Wr} \leq s^{Wu}$ or $l^{Wr} \leq l^{Wu}$.

Suppose that $s^{Wr} \leq s^{Wu}$. This implies that

$$\rho\left[u'\left(s^{Wr}; \overline{\theta}\right) + v'\left(s^{Wr}\right)\right] + \rho\left(1-\gamma\right)\left[u'\left(s^{Wr}; \underline{\theta}\right) + v\left(s^{Wr}\right)\right] > 0.$$

It also implies that $l^{Wr} = 2m\left(\underline{\theta}, \gamma\right) - s^{Wr} > l^{Wu}$ since when $\gamma_1 < \gamma < \gamma_2$ we have $s^{Wu} < 2m\left(\underline{\theta}, \gamma\right) - l^{Wu}$. Thus,

$$\left[u'\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}; \underline{\theta}\right) + v'\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}\right)\right] < 0.$$

Therefore, $\frac{dP^W\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}, s^{Wr}\right)}{ds} > 0$ and the optimality condition is not satisfied. Thus, $s^{Wr} > s^{Wu}$.

Now suppose that $l^{Wr} \leq l^{Wu}$. This implies that $2m\left(\underline{\theta}, \gamma\right) - s^{Wr} \leq l^{Wu}$ and that

$$\left[u'\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}; \underline{\theta}\right) + v'\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}\right)\right] > 0.$$

It also implies that $s^{Wr} = 2m\left(\underline{\theta}, \gamma\right) - l^{Wr} > s^{Wu}$. Thus

$$\rho\left[u'\left(s^{Wr}; \overline{\theta}\right) + v'\left(s^{Wr}\right)\right] + \rho\left(1-\gamma\right)\left[u'\left(s^{Wr}; \underline{\theta}\right) + v\left(s^{Wr}\right)\right] < 0.$$

Therefore, $\frac{dP^W\left(2m\left(\underline{\theta}, \gamma\right) - s^{Wr}, s^{Wr}\right)}{ds} < 0$ and the optimality condition is not satisfied. Thus, $l^{Wr} > l^{Ws}$. ■

Proof of Proposition 2. When $\gamma = 0$ we have $P^W(l, s) \equiv P^G(l, s)$ which implies that $l^{Wu} = l^G$ and $s^{Wu} = s^G$. It then follows that when $\gamma = 0$, we have $P^W\left(l^{Wu}, s^{Wu}\right) = P^G\left(l^G, s^G\right)$. Moreover $P^W\left(l^{Wu}, s^{Wu}\right)$ is increasing in γ, while $P^G\left(l^G, s^G\right)$ is independent of γ. This proves that $P^G\left(l^G, s^G\right)$ is below $P^W\left(l^{Wu}, s^{Wu}\right)$ for $\gamma \in (0, 1]$.

To verify that $\gamma_1 < \widehat{\gamma} < \gamma_2$, it is now sufficient to show

$$P^W\left(l^{Wr}(\gamma_1), s^{Wr}(\gamma_1)\right) < P^G\left(l^G, s^G\right),$$

and

$$P^W\left(l^{Wr}(\gamma_2), s^{Wr}(\gamma_2)\right) > P^G\left(l^G, s^G\right).$$

But note that $P^W\left(l^{Wr}(\gamma_1), s^{Wr}(\gamma_1)\right)$ is equal to the highest payoffs attainable under a non-contingent agreement and it must be smaller than the government's payoff under the GATT (because any non-contingent agreement is feasible, i.e., incentive compatible, under the GATT rules). Moreover, $l^{Wr}(\gamma_2) = l^{Wu}$ and $s^{Wr}(\gamma_2) = s^{Wu}(\gamma_2)$ and, thus, $P^W\left(l^{Wr}(\gamma_2), s^{Wr}(\gamma_2)\right)$ is equal to $P^W\left(l^{Wu}(\gamma_2), s^{Wu}(\gamma_2)\right)$ which is larger than $P^G\left(l^G, s^G\right)$. ■

Proof of Proposition 3. Social welfare under the GATT, denoted by S^G, can be written as follows:

$$S^G = 2\left\{\rho\left[u\left(s^G;1\right) + v\left(s^G\right)\right] + (1-\rho)\left[u\left(l^G;1\right) + v\left(l^G\right)\right]\right\}.$$

This is identical to the political welfare under the GATT if $\underline{\theta} = \overline{\theta} = 1$. Similarly, social welfare under the WTO, denoted by S^W, is given by:

$$S^W(\gamma) = \begin{cases} S^{Wr}(\gamma) & \text{if} \quad \gamma_1 < \gamma < \gamma_2 \\ S^{Wu}(\gamma) & \text{if} \quad \gamma > \gamma_2 \end{cases}$$

where,

$$\begin{aligned} S^{Wr}(\gamma) &= \rho(2-\gamma)\left[u\left(s^{Wr};1\right) + v\left(s^{Wr}\right)\right] + (2(1-\rho)+\rho\gamma)\left[u\left(l^{Wr};1\right) + v\left(l^{Wr}\right)\right] \\ S^{Wu}(\gamma) &= \rho(2-\gamma)\left[u\left(s^{Wu};1\right) + v\left(s^{Wu}\right)\right] + (2(1-\rho)+\rho\gamma)\left[u\left(l^{Wu};1\right) + v\left(l^{Wu}\right)\right] \end{aligned}$$

To prove the proposition (i.e., $S^W(\gamma) < S^G \ \forall \gamma \in (\gamma_1, 1)$), it is sufficient to show that $S^{Wu}(\gamma) < S^G \ \forall \gamma \in [0,1]$ and that $W^{Sr}(\gamma) < S^{Wu}(\gamma) \ \forall \gamma \in [0, \gamma_2]$.

To show the former, I prove that $S^{Wu}(0) = S^G$, $\frac{dS^{Wu}(0)}{d\gamma} < 0$, and $\frac{d^2 S^{Wu}(\gamma)}{d\gamma^2} < 0$. When $\gamma = 0$, we have $s^{Wu} = s^G$, $l^{Wu} = s^{Wu}$ and $S^{Wu}(0) = 2\left\{\left[u\left(s^G;1\right) + v\left(s^G\right)\right] + (1-\rho)\left[u\left(l^G;1\right) + v\left(l^G\right)\right]\right\} = S^G$. Substituting for $u(.,.)$ and $v(.)$ in $S^{Wu}(\gamma)$ and taking derivative yields

$$\frac{dS^{Wu}}{d\gamma} = \frac{\rho(1+b)}{(3+b)} \times \left\{\left(s^{Wu}\right)^2 - 2(2-\gamma)s^{Wu}\frac{dS^{Wu}}{d\gamma}\right\}.$$

Now substitute, $s^{Wu}(\gamma = 0) = \frac{2(\theta-1)}{5b+13-(1+b)\theta}$, $\frac{dS^{Wu}(\gamma=0)}{d\gamma} = \frac{4(3+b)(\theta-1)}{[5b+13-(1+b)\theta]^2}$, and $\gamma = 0$ to get

$\frac{dS^{Wu}(0)}{d\gamma} = -\frac{4\rho(\theta-1)^2(1+b)[(1+b)\theta+11+3b]}{(3+b)[5b+13-(1+b)\theta]^3} < 0$. Moreover,

$$\frac{d^2S^{Wu}(\gamma)}{d\gamma^2} = -\frac{32\rho(1+b)(\theta-1)^2(5+\theta-3\gamma+(1-\gamma+\theta)b)}{[5b+13-(1+b)\theta-2\gamma(3+b)]^4} < 0.$$

To show the latter,first note that for $\gamma < \gamma_2$ the incentive constraint, given by $s+l \geq 2m(\underline{\theta},\gamma)$, is binding which implies $s^{Wu}+l^{Wu} < 2m(\underline{\theta},\gamma)$, $s^{Wr}+l^{Wr} = 2m(\underline{\theta},\gamma)$, and $s^{Wu}+l^{Wu} < s^r+l^r$. It then follows that $s^{Wu} < s^{Wr}$ and $l^{Wu} < l^{Wr}$, because if $s^{Wu} > s^{Wr}$ and $l^{Wu} < l^{Wr}$ the political welfare in case of a binding constraint can be raised by decreasing s^{Wr}, and if $s^{Wu} < s^{Wr}$and $l^{Wu} > l^{Wr}$ political welfare in case of a binding constraint can be raised by decreasing l^{Wr}. and Therefore, $W^{Sr}(\gamma) < W^{Su}(\gamma)\ \forall\gamma \in [0,\gamma_2]$. ■