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Trade skirmishes and safeguards: A theory of the WTO Dispute Settlement Process

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World Trade Organization
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<p>TRADE SKIRMISHES AND SAFEGUARDS: A THEORY OF THE WTO DISPUTE SETTLEMENT PROCESS</p>
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Trade Skirmishes and Safeguards: A Theory of the WTO Dispute Settlement Process*

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Abstract

I propose a framework within which to interpret and evaluate the major reforms introduced to the GATT system in its transition to the WTO. In particular, I examine the WTO Agreement on Safeguards that has replaced the GATT escape clause (Article XIX), and the Dispute Settlement Process (DSP) that resembles a court of law under the WTO. Using this framework, I interpret the weakening of the reciprocity principle under the Agreement on Safeguards as an attempt to reduce efficiency-reducing trade skirmishes. The DSP is interpreted as an impartial arbitrator that announces its opinion about the state of the world when a dispute arises among member countries. I demonstrate that the reforms in the GATT escape clause should be bundled with the introduction of the DSP, in order to maintain the incentive-compatibility of trade agreements. The model implies that trade agreements under the WTO lead to fewer trade skirmishes but this effect does not necessarily result in higher payoffs to the governments. The model also implies that the introduction of the WTO court, which has no enforcement power, can in fact improve the self-enforceability of trade agreements.

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

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

1 Introduction

The role of GATT and its successor, the WTO, in reducing trade barriers has been widely acknowledged. The design of the WTO is mainly based on the GATT agreement but it also features significant reforms in some of the fundamental GATT principles and practices. Despite the important changes brought about by the WTO, however, economists have widely focused their attention on the old GATT rules to provide an economic theory of the international trading system. The most notable work is the “Economic Theory of GATT” by Bagwell and Staiger (1999, 2002) that framed the subsequent research in this area. My purpose in this paper is to incorporate new features brought about by the WTO into an economic analysis of international trade institutions.

Trade agreements under GATT and the WTO are subject to a safeguard clause. A safeguard clause allows a country to abandon its obligations under the agreement if some of its domestic industries are subject to substantial injury due to a surge in imports. The use of this clause

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was regulated under the GATT Article XIX, which was eventually replaced by the Agreement on Safeguards after the establishment of the WTO. According to Article XIX of GATT, a signatory who sought protection in the form of safeguards was subject to reciprocal retaliation by the affected countries if an agreement was not achieved between the parties on other forms of compensation. Under the new Agreement on Safeguards, however, it is possible for a country to adopt a safeguard measure for a period of three years without compensating the affected countries or facing retaliation from them. This loosening of the safeguard discipline warrants explanation since, as noted by Bagwell and Staiger (2005), a country that bears no cost by invoking the safeguard clause has the incentive to exaggerate its need for increased protection in order to improve its terms of trade.

A second notable change in GATT in its transition to the WTO has been the strengthening of the Dispute Settlement Process (DSP). International trade relations have become much more legalized under the WTO than under GATT. Dispute settlement under GATT was a diplomatic process for the negotiation and rebalancing of reciprocal state-to-state trade concessions (Shaffer 2003). In contrast, the DSP under the WTO is quite similar to a domestic legal system in that it involves a dispute panel that acts as a court of law and an Appellate Body that reviews the rulings of the panel. This “legalization” of the WTO is puzzling since the WTO members are sovereign governments that are not bound to international law, and to the rulings of the WTO dispute panels for that matter.¹

In this paper, I provide a model of the WTO Dispute Settlement Process and apply it to the Agreement on Safeguards. I work within a political economy framework that assumes safeguard clauses in trade agreements are designed to enable governments to dissipate occasional political pressures for higher protection. In addition, I assume that the home government is better informed about the political pressure it faces, and third parties, such as foreign governments and the DSP, cannot directly observe the true extent of these pressures. In this asymmetric information setting, I characterize incentive-compatible trade policies under which governments have no incentive to misrepresent the political pressure for protection.

I model the DSP as an impartial arbitrator that investigates the state of the world and issues its opinion about the culpability of the safeguard-imposing country, that is, whether the situation in the defending country justifies a safeguard measure. The DSP does not observe the state of the world perfectly and its judgment may be wrong. Nevertheless, the panel’s ruling is correlated with the true state of the world and, thus, provides a public signal that the parties can use to coordinate their strategies. In contrast, there is no such public signal available under GATT. Moreover, private investigations by the disputing parties cannot generate an informative public signal since the parties may act opportunistically in disclosing their findings, while the WTO arbitrators are presumably impartial entities who have the proper incentives to announce their findings truthfully.

I show that the reciprocity principle embodied in the GATT Article XIX ensures truthful revelation of private information. Based on the reciprocity principle, if a government invokes the safeguard clause in response to domestic political pressures, the affected negotiating parties will be free to withdraw equivalent concessions immediately, so that an instantaneous balance of concession is maintained among parties at all time. Therefore, even though GATT 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 safeguard clause induces the governments to use the clause only when they are faced with intense protectionist pressures. 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, p. 502) note that their analysis “indicates some discord—or at least reason for caution—with the WTO’s elimination

¹See Srinivasan (2007) for a thorough discussion of the WTO Dispute Settlement Process.

of the compensation and retaliation provisions associated with [safeguard] clause actions...”²

In this paper, however, I show that if an impartial entity, such as the DSP, provides the trading partners with reliable (but not necessarily perfect) judgment about the state of the world, they can coordinate on an incentive-compatible strategy profile that does not require an “instantaneous” balance of concessions. In my model, the judgment of the impartial arbitrator, which works as a public signal about the true state of the world, provides a new piece of information that mitigates the information asymmetry among the negotiating parties. 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, I show that the parties can negotiate an incentive-compatible agreement that limits retaliation against a safeguard-imposing country to cases where the dispute panel has dismissed the legitimacy of the safeguard measure. This analysis implies that the DSP plays a central role in maintaining the incentive compatibility of state-contingent agreements.

This paper can be viewed in the tradition of the economic theory of contract remedies that was introduced to the study of international trade agreements by Sykes (1991). One tenet in this literature is that an enforcement system should encourage efficient breach, that is, the breach of a contract in situations where “the promisor is able to profit from his default after placing his promisee in as good a position as he would have occupied had performance been rendered” (Birmingham 1969). A mechanism that is used by domestic courts to facilitate efficient breach is called the liability rule. Under this rule, a party to a contract is allowed to abandon its obligation if it compensates the breached-upon party for its loss from non-compliance. As Schwartz and Sykes (2002) explain, the reciprocity principle may be interpreted as a liability rule to encourage efficient breach of trade agreements, since this principle is effectively a mechanism to compensate the affected countries for their loss due to noncompliance.

In disputes among governments compensation is usually transferred through policy adjustments such as withdrawal of equivalent concessions. In contrast to monetary transfers, which have no efficiency consequences, withdrawal of equivalent concessions is distortionary and further reduces the aggregate welfare of the disputing parties.³ Therefore, for the sake of efficiency, trading partners are interested in curbing the size of compensation as long as they can maintain the incentive-compatibility of their agreement. In fact, as emphasized above, under the WTO Agreement on Safeguards no such compensation is necessarily afforded. This paper suggests that the WTO has developed a new contract remedy scheme based on the understanding that compensating a breached-upon party in trade disputes usually requires an efficiency-reducing trade skirmish.

I analyze the welfare effect of the transition from GATT to the WTO in terms of political welfare (defined as a weighted sum of consumer and producer surplus and government revenues, where a larger weight is given to the welfare of the organized political lobby groups) as well as social welfare (defined as an unweighted sum of all welfare components). The welfare effect can be broken down into three parts. First, there are fewer trade skirmishes under the WTO, which is an efficiency gain by itself. Second, the set of tariffs negotiated under the WTO is different from those negotiated under GATT. However, tariffs under the WTO are not necessarily more efficient than tariffs under GATT. In fact when the public signal generated by the dispute panel is too noisy, the WTO tariffs are less efficient than the GATT tariffs. There is a critical level of the panel judgment quality below which the efficiency loss due to less efficient tariffs under the WTO outweighs the efficiency gain due to the lower rate of trade skirmishes. Therefore, GATT becomes superior to the

²Bagwell and Staiger (2005) point out that the Agreement on Safeguards imposes a dynamic constraint on the use of the escape clause that may address the incentive-compatibility problem. Their contribution and its relevance to this work will be discussed in Subsection 11.3.

³As I will argue in Section 2, other forms of policy adjustments that are not efficiency reducing, such as cutting tariffs on the imports from the complaining countries, are usually impractical.

WTO in terms of political welfare when the DSP cannot generate high-quality judgments.

The third potential welfare effect is due to differences in enforcement capabilities across institutions. Using a repeated-game framework, I show that if the governments are sufficiently patient, the self-enforcing constraint is not binding under the GATT and the WTO. However, the minimum patience (i.e., discount factor) needed to satisfy the self-enforcing constraint is lower under the WTO than under GATT. This analysis therefore suggests that, despite having no teeth, the dispute panels of the WTO can improve the enforceability of trade agreements.

As an extension to the main model, I formulate the decision making of a court that pursues the specific objective of maximizing the joint political welfare of the disputing governments. I characterize the optimal behavior of a “strategic” court and demonstrate that the member countries will benefit from a systematic bias towards protectionism if the court is sufficiently accurate. In contrast, a systematic bias towards free trade (i.e., a pro-complainant bias) is desired when the court is not sufficiently accurate.

The incompleteness of trade agreements and the vague language of the safeguard clause are also addressed in this paper (Section 10). I show that when agreements are written in vague terms (because of high cost of contracting or other reasons), an entity that can fill the gap in the contract and provide an interpretive service can improve the joint welfare of the governments. I also consider other extensions and implications of the model in Section 11.

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 differs since I assume that the DSP is faced with similar information barriers as the uninformed party in a dispute.

Rosendorff (1996) studies the safeguard clause in trade agreements, assuming that a dispute panel rules against the defendant with a fixed and publicly known probability that is not correlated 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.

Riezman (1991) uses the notion of public signals in modeling trade cooperation when governments have private information about their protectionist policies. He interprets the volume of trade to a country as a public signal of the protectionist policies of its government. Within a dynamic-game framework similar to that of Green and Porter (1984), Riezman (1991) shows that governments can sustain a cooperative outcome (i.e., low tariffs) with occasional periods of high tariff when a country’s import volume falls substantially, that is, when the public signal indicates a potential deviation from the cooperative policies.

Park (2008) has independently developed a model of the WTO as a public signalling device. In a framework similar to that of Riezman (1991), Park (2008) analyzes the issue of enforcing international trade agreements when each country can secretly raise its protection level through concealed trade barriers. He constructs third-party trigger strategies under which each country triggers a tariff war based on the WTO’s decision on whether any concealed trade barrier has been erected.

In using a mechanism design approach to study trade agreements, my model is similar to Feenstra and Lewis (1991) and Bagwell and Staiger (2005). None of these papers, however, provide a model of the DSP and its role in trade agreements. Moreover, in Feenstra and Lewis (1991) the policy instrument that is used to compensate the affected exporting countries is an export restraint that allows the exporting countries to share the rents generated from higher protection. In contrast, I assume that governments cannot negotiate such gray area measures as they are illegal under the WTO.

Finally, Ludema (2001) models the DSP as an institution that eases communication after an agreement has begun. In a repeated-game framework, he shows that improved communication and the opportunity to renegotiate an agreement hinders cooperation by diluting the threat of severe punishment for breach of the agreement. In a similar context, Klimenko, Ramey, and Watson (2007) model the DSP as an institution that prevents governments from ignoring past violations in order to keep the punishment threats credible.

In the next Section, I discuss the safeguard provisions under the GATT and the WTO and provide a justification for using a political economy framework to analyze state contingent trade agreements. Then, in Section 3, I characterize the economic and political environment under which trade agreements are implemented. In Section 4, I will find the incentive-compatible agreement that maximizes political welfare under the GATT principle of reciprocity. Then, in Section 5, I introduce a model of DSP and find the incentive-compatible agreement that maximizes political welfare under the Agreement on Safeguards. Using these models, I compare political and social welfare across the two institutions in Sections 6 and 7. Section 8 addresses the issue of enforcement in a repeated-game framework. The issue of optimal decision making by the DSP will be considered in Section 9. In Section 10, I discuss incompleteness of trade agreements and its implications for implemented tariffs. Finally, I discuss other extensions and implications of my model in Section 11.

2 The Safeguard Clause: GATT vs. WTO

Article XIX of GATT and the WTO Agreement on Safeguards allow governments to suspend their obligations under the trade agreement if the trade liberalization has caused a “surge” in imports that threatens “substantial injury” to the domestic industries. A safeguard measure, effectively, slows the growth of imports in the troubled industries and reduces the efficiency gains from more open trade.

In this paper I take a political economy approach to study the safeguard clause. In particular, I follow Hillman (1982), Sykes (1991, 2006), and Baldwin and Robert-Nicoud (2007), in viewing safeguards as a response by governments to the political pressure from domestic interest groups. Hillman (1982) and Baldwin and Robert-Nicoud (2007) argue that declining industries experience a greater return to investment in lobbying for protection because rents from protection will not be dissipated by new entry. On the other hand, Sykes (1991, 2006) points out that the declining industries are more likely to meet the two main conditions for a safeguard measure, i.e., a surge in imports and substantial injury. Therefore, one can argue that the main motivation behind the safeguard clause is to allow governments to dissipate political pressures from declining industries for increased protection.

This view is in line with Dam’s (1970) argument that “the presence of [the safeguard clause] encourages cautious countries to enter into a greater number of tariff bindings than would otherwise be the case.” In other words, a rigid agreement that does not allow governments to suspend their obligations under high political pressure, makes the governments reluctant to give generous concessions in the first place.

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 weight that the government gives to the welfare of the import-competing sector may vary over time and is a function of the political pressures inflicted by these industries.

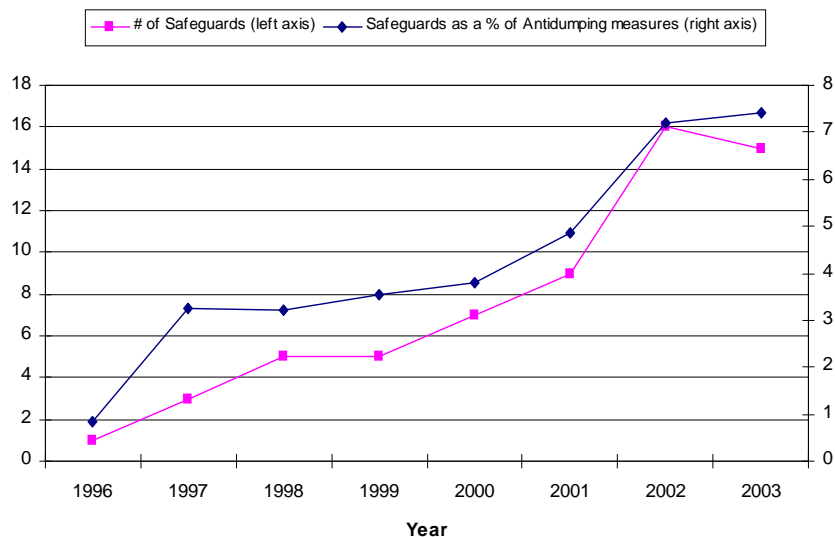


Figure 1: The use of the safeguard measure over time. (Source: The World Bank and the WTO.)

2.1 Safeguard Remedies under GATT and the WTO

The fundamental difference between the GATT Article XIX and the Agreement on Safeguards is in the way that the safeguard 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. If an agreement on compensation is not reached between the parties, the affected countries will be free to withdraw substantially equivalent concessions initially negotiated with the party which has taken the safeguard action. Under the WTO Agreement on Safeguards, however, a safeguard-imposing country can avoid paying compensation or facing retaliation 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 been hard to support theoretically, as it motivates parties to employ more protectionist policies.

In principle, a safeguard-imposing country could offer to affected exporting countries alternative concessions on other products in order to avoid retaliation. However, safeguard-imposing countries often found it very difficult to grant alternative concessions as a way of avoiding punishment. As Jackson (1997, p. 194) points out,

“as the general average of tariffs has declined to a very low point,... it has become increasingly harder for countries invoking safeguard measures to be able to effectively compensate affected countries by way of granting alternative concessions. Usually the “compensation bill” is sufficiently large that it becomes extremely difficult to find any products that have a tariff high enough to make an alternative concession meaningful, except for products that are already very sensitive and subject to the pressures of the domestic interests who claim they are already harmed by imports.”

In the GATT era, as a result, governments usually turned away from the safeguard measures and negotiated extra-legal forms of trade barrier, such as Voluntary Export Restraints (VERs), which allowed the affected countries to share the rents generated by higher protection. Some scholars have interpreted the loosening of the safeguard discipline as an attempt to divert protectionist

policies from relying heavily on ‘gray-area’ and discriminatory measures, such as VERs and antidumping policies, towards safeguard measures. On the efficiency grounds, economists typically prefer that a country resort to safeguard measures, which are applied nondiscriminatorily, in lieu of antidumping measures that discriminate among foreign exporters (Bown 2002). Moreover, the use of VERs is criticized as lacking transparency and enabling international cartels with the help of governments (Rosendorff 1996).⁴ In fact, the Agreement on Safeguards “was negotiated in large part because GATT Contracting Parties increasingly had been applying a variety of so-called ‘gray-area’ measures.”⁵ In other words, elimination of the compensatory requirement was intended to make the safeguard measures a more appealing instrument of protection to the governments. As a consequence of the reforms in the safeguard clause, the relative use of safeguard measures has been on the rise since the establishment of the WTO in 1995 (Figure 1).

Given that VERs and other gray-area measures are not sanctioned by the GATT or the WTO, in this paper I assume that the only acceptable form of protection is a safeguard measure. Although the GATT signatories ignored this restriction in practice, this assumption allows me to compare the two alternative safeguard institutions suggested by the GATT and the WTO.

3 The Model

3.1 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:

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

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:

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

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

⁴For 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).

⁵Quoted by Sykes (2006, p. 26) from a report on the WTO website.

countries and the home consumers' surplus from the consumption of x and y will be given by

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

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

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

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.

3.2 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.⁶ Namely,

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

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. The following assumption ensures that no prohibitive tariff will be chosen by any government:

Assumption 1. $\theta < \frac{2}{5} \frac{4b+1}{b+1}$.⁷ ■

3.3 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 $\bar{\theta}$. 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 $\bar{\theta}$ are such that $\tau^{PE}(\bar{\theta}) < \tau^N(\underline{\theta})$. ■

This assumption ensures that if an agreement sets a tariff binding equal to or smaller than $\tau^{PE}(\bar{\theta})$, 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 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, 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

⁶ Bagwell and Staiger (1999, 2002) first introduced this definition of politically efficient (or, in their language, politically optimal) tariffs.

⁷ It is shown in the appendix that the Nash tariff will be non-prohibitive if and only if $\theta < \frac{3b-1}{b+1}$. However, I need to make the stronger assumption that $\theta < \frac{2}{5} \frac{4b+1}{b+1}$ in order for the other results of the paper to hold.

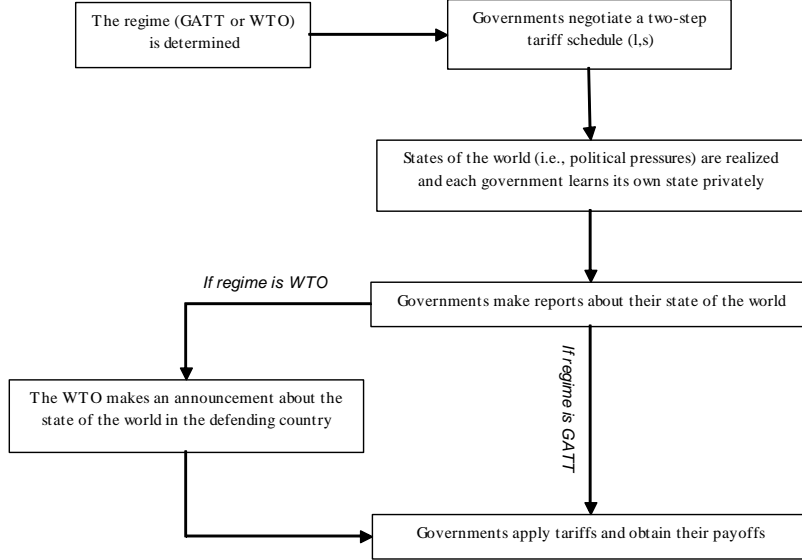


Figure 2: The sequence of events under the GATT and the WTO.

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 $\hat{\theta}$ and $\hat{\theta}^*$ where $\hat{\theta}, \hat{\theta}^* \in \{\underline{\theta}, \bar{\theta}\}$. 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, GATT and the WTO differ in the way they regulate further steps. The tariff agreement under 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.

4 Trade Agreements under GATT: No Public Monitoring

According to the GATT safeguard 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 safeguard clause requires the negotiating parties to maintain a balance of concessions at each point in time.

I model the GATT safeguard 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., $\hat{\theta} = \bar{\theta}$, 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 $\hat{\theta} = \bar{\theta}$, 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. Table (1) summarizes the strategy profile, referred to as the GATT strategy profile, to be employed by the governments. In this table the set of tariffs to be chosen by each government for each combination of announcements is given.

Table 1: GATT Strategy Profile

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

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

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

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 $u(s; \bar{\theta}) + u(s; \underline{\theta})$ from its importing sectors and $v(s) + v(s)$ 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 GATT as a function of the negotiated tariffs, l and s :

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

$P^G(l, s)$ 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 $P^G(l, s)$ 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

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

while its expected payoff from lying is

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

Therefore, truth-telling requires

$$u(l; \underline{\theta}) + v(l) \geq u(s; \underline{\theta}) + v(s). \quad (6)$$

Similarly, truthful revelation of high pressure is ensured if

$$u(s; \bar{\theta}) + v(s) \geq u(l; \bar{\theta}) + v(l). \quad (7)$$

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

$$\begin{aligned} & \max_{l,s} P^G(l, s) \quad (8) \\ & \text{subject to incentive constraints (6) and (7).} \end{aligned}$$

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

$$l^G = \arg \max_l [u(l; \underline{\theta}) + v(l)] \equiv \tau^{PE}(\underline{\theta}), \quad (9)$$

$$s^G = \arg \max_s [u(s; \bar{\theta}) + v(s) + u(s; \underline{\theta}) + v(s)]. \quad (10)$$

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

$$\tau^{PE}(\underline{\theta}) = l^G < s^G < \tau^{PE}(\bar{\theta}). \quad (11)$$

But (11) is also a sufficient condition for (6) and (7) to be satisfied. To see this, recall that according to Lemma 1, $u(\tau; \theta) + v(\tau)$ is concave and attains its maximum at $\tau = \tau^{PE}(\theta)$. This implies that (6) and (7) are satisfied as long as $\tau^{PE}(\underline{\theta}) \leq l \leq s \leq \tau^{PE}(\bar{\theta})$. Formally,

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

The fact that these incentive constraints are not binding suggests that the GATT's instantaneous reciprocity principle imposes more punishment than necessary to keep the governments truthful in disclosing their private information.⁸

5 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. 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. 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 $\tilde{\theta} \in \{\underline{\theta}, \bar{\theta}\}$ ($\tilde{\theta}^* \in \{\underline{\theta}, \bar{\theta}\}$) denote

⁸Beshkar (2009) investigates two methods to reduce the level of punishments, namely, a randomized reciprocal punishment and a less-than-proportional punishment. He shows that both methods can improve the expected joint welfare of the governments. Reinhardt (2001) and Rosendorf (2005) also view international trade institutions as public randomizing devices where retaliation against a deviating party is authorized with a fixed and exogenous probability.

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.,

$$\Pr(\tilde{\theta} = \underline{\theta} | \theta = \underline{\theta}) = \Pr(\tilde{\theta} = \bar{\theta} | \theta = \bar{\theta}) = \gamma.$$

If the home country announces high political pressure, i.e., $\hat{\theta} = \bar{\theta}$, 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 $\tilde{\theta} = \hat{\theta} = \bar{\theta}$, 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.⁹

5.1 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 $2[u(l; \underline{\theta}) + v(l)]$.

With probability $\rho(1 - \rho)$ we have $\theta = \underline{\theta}$, and $\theta^* = \bar{\theta}$. 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:

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

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

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

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

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

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

⁹The availability of such an importing industry 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.

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:

$$P^W(l, s) = \rho [u(s; \bar{\theta}) + v(s)] + \rho(1 - \gamma) [u(s; \underline{\theta}) + v(s)] + (2(1 - \rho) + \rho\gamma) [u(l; \underline{\theta}) + v(l)]. \quad (12)$$

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

5.2 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

$$u(s; \underline{\theta}) + \gamma v(s) \leq u(l; \underline{\theta}) + \gamma v(l). \quad (13)$$

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

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

or, equivalently, by

$$u(s; \bar{\theta}) + (1 - \gamma)v(s) \geq u(l; \bar{\theta}) + (1 - \gamma)v(l). \quad (14)$$

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

$$\max_{l, s} P^W(l, s) \quad (15)$$

subject to incentive constraints (13) and (14).

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

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

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 (13) we have $\alpha = \gamma$ and $\theta = \underline{\theta}$, and in the incentive constraint (14) we have $\alpha = 1 - \gamma$ and $\theta = \bar{\theta}$. 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 $\tau^{PE}(\bar{\theta}) = m(\bar{\theta}, 1)$.

It is now straightforward to show that the unconstrained optimal negotiated tariffs, l^{Wu} and s^{Wu} , satisfy (14) and thus (14) 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

$$m(\underline{\theta}, 1) < m(\bar{\theta}, 1) < m(\bar{\theta}, 1 - \gamma),$$

or, equivalently,

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

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

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

But since $u(\tau, \bar{\theta}) + (1 - \gamma)v(\tau)$ is a concave function that attains its maximum at $m(\bar{\theta}, 1 - \gamma)$, this inequality implies that:

$$u(l^{Wu}; \bar{\theta}) + (1 - \gamma)v(l^{Wu}) < u(s^{Wu}; \bar{\theta}) + (1 - \gamma)v(s^{Wu}).$$

Therefore, the incentive constraint (14) is not binding.

Now consider the incentive constraint (13). Since $l^{Wu} < s^{Wu}$ for all $\gamma \in [\frac{1}{2}, 1]$, and $u(\tau; \underline{\theta}) + \gamma v(\tau)$ is concave and symmetric around $m(\underline{\theta}, \gamma)$, the incentive constraint (13) is non-binding if and only if

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

Figure 3 depicts a situation where this inequality, and hence, the incentive constraint (13), is satisfied. This inequality is violated for $\gamma = \frac{1}{2}$ (because $l^{Wu} < s^{Wu}(\gamma = \frac{1}{2}) < m(\underline{\theta}, \frac{1}{2})$)¹⁰ and is satisfied if $\gamma = 1$ (because $l^{Wu} = m(\underline{\theta}, 1) < s^{Wu}(\gamma = 1) = m(\bar{\theta}, 1)$). Moreover, $s^{Wu} + l^{Wu}$ is increasing in γ (Lemma 3) while $2m(\underline{\theta}, \gamma)$ is decreasing in γ (Lemma 4). Therefore,

Lemma 5 *There exists $\gamma_2 \in (\frac{1}{2}, 1)$ such that l^{Wu} and s^{Wu} are incentive compatible and thus optimal solutions to the WTO negotiators' problem (15) 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 $s^{Wu} < 2m(\underline{\theta}, \gamma) - l^{Wu}$ and the incentive constraint (13) is binding. The following Lemma characterizes the optimal negotiated tariffs under the WTO when this incentive constraint is binding.

Lemma 6 *There exists $\gamma_1 \in (\frac{1}{2}, \gamma_2)$ such that the optimal solution to the WTO negotiators' problem (15) 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 (15) is a non-contingent tariff schedule, denoted by τ^{nc} . Letting (l^{Wr}, s^{Wr}) denote the optimal solution to

¹⁰For $\gamma = \frac{1}{2}$ we have $s^{Wu} = 2\frac{\theta-1}{b(4-\theta)+10-\theta}$ and $m(\underline{\theta} = 1, \frac{1}{2}) = \frac{1}{2}\frac{b-1}{(b+1)(b+4)}$. The sufficient condition for $s^{Wu}(\gamma = \frac{1}{2}) < m(\underline{\theta} = 1, \frac{1}{2})$ is therefore $\bar{\theta} < \frac{2}{5}\frac{4b+1}{b+1}$, which is guaranteed by Assumption 1 (calculations are provided in the appendix under the proof of lemma 6).

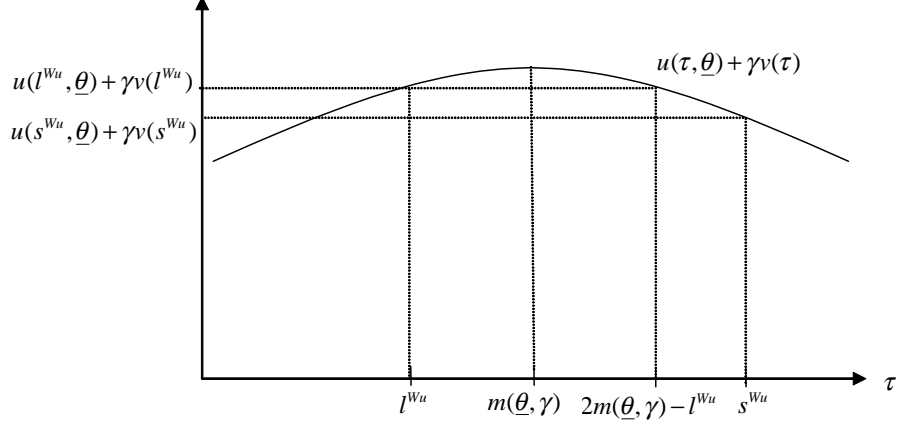


Figure 3: An example where the incentive constraint (13) is satisfied, i.e., when $s^{Wu} \geq 2m(\theta, \gamma) - l^{Wu}$.

(15) 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

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

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

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

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.

6 Political Welfare under WTO vs. GATT

A potential source of political welfare improvement in transition from 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 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.¹¹ 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.

¹¹Lemma 3 states that $s^{Wu} < \tau^{PE}(\bar{\theta})$.

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 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 $\max_{s^{Wr}} P^W(2m(\underline{\theta}, \gamma) - s^{Wr}, s^{Wr})$. Apply the envelope theorem to get:

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

The expression on the second line is positive because

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

The expression on the third line is also positive because

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

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

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

Political welfare under the WTO for different levels of γ is depicted in Figure (4). 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 (13) is not binding. The lower curve, $P^W(l^{Wr}(\gamma), s^{Wr}(\gamma))$, represents the political payoff under the WTO when the incentive constraint (13) is binding. These two curves are tangent at $\gamma = \gamma_2$. Furthermore, as was noted in Lemma 3, 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 constraint (13) is binding), and cd (when the incentive constraints are not binding).

Political welfare under GATT, $P^G(l^G, s^G)$, which is independent of γ , is represented by a horizontal line in Figure 4. As depicted on the graph, $P^G(l^G, s^G)$ always lie below the upper curve, $P^W(l^{Wu}, s^{Wu})$, and it intersects with the lower curve, $P^W(l^{Wr}, s^{Wr})$, at $\gamma = \hat{\gamma} \in (\gamma_1, \gamma_2)$. In other words:

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

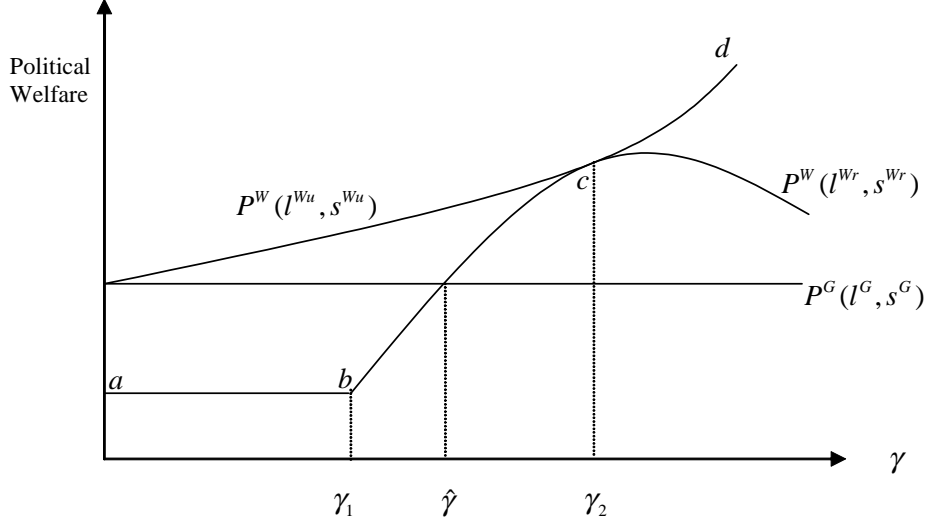


Figure 4: Comparing Expected Political Welfare under WTO and GATT.

7 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 safeguard 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.¹² However, social welfare is improved through the former channel of political gains, as lower frequency of trade skirmishes reduces the average rate of retaliatory tariffs. But it turns out that the social costs of the new safeguard clause outweigh its social gains and, thus, social welfare is undermined as a result of the reforms in the safeguard clause:

Proposition 3 *Social welfare is higher under the GATT safeguard clause (Article XIX) than under the WTO safeguard clause (the safeguard agreement).*¹³

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

¹²With 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.

¹³This result does not necessarily mean that average tariffs are greater under the WTO than under the GATT. In particular, even if average tariffs are the same under the two systems, social welfare will be lower under the WTO since social welfare is a concave function of tariffs and the low and safeguard tariffs are farther apart under the WTO.

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 safeguard 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.¹⁴

8 Enforcement

Thus far, I have characterized the incentive-compatible trade agreements under GATT and the WTO that maximize the joint political welfare of the negotiating governments. However, a trade agreement should be not only incentive-compatible (i.e., one that induces 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 GATT and 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 $\tau^N(\bar{\theta})$ on the imports of the sector where political pressure is high, and to set $\tau^N(\underline{\theta})$ on the imports of the sector with low political pressure. Denoting the expected per-period welfare of the government when there is no cooperation by P^N , we can write the discounted future value of cooperation under agreement $A = \{W, G\}$ as

$$\frac{\delta}{1 - \delta} (P^A - P^N),$$

where δ is the common discount factor of the governments.

To characterize the self-enforcing conditions for each institution we also need to derive the government's one-period payoff from cheating. To this end, note that the government's one-period payoff from cheating depends on the realization of the political shocks. If the government faces a high political pressure and considers cheating, it will be a dominant strategy to lie about the actual political pressure in addition to setting non-cooperative tariffs. That is because by disclosing high political pressure, the government will be subject to potential retaliations in the current period. In contrast, for a government that faces low political pressure, the decision to deviate from the agreement can be made after the announcement of political shocks by the parties (and the DSP's ruling in case of the WTO agreement.)

Therefore, letting $C^A(\bar{\theta})$ denote the government's one-period payoff from cheating under agreement $A = \{W, G\}$ and high political pressure, we have

$$\begin{aligned} C^G(\bar{\theta}) \equiv & [u(\tau^N(\bar{\theta}), \bar{\theta}) + v(l^G) + u(\tau^N(\underline{\theta}), \underline{\theta}) + (1 - \rho)v(l^G) + \rho v(s^G)] \\ & - [u(s^G, \bar{\theta}) + v(s^G) + (1 - \rho)(u(l^G, \underline{\theta}) + v(l^G)) + \rho(u(s^G, \underline{\theta}) + v(s^G))], \end{aligned}$$

¹⁴As 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.

and

$$C^W(\bar{\theta}) \equiv \left[u(\tau^N(\bar{\theta}), \bar{\theta}) + v(l^W) + u(\tau^N(\underline{\theta}), \underline{\theta}) + (1-\rho)v(l^W) + \rho v(s^W) \right] \\ - \left[u(s^W, \bar{\theta}) + \gamma v(l^W) + (1-\gamma)v(s^W) \right. \\ \left. + (1-\rho)(u(l^W, \underline{\theta}) + v(l^W)) + \rho(\gamma u(l^W, \underline{\theta}) + (1-\gamma)u(s^W, \underline{\theta}) + v(s^W)) \right].$$

In each of these identities, the first bracket represents the government's one-period welfare when it reverts to non-cooperative tariffs and the second bracket represents the government's one-period welfare when it cooperates.

As noted above, for the case where $\theta = \underline{\theta}$, the government can wait until the uncertainty about the other country's political parameter is resolved before considering deviation. The payoff from cheating, therefore, will depend on the announcement of the other country and, in case of the WTO agreement, on the DSP's ruling as well. To investigate these various self-enforcement conditions under the WTO, let $C^W(\underline{\theta}, \theta^*, \tilde{\theta})$ denote the government's one-period payoff from cheating when it faces a low political pressure, the announced political pressure in the foreign country is θ^* , and the court's ruling (if any) about the foreign country's announcement is $\tilde{\theta}$. Therefore,

- *WTO Self-Enforcement Conditions:*

$$C^W(\bar{\theta}) \leq \frac{\delta}{1-\delta} (P^W - P^N). \quad (16)$$

$$C^W(\underline{\theta}, \theta^*, \tilde{\theta}) \leq \frac{\delta}{1-\delta} (P^W - P^N); \forall \theta^*, \tilde{\theta}. \quad (17)$$

Inequality (17) represents three self-enforcement conditions for the cases where $(\theta^* = \bar{\theta}, \tilde{\theta} = \bar{\theta})$, $(\theta^* = \bar{\theta}, \tilde{\theta} = \underline{\theta})$, and $(\theta^* = \underline{\theta})$. The payoff from cheating under these conditions can be ranked as follows.

Lemma 8 $C^W(\underline{\theta}, \underline{\theta}, \tilde{\theta}) = C^W(\underline{\theta}, \bar{\theta}, \bar{\theta}) > C^W(\underline{\theta}, \bar{\theta}, \underline{\theta})$.

This lemma implies that condition (16) and $C^W(\underline{\theta}, \underline{\theta}, \tilde{\theta}) \leq \frac{\delta}{1-\delta} (P^W - P^N)$ are sufficient conditions for self-enforceability of the WTO.

Now let $C^G(\underline{\theta}, \theta^*)$ denote the government's one-period payoff under the GATT from cheating when it faces a low political pressure, and the announced political pressure in the foreign country is θ^* . Therefore,

- *GATT Self-Enforcement Conditions:*

$$C^G(\bar{\theta}) \leq \frac{\delta}{1-\delta} (P^G - P^N). \quad (18)$$

$$C^G(\underline{\theta}, \theta^*) \leq \frac{\delta}{1-\delta} (P^G - P^N); \forall \theta^*. \quad (19)$$

Inequality (19) represents two self-enforcement conditions for the cases where $\theta^* = \bar{\theta}$ and $\theta^* = \underline{\theta}$, respectively. The payoff from cheating under these conditions can be ranked as follows.

Lemma 9 $C^G(\underline{\theta}, \underline{\theta}) > C^G(\underline{\theta}, \bar{\theta})$.

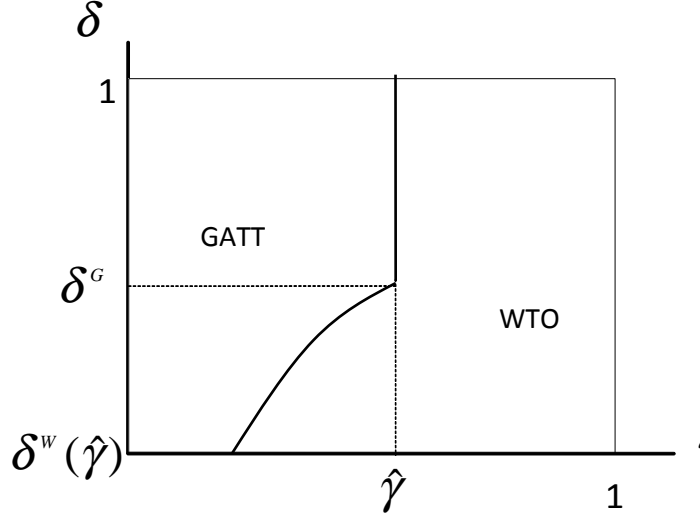


Figure 5: For impatient governments (i.e., when $\delta^W(\hat{\gamma}) < \delta < \delta^G$), WTO outperforms GATT for a larger range of γ .

This lemma implies that condition (18) and $C^G(\underline{\theta}, \underline{\theta}) \leq \frac{\delta}{1-\delta} (P^G - P^N)$ are sufficient conditions for self-enforceability of the GATT.

Now we are ready to compare the self-enforceability of the WTO and GATT. Let δ^G denote the minimum discount factor for which (l^G, s^G) is self-enforcing under the GATT. Similarly, define $\delta^W(\gamma)$ as the minimum discount factor for which (l^W, s^W) is self-enforcing under the WTO when judgment quality is γ . Now recall from Proposition 2 that the value of cooperation is the same across the institutions, i.e., $P^G = P^W$, when the WTO judgment quality is at its critical level, $\hat{\gamma}$. Moreover,

Lemma 10 For $\gamma = \hat{\gamma}$ we have a) $C^G(\underline{\theta}, \underline{\theta}) > C^W(\underline{\theta}, \underline{\theta}, \tilde{\theta})$ and b) $C^G(\bar{\theta}) > C^W(\bar{\theta})$.

Therefore,

Proposition 4 For $\delta = \delta^G$ and $\gamma = \hat{\gamma}$, the WTO's self-enforcement conditions are not binding and, therefore, $\delta^W(\hat{\gamma}) < \delta^G$.

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 GATT. 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.

Corollary 1 If $\delta^W(\hat{\gamma}) \leq \delta < \delta^G$, the minimum judgment quality for which the political welfare is higher under the WTO than under GATT is less than $\hat{\gamma}$.¹⁵

This Corollary is shown in Figure (5). For $\delta > \delta^G$, the critical value of γ is what we obtained under full commitment, i.e., $\gamma = \hat{\gamma}$. However, as δ falls below δ^G , the critical value of γ above which the WTO outperforms GATT, decreases. Therefore, for this intermediate range of discount factors the WTO enhances the political efficiency of trade agreements by improving their self-enforceability.

¹⁵No clear conclusion was obtained for $\delta < \delta^W(\hat{\gamma})$. Therefore, I restrict my attention to $\delta > \delta^W(\hat{\gamma})$.

9 Optimal Court

So far I have assumed that the only role for the WTO court is to generate a public signal by announcing the result of its investigations. This ruling mechanism, however, does not necessarily maximize the joint welfare of the WTO member countries. In this section I take a mechanism design approach (with the restriction that the authorized retaliation must be reciprocal) to characterize the court's ruling behavior that maximizes the expected joint political welfare.

I assume that after observing $\tilde{\theta}$, the court rules in favor of the defendant with probability $r(\tilde{\theta})$. Letting $\alpha \equiv r(\bar{\theta})$ and $\beta \equiv r(\underline{\theta})$, the expected joint political welfare can be written as follows

$$\begin{aligned}
 W(l, s, \alpha, \beta) &\equiv 2(1 - \rho) [u(l; \underline{\theta}) + v(l)] & (20) \\
 &+ \rho [u(s; \bar{\theta}) + v(s)] \\
 &+ \rho\gamma (\alpha [u(l; \underline{\theta}) + v(l)] + (1 - \alpha) [u(s; \underline{\theta}) + v(s)]) \\
 &+ \rho(1 - \gamma) (\beta [u(l; \underline{\theta}) + v(l)] + (1 - \beta) [u(s; \underline{\theta}) + v(s)]).
 \end{aligned}$$

The first line on the right hand side of (20) represents the joint political welfare of the governments when the home country is facing a low political pressure, weighted by the probability of low pressure. The remaining terms on the right hand side represent the expected joint welfare when the home country faces high pressure, weighted appropriately. The second line is the joint welfare effect of a safeguard tariff at home.

The third and fourth lines in (20) represent the expected joint welfare effect of the foreign country's tariffs, which are determined based on the DSP's rulings. In particular, the third line is the expected joint political welfare from the foreign country's tariff when the court receives a *high* pressure signal, which happens with probability γ . In this case, with probability α the foreign country will have to impose the low tariff (l), and with probability $(1 - \alpha)$ it will be authorized to impose the retaliatory tariff (s). Similarly, the last line in (20) represents the expected joint political welfare from the foreign country's tariff when the court receives a *low* pressure signal. Identity (20) can be simplified as follows:

$$\begin{aligned}
 W(l, s, \alpha, \beta) &\equiv \rho [u(s; \bar{\theta}) + v(s) + [\gamma(1 - \alpha) + (1 - \gamma)(1 - \beta)] [u(s; \underline{\theta}) + v(s)]] \\
 &+ [2(1 - \rho) + \rho\gamma\alpha + \rho(1 - \gamma)\beta] [u(l; \underline{\theta}) + v(l)].
 \end{aligned}$$

The incentive compatibility constraints when the home country faces low and high political pressure, respectively, are given as follows:

$$\begin{aligned}
 &u(s; \underline{\theta}) + (1 - \gamma) [\alpha v(l) + (1 - \alpha) v(s)] + \gamma [\beta v(l) + (1 - \beta) v(s)] \\
 \leq &u(l; \underline{\theta}) + v(l), & (21)
 \end{aligned}$$

and

$$\begin{aligned}
 &u(s; \bar{\theta}) + \gamma [\alpha v(l) + (1 - \alpha) v(s)] + (1 - \gamma) [\beta v(l) + (1 - \beta) v(s)] \\
 \geq &u(l; \bar{\theta}) + v(l). & (22)
 \end{aligned}$$

The following proposition summarizes the optimal ruling strategy.

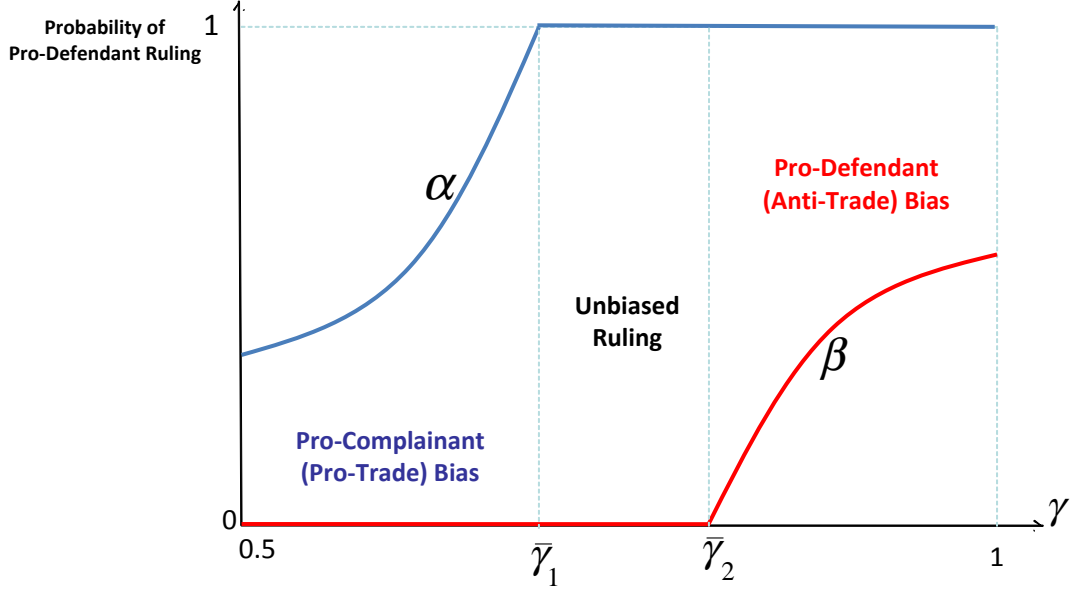


Figure 6: Optimal ruling as a function of judgment accuracy.

Proposition 5 *There exist $\frac{1}{2} < \bar{\gamma}_1 \leq \bar{\gamma}_2 < 1$ such that*

$$\begin{cases} 0 < \alpha < 1, \beta = 0 & \text{if } \gamma < \bar{\gamma}_1, \\ \alpha = 1, \beta = 0 & \text{if } \bar{\gamma}_1 \leq \gamma \leq \bar{\gamma}_2, \\ \alpha = 1, 0 < \beta < 1 & \text{if } \gamma > \bar{\gamma}_2. \end{cases}$$

Figure (6) illustrate this proposition. The vertical axis is the probability of a pro-defendant ruling by the court and the horizontal axis is the court's judgment quality. In comparison with the ruling behavior of a public signalling device, an optimal court shows a pro-complainant bias when γ is sufficiently small, while for a large γ the optimal court shows a pro-defendant bias. Formally,

Corollary 2 *The optimal court is pro-defendant if $\gamma > \bar{\gamma}_2$, and is pro-complainant if $\gamma < \bar{\gamma}_1$.*

The proof of Proposition 5 is provided in the appendix but an intuition of this result can be given here. Recall that for sufficiently high accuracy of judgment, the incentive compatibility constraints are not binding when the court's only role is to reveal the result of its investigations (Lemma 5). When the incentive compatibility constraint is not binding, a lower probability of a trade skirmish, or equivalently, a higher probability of pro-defendant ruling, would still ensure incentive compatibility. Under this situations, the court can improve the welfare of the parties by adopting a pro-defendant bias because such a ruling strategy reduces the rate of trade skirmishes without violating the incentive compatibility constraint. On the other hand, the incentive compatibility constraint is binding under a pure public signalling court with low judgment quality. By taking a pro-complainant bias, the court can relax this constraint and let the parties choose tariffs that are more politically efficient.

Maintaining a biased legal system may seem impractical. However, the quasi-legal system of the WTO may be able to generate a systematic anti-trade or pro-trade bias by carefully allocating the burden of proof on the appropriate party.¹⁶

¹⁶For a discussion on the allocation of the burden of proof in the WTO, see Grando (2006).

10 Vagueness in the safeguard clause and a gap-filling role for the DSP

So far I have characterized a “complete” contract that specifies actions to be taken by the parties in each contingency. In particular, the model characterizes the optimal level of the low tariff, to be taken in normal times, as well as the safeguard tariff, to be taken in emergency situations. In practice, however, a trade agreement usually sets the low tariff level for normal periods, leaving the safeguard tariff levels largely unspecified and discretionary. The incompleteness of trade agreements might be a consequence of costly contracting and the difficulty in identifying future contingencies (Horn, Maggi, and Staiger, forthcoming). In this Section, I investigate the effect of incompleteness of trade agreements on the workings of the GATT and the WTO.¹⁷

First consider the GATT agreement. Given the reciprocal reaction to a safeguard measure, a country that is under high pressure would choose a tariff level, s , that maximizes $u(s; \bar{\theta}) + v(s)$. The solution to this maximization problem is the politically efficient tariff under high pressure. Thus, under the reciprocity principle, if a safeguard-adopting country is free to set its safeguard tariff level unilaterally, it will set $s = \tau^{PE}(\bar{\theta})$.

Note that $\tau^{PE}(\bar{\theta}) > s^G$, meaning that the discretionary safeguard tariff is greater than the optimal safeguard tariff under the GATT, which was set out in Proposition 1. The intuition behind this result is simple. When countries are free to choose the level of safeguard that they want to impose, they only take into account the effect of the ensuing trade skirmish on their country but not on the foreign countries. Therefore, they tend to set a safeguard tariff that is higher than politically optimal level.

The above discussion shows that our assumption regarding the completeness of trade agreements can have a substantial effect on the resulting tariff rates under the GATT. Under the WTO, however, contract incompleteness may not have such substantial effects if the WTO court can fill the gap in the agreement ex post. Although the WTO Agreement on Safeguards does not specify the exact level of the safeguard tariff, it requires a safeguard-imposing country to raise its trade barriers only “to the extent necessary to prevent or remedy serious injury and to facilitate adjustment” (Article 5.1 of the WTO Agreement on Safeguards). In fact, the optimal WTO safeguard level that is calculated in this paper can be interpreted as the appropriate level of protection, which will be determined by the WTO court.

One way to induce the safeguard adopting countries to choose the optimal level of safeguard is for the WTO court to authorize retaliation if the imposed safeguard is greater than the optimal safeguard.¹⁸ Under this decision rule, a government would choose the optimal safeguard tariff even though it is not specified in the agreement. In a costly contracting environment, thus, the WTO introduces additional improvements over the GATT by providing a gap-filling and interpretation service.

¹⁷I am grateful to a referee for prompting me to do this analysis.

¹⁸Theoretically, in response to a proposed safeguard measure that exceeds the optimal level, the court can authorize arbitrarily large retaliations in order to induce the safeguard-imposing countries to adopt the optimal safeguard measure. This requires the authorization of more-than-reciprocal retaliation, which can be interpreted as a pro-complainant bias in ruling. Note that more-than-reciprocal retaliation is a threat that will not be exercised on the equilibrium path.

11 Other Extensions and Discussion of Findings

11.1 Empirical Facts About the DSB's Ruling Pattern

Between 1995 and 2008, WTO member countries adopted 89 safeguard measures, from which 19 measures were challenged by a formal dispute in the WTO. Of these 19 disputes, only 7 cases were brought before a dispute panel for a formal trial and the remaining cases were either settled or otherwise discontinued without the involvement of the DSB. In all of 7 safeguard cases litigated so far, the Appellate Body has ruled consistently against the safeguard imposing country.¹⁹

The Appellate Body's ruling history may indicate a systematic bias against safeguards. The theoretical findings of this paper regarding the DSB's optimal judgment strategy may shed light on the apparent bias in the Appellate Body's ruling pattern. In particular, if one believes that the DSB's objective is to maximize the joint political welfare of the parties, then the theoretical findings of this paper suggests the following. First, an understanding on behalf of the DSB may be that the likelihood of a contingency that justifies the use of safeguards (i.e., ρ) is very low. In that case, according to the analysis given in Section , the DSB's optimal ruling is biased against the use of safeguards. Second, the DSB may perceive its judgment quality (i.e., γ) to be relatively low. That is because according to Corollary 2 the optimal decision of a court with low judgment quality indicates an anti-safeguard bias.

Sykes (2004) and Grossman and Sykes (2007) provide some insights regarding the history of adverse rulings by the WTO Appellate Body in safeguard cases. After analyzing the rulings of the DSB from a legal and economic standpoint, they conclude that the decisions made by the DSB in safeguard cases are unsatisfactory and that the safeguards jurisprudence under the WTO is in a "state of confusion". These studies suggest that the DSB's interpretation of the Agreement on Safeguards and the GATT Article XIX has made it increasingly difficult for the safeguard measures to be adopted legally under the WTO.

Within the framework of this paper, the disagreement among the observers regarding the safeguard jurisprudence can be viewed as a disagreement over the frequency (i.e., ρ in my model) of situations under which a safeguard measure generates a net gain in joint political welfare of the governments. For example, the WTO Appellate Body seems to see a very limited opportunity for joint-welfare-improving safeguards, hence, its string of adverse rulings in safeguard cases.

11.2 Pretrial Settlement Negotiations

In using the model of this paper to interpret the DSB's ruling pattern a caveat is in order. As I mentioned above, from 89 safeguard measures adopted by WTO member countries, only 7 measures initiated the DSB litigation process. The cases that are litigated, on the other hand, are hardly selected randomly from the pool of all potential disputes. In fact, cases in which the safeguard-imposing party has a weak legal position are more likely to be litigated. That is because the defending country usually benefits from prolonging the dispute process since it can continue its disputed measure with impunity throughout the process. Therefore, the seemingly biased ruling pattern of the DSB might be attributable to this selection problem.

My model can be extended to include the pretrial negotiation between the disputing parties.²⁰ The complaining party may receive a noisy signal about the true state of the world in the defending country through pretrial negotiations or independent investigations. Based on its privately observed

¹⁹Information about the use of safeguard measures and the WTO disputes are obtained from the WTO Safeguards Gateway and the WTO Dispute Settlement Gateway (checked online February 2009).

²⁰Furusawa (2003) and Beshkar (2008) study pre-trial negotiations in the shadow of costly litigations in the WTO. Beshkar and Bond (2008) provide a review of pretrial settlement bargaining models with potential applications to the DSP of the WTO.

signal, the complaining country decides whether to litigate or to drop charges against the defending party. Assuming that the private signals received by the complaining party and the court are correlated, a complaining party that receives a high-pressure signal is more likely to lose the case in the court. In this case the complaining party will be more likely to drop charges against the defending country in order to avoid the cost of litigation. In contrast, when there is a strong legal case against the defending party, early settlement is unlikely given the interest of the defending party in delaying its compliance.

11.3 Dynamic Usage Constraint

According to Article 7.5 of the WTO Agreement on Safeguards, once a safeguard measure expires, it cannot be re-imposed in the same industry for a period of time equal to the duration of the most recent safeguard measure. Bagwell and Staiger (2005) interpret this rule as a “dynamic use constraint” and show that under such a rule, if governments are sufficiently patient and the size of the acceptable safeguard measure is sufficiently small, the agreement will be incentive compatible. They further show that the imposition of a dynamic use constraint and the elimination of the compensation requirement may increase the political welfare of the governments.

The dynamic use constraint embodied in the Agreement on Safeguards increases the opportunity cost of adopting a safeguard measure, which allows the system to reduce its reliance on trade skirmishes as a mechanism to ensure incentive compatibility. It is also straightforward to show that under this constraint, the optimal ruling of the court that was discussed in Section 9, will be more biased in favor of the safeguard-imposing country.

12 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 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 safeguard 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 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 safeguard clause on social welfare. Finally, I have studied trade agreements within the constraints of the existing institutions, i.e., GATT and the WTO. An open line of research is to study the optimal design of international trade institutions.

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

$$\begin{aligned} u(\tau; \theta) &= \psi_x(\tau) + \theta\pi_x(\tau) + T(\tau) \\ &= \frac{1}{2} \left(\frac{(1+b)(1-\tau)}{3+b} \right)^2 + \frac{\theta}{2} \left(\frac{2+(1+b)\tau}{3+b} \right)^2 + \frac{(b-1)\tau - 2(1+b)\tau^2}{3+b} \\ &= \frac{1}{(3+b)^2} \left\{ \frac{1}{2}(1+b)^2 + 2\theta + [2\theta(1+b) - 4]\tau + \left[\frac{1+\theta}{2}(1+b)^2 - 2(3+b)(1+b) \right] \tau^2 \right\}. \end{aligned} \quad (23)$$

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

$$\begin{aligned} v(\tau^*) &= \psi_y(\tau^*) + \pi_y(\tau^*) = \frac{1}{2} \left(\frac{1+b+2\tau^*}{3+b} \right)^2 + 2b \left(\frac{1-\tau^*}{3+b} \right)^2 \\ &= \frac{1}{(3+b)^2} \left\{ \frac{(1+b)^2}{2} + 2b + 2(1-b)\tau^* + 2(1+b)\tau^{*2} \right\}. \end{aligned} \quad (24)$$

For further use, note that

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

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

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

and,

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

Moreover,

$$u(\tau; \theta) + v(\tau) = \frac{1}{(3+b)^2} \left\{ \begin{array}{l} (1+b)^2 + 2\theta + 2b - 2(1-\theta)(1+b)\tau \\ + [\frac{1+\theta}{2}(1+b) - 2(2+b)](1+b)\tau^2 \end{array} \right\}$$

$$u'(\tau; \theta) + v'(\tau) = \frac{(1+b)}{(3+b)^2} \{ 2(\theta - 1) + (\theta(1+b) - 3b - 7)\tau \}. \quad (25)$$

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

■

Nash tariff. Non-cooperative (Nash) tariff, τ^N , as a function of political pressure solves $u'(\tau^N; \theta) = 0$. 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 $2(\theta - 1) + (\theta(1+b) - 3b - 7)\tau = 0$. Solving for τ yields: $\tau^{PE} = \frac{2(\theta-1)}{7-\theta+b(3-\theta)}$. The SOC is given by $u''(\tau; \theta) + v''(\tau) < 0$, or $\theta < \frac{3b+7}{b+1}$, which is satisfied according to Assumption 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 $\theta < \frac{3b-1}{1+b}$, which is always satisfied under Assumption 1. ■

Proof of Lemma 1. It is sufficient to show that when $\theta < \frac{2}{5} \frac{4b+1}{b+1}$ 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 $\theta < \frac{11+3b}{b+1}$, which holds because $\frac{11+3b}{b+1} > \frac{2}{5} \frac{4b+1}{b+1}$. 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:

$$[\psi'_x(\tau^N) + \theta\pi''_x(\tau^N) + T''(\tau^N)] d\tau^N + \pi'_x(\tau^N) d\theta = 0.$$

Rearranging yields

$$\frac{d\tau^N}{d\theta} = \frac{-\pi'_x(\tau^N)}{[\psi''_x(\tau^N) + \theta\pi''_x(\tau^N) + T''(\tau^N)]}.$$

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

$$l^{Wu} \equiv \arg \max_l [u(l; \underline{\theta}) + v(l)] = \tau^E(\underline{\theta}), \quad (26)$$

$$s^{Wu} \equiv \arg \max_s \{ [u(s; \bar{\theta}) + v(s)] + (1 - \gamma) [u(s; \underline{\theta}) + v(s)] \}. \quad (27)$$

To verify that $\tau^{PE}(\underline{\theta}) < s^{Wu} \leq \tau^{PE}(\bar{\theta})$, it is sufficient to show that the concave function $[u(s; \bar{\theta}) + v(s)] + (1 - \gamma) [u(s; \underline{\theta}) + v(s)]$ is increasing when $s = \tau^{PE}(\underline{\theta})$ and decreasing when $s = \tau^{PE}(\bar{\theta})$. I do this by taking first derivative of this function and evaluating it at $\tau^{PE}(\underline{\theta})$ and $\tau^{PE}(\bar{\theta})$:

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

and

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

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

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

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

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

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

Proof of Lemma 4. $u(\tau; \theta) + \alpha v(\tau)$ is concave because $u''(\tau; \theta) + \alpha v''(\tau) = -\frac{(1+b)[-4\alpha + (11+3b)\theta - \theta(b+1)]}{(3+b)^2} < 0$, for $0 < \alpha < 1$ and the parameter range specified in Assumption 1 (i.e., $\theta < \frac{2}{5} \frac{4b+1}{b+1}$). Moreover, $u(\tau; \theta) + \alpha v(\tau)$ is a quadratic function and, thus, symmetric around $m(\theta, \alpha)$. ■

Proof of Lemma 6. According to Lemma 5, the incentive constraint (13) is binding for $\gamma < \gamma_2$, i.e., $u(s; \underline{\theta}) + \gamma v(s) = u(l; \underline{\theta}) + \gamma v(l)$. Since $u(\tau; \underline{\theta}) + \gamma v(\tau)$ is concave in τ and symmetric around $\tau = m(\underline{\theta}, \gamma)$, the above equality holds iff $l + s = 2m(\underline{\theta}, \gamma)$ or $l = s$. The optimal solution satisfies the former equation iff $s^{Wu}(\gamma) \geq m(\underline{\theta}, \gamma)$, while it satisfies the latter equation iff $s^{Wu}(\gamma) \leq m(\underline{\theta}, \gamma)$. Since $s^{Wu}(\gamma)$ is increasing in γ and $m(\underline{\theta}, \gamma)$ is decreasing in γ there is a unique solution, γ_1 , to the equation $s^{Wu}(\gamma) = m(\underline{\theta}, \gamma)$. To prove the Lemma, therefore, it is sufficient to show that $\gamma_1 > \frac{1}{2}$. But $m(\underline{\theta}, \gamma)$ is the solution to $u'(m, \underline{\theta}) + \gamma v'(m) = 0$. Assuming $\underline{\theta} = 1$, substituting functional forms and solving for m yields $m = \frac{(1-\gamma)(b-1)}{(b+1)(b-2\gamma+5)}$. On the other hand, $s^{Wu} = \frac{2(\bar{\theta}-1)}{5b-\bar{\theta}-6\gamma-b\bar{\theta}-2b\gamma+13}$.

Therefore, $s^{Wu} \leq m$ if and only if $\frac{2(\bar{\theta}-1)}{5b-\bar{\theta}-6\gamma-b\bar{\theta}-2b\gamma+13} \leq \frac{(1-\gamma)(b-1)}{(b+1)(b-2\gamma+5)}$. When $\gamma = \frac{1}{2}$ this inequality is satisfied iff $2\frac{\bar{\theta}-1}{b(4-\bar{\theta})+10-\bar{\theta}} < \frac{1}{2}\frac{b-1}{(b+1)(b+4)}$. Rearranging yields $\bar{\theta} < \frac{2}{5}\frac{4b+1}{b+1}$, which is guaranteed by Assumption 1. ■

Proof of Lemma 7. According to Lemma 6, when $\gamma_1 < \gamma < \gamma_2$, the optimal solution to (15) is given by (l^{Wr}, s^{Wr}) , where $l^{Wr} + s^{Wr} = 2m(\underline{\theta}, \gamma)$. Therefore, problem (15) can be written as

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

and the FOC is given by

$$\begin{aligned} \frac{dP^W(2m(\underline{\theta}, \gamma) - s, s)}{ds} &= \rho [u'(s; \bar{\theta}) + v'(s)] + \rho(1-\gamma) [u'(s; \underline{\theta}) + v'(s)] \\ & \quad - (2(1-\rho) + \rho\gamma) [u'(2m(\underline{\theta}, \gamma) - s; \underline{\theta}) + v'(2m(\underline{\theta}, \gamma) - s)] = 0. \end{aligned}$$

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 $\rho [u'(s^{Wr}; \bar{\theta}) + v'(s^{Wr})] + \rho(1-\gamma) [u'(s^{Wr}; \underline{\theta}) + v'(s^{Wr})] > 0$. It also implies that $l^{Wr} = 2m(\underline{\theta}, \gamma) - s^{Wr} > l^{Wu}$ since when $\gamma_1 < \gamma < \gamma_2$ we have $s^{Wu} < 2m(\underline{\theta}, \gamma) - l^{Wu}$. Thus, $u'(2m(\underline{\theta}, \gamma) - s^{Wr}; \underline{\theta}) + v'(2m(\underline{\theta}, \gamma) - s^{Wr}) < 0$. Therefore, $\frac{dP^W(2m(\underline{\theta}, \gamma) - s^{Wr}, s^{Wr})}{ds} > 0$ and the optimality condition is not satisfied. Thus, $s^{Wr} > s^{Wu}$.

Now suppose that $l^{Wr} \leq l^{Wu}$. This implies that $2m(\underline{\theta}, \gamma) - s^{Wr} \leq l^{Wu}$ and that $u'(2m(\underline{\theta}, \gamma) - s^{Wr}; \underline{\theta}) + v'(2m(\underline{\theta}, \gamma) - s^{Wr}) > 0$. It also implies that $s^{Wr} = 2m(\underline{\theta}, \gamma) - l^{Wr} > s^{Wu}$. Thus $\rho [u'(s^{Wr}; \bar{\theta}) + v'(s^{Wr})] + \rho(1-\gamma) [u'(s^{Wr}; \underline{\theta}) + v'(s^{Wr})] < 0$. Therefore, $\frac{dP^W(2m(\underline{\theta}, \gamma) - s^{Wr}, s^{Wr})}{ds} < 0$ and the optimality condition is not satisfied. Thus, $l^{Wr} > l^{Wu}$. ■

Proof of Proposition 2. For $\gamma = 0$ 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 for $\gamma = 0$ we have $P^W(l^{Wu}, s^{Wu}) = P^G(l^G, s^G)$. Moreover $P^W(l^{Wu}, s^{Wu})$ is increasing in γ , while $P^G(l^G, s^G)$ is independent of γ . This proves that $P^G(l^G, s^G)$ is below $P^W(l^{Wu}, s^{Wu})$ for $\gamma \in (0, 1]$.

To verify that $\gamma_1 < \hat{\gamma} < \gamma_2$, it is now sufficient to show $P^W(l^{Wr}(\gamma_1), s^{Wr}(\gamma_1)) < P^G(l^G, s^G)$, and $P^W(l^{Wr}(\gamma_2), s^{Wr}(\gamma_2)) > P^G(l^G, s^G)$. But note that $P^W(l^{Wr}(\gamma_1), s^{Wr}(\gamma_1))$ is equal to the highest payoffs attainable under a non-contingent agreement and it must be smaller than the government's payoff under 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, $P^W(l^{Wr}(\gamma_2), s^{Wr}(\gamma_2))$ is equal to $P^W(l^{Wu}(\gamma_2), s^{Wu}(\gamma_2))$ which is larger than $P^G(l^G, s^G)$. ■

Lemma 11 If $\underline{\theta} = 1$, then $s^{Wu} = \frac{2(1-\bar{\theta})}{\bar{\theta}(1+b)+2\gamma(b+3)-13-5b}$, and $\frac{ds^{Wu}}{d\gamma} = \frac{4(b+3)(\bar{\theta}-1)}{(\bar{\theta}(1+b)+2\gamma(b+3)-13-5b)^2}$.

Proof. Substituting (25) into the FOC associated with (27) yields

$$-2(1-\bar{\theta}) + (\bar{\theta}(1+b) - 3b - 7) s^{Wu} + (1-\gamma) [-2(1-\underline{\theta}) + (\underline{\theta}(1+b) - 3b - 7) s^{Wu}] = 0.$$

Solving for s^{Wu} and taking its derivative with respect to γ (assuming $\underline{\theta} = 1$) yields the stated results. ■

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

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

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

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

where,

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

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 $S^{Wr}(\gamma) < S^{Wu}(\gamma) \forall \gamma \in [0, \gamma_2]$.

I show the former, by proving that $S^{Wu}(0) = S^G$ and $\frac{dS^{Wu}(\gamma)}{d\gamma} < 0 \forall \gamma \in (0, 1]$. Note from (9) and (26) that $l^{Wu}(\gamma) = l^G \forall \gamma$. Also, comparing (10) and (27) yields $s^{Wu}(0) = s^G$. Therefore,

$$S^{Wu}(0) = 2 \{ [u(s^G; 1) + v(s^G)] + (1-\rho) [u(l^G; 1) + v(l^G)] \} = S^G.$$

Noting that $u(\tau; 1) + v(\tau) = \frac{(1+b)(1-\tau^2)}{(3+b)}$, $S^{Wu}(\gamma)$ can be written as follows:

$$\begin{aligned} S^{Wu}(\gamma) &= \rho(2-\gamma) \frac{(1+b)(1-(s^{Wu})^2)}{(3+b)} + (2(1-\rho) + \rho\gamma) \frac{(1+b)(1-(l^{Wu})^2)}{(3+b)} \\ &= \frac{(1+b)}{(3+b)} \left(2 - \rho(2-\gamma)(s^{Wu})^2 - (2(1-\rho) + \rho\gamma)(l^{Wu})^2 \right). \end{aligned}$$

Taking derivative yields

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

Substitute for s^{Wu} and $\frac{ds^{Wu}}{d\gamma}$ from Lemma 11 to get:

$$\begin{aligned} \frac{dS^{Wu}(\gamma)}{d\gamma} &= \frac{\rho(1+b)}{(3+b)} \left(\left(\frac{2(1-\bar{\theta})}{\bar{\theta}(1+b)+2\gamma(b+3)-13-5b} \right)^2 - 2(2-\gamma) \frac{2(1-\bar{\theta})}{\bar{\theta}(1+b)+2\gamma(b+3)-13-5b} \frac{4(b+3)(\bar{\theta}-1)}{(\bar{\theta}(1+b)+2\gamma(b+3)-13-5b)^2} \right) \\ &= \left(\frac{\rho(1+b)}{(3+b)} \right) \left(\frac{2(\bar{\theta}-1)}{\bar{\theta}(1+b)+2\gamma(b+3)-13-5b} \right)^2 \left(\frac{\bar{\theta}(1+b)+3b+11-2\gamma(b+3)}{\bar{\theta}(1+b)-13-5b+2\gamma(b+3)} \right). \end{aligned}$$

The first two parentheses are obviously positive. The fraction in the third parenthesis has a positive numerator (since $\gamma \leq 1$) but a negative denominator (assumption 1 guaranties a negative sign for this denominator). Therefore, $\frac{dS^{Wu}(\gamma)}{d\gamma} < 0$.

To show that $S^{Wr}(\gamma) < S^{Wu}(\gamma) \forall \gamma \in [0, \gamma_2]$, 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 $s^{Wu} + l^{Wu} < s^{Wr} + l^{Wr}$. 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 increasing 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 increasing l^{Wr} . Therefore, $S^{Wr}(\gamma) < S^{Wu}(\gamma) \forall \gamma \in [0, \gamma_2]$. ■

Proof of Lemma 8. First consider the cases where $\theta^* = \underline{\theta}$ and $(\theta^* = \bar{\theta}, \tilde{\theta} = \bar{\theta})$, respectively. In each of these cases, the home government is supposed to set both of its import tariffs at the low agreement level according to the WTO agreement. Therefore, under these two cases the home government has the same payoff from cheating. However, when $(\theta^* = \bar{\theta}, \tilde{\theta} = \underline{\theta})$ the home country is allowed to impose high tariff (as a form of retaliation) in one sector but a low tariff in the other sector. Therefore, compared to the former two cases, the home government has a lower payoff from cheating when $(\theta^* = \bar{\theta}, \tilde{\theta} = \underline{\theta})$. ■

Proof of Lemma 9. Under the GATT when the foreign country announces a high shock, the home country is authorized to impose a retaliatory tariff, which is higher than the normal tariff. Therefore, a government receives a lower payoff from cheating when $\theta^* = \bar{\theta}$ than when $\theta^* = \underline{\theta}$. ■

Proof of Lemma 10, Part a. $(\underline{\theta}, \underline{\theta})$ and $(\underline{\theta}, \underline{\theta}, \tilde{\theta})$ represent cases under the GATT and the WTO, respectively, where both countries have announced a low shock. Under these situations both countries are supposed to set the respective agreement's low tariff in both sectors. At $\gamma = \hat{\gamma}$ the incentive compatibility constraint is binding under the WTO and $l^W = l^{Wr} > \tau^{PE}(\underline{\theta}) = l^G$. Therefore, the tariff recommended by the WTO in this situation is greater than the tariff recommended by the GATT, which implies that the payoff from cheating is lower under the WTO. Hence, $C^G(\underline{\theta}, \underline{\theta}) > C^W(\underline{\theta}, \underline{\theta}, \tilde{\theta})$. ■

Proof of Lemma 10, Part b. I first calculate $C^W(\bar{\theta})$ and $C^G(\bar{\theta})$ and then show that $C^W(\bar{\theta}) < C^G(\bar{\theta})$. Under the WTO, when $\theta = \bar{\theta}$, the government's one-period welfare from cooperative tariffs is given by

$$\begin{aligned} & u(s^W, \bar{\theta}) + \gamma v(l^W) + (1 - \gamma)v(s^W) + (1 - \rho)[u(l^W, \underline{\theta}) + v(l^W)] \\ & + \rho[\gamma u(l^W, \underline{\theta}) + (1 - \gamma)u(s^W, \underline{\theta}) + v(s^W)]. \end{aligned}$$

On the other hand, the welfare from non-cooperative tariffs is given by

$$u(\tau^N(\bar{\theta}), \bar{\theta}) + v(l^W) + u(\tau^N(\underline{\theta}), \underline{\theta}) + (1 - \rho)v(l^W) + \rho v(s^W).$$

The difference between these two welfare levels gives the one-period payoff from cheating under the WTO. Namely,

$$\begin{aligned} C^W(\bar{\theta}) &= u(\tau^N(\bar{\theta}), \bar{\theta}) + u(\tau^N(\underline{\theta}), \underline{\theta}) + (1 - \gamma)[v(l^W) - v(s^W)] \\ &\quad - u(s^W, \bar{\theta}) - \rho(1 - \gamma)u(s^W, \underline{\theta}) - (1 - \rho + \rho\gamma)u(l^W, \underline{\theta}). \end{aligned}$$

Under the GATT, when $\theta = \bar{\theta}$, the government's one-period welfare from cooperative tariffs is given by

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

On the other hand, the welfare from non-cooperative tariffs is given by

$$u(\tau^N(\bar{\theta}), \bar{\theta}) + v(l^G) + u(\tau^N(\underline{\theta}), \underline{\theta}) + (1 - \rho)v(l^G) + \rho v(s^G).$$

The one-period payoff from cheating under the GATT is thus given by

$$\begin{aligned} C^G(\bar{\theta}) &= u(\tau^N(\bar{\theta}), \bar{\theta}) + u(\tau^N(\underline{\theta}), \underline{\theta}) + v(l^G) - v(s^G) \\ &\quad - u(s^G, \bar{\theta}) - \rho u(s^G, \underline{\theta}) - (1 - \rho)u(l^G, \underline{\theta}). \end{aligned}$$

This lemma states that $C^W(\bar{\theta}) - C^G(\bar{\theta}) < 0$ or, equivalently,

$$\begin{aligned} C^W(\bar{\theta}) - C^G(\bar{\theta}) &= \rho [u(s^G, \underline{\theta}) - u(s^W, \underline{\theta})] + (1 - \rho) [u(l^G, \underline{\theta}) - u(l^W, \underline{\theta})] \\ &\quad + \rho\gamma [u(s^W, \underline{\theta}) - u(l^W, \underline{\theta})] + \gamma [v(s^W) - v(l^W)] + [v(l^W) - v(l^G)] \\ &\quad + [u(s^G, \bar{\theta}) + v(s^G) - u(s^W, \bar{\theta}) - v(s^W)] < 0. \end{aligned}$$

Given that at $\gamma = \hat{\gamma}$ we have $u(s^W, \underline{\theta}) + \gamma v(s^W) = u(l^W, \underline{\theta}) + \gamma v(l^W)$, or equivalently, $u(s^W, \underline{\theta}) - u(l^W, \underline{\theta}) = -\gamma [v(s^W) - v(l^W)]$, we can rewrite this inequality as

$$\begin{aligned} C^W(\bar{\theta}) - C^G(\bar{\theta}) &= \rho [u(s^G, \underline{\theta}) - u(s^W, \underline{\theta})] + (1 - \rho) [u(l^G, \underline{\theta}) - u(l^W, \underline{\theta})] \\ &\quad + (1 - \rho\gamma)\gamma [v(s^W) - v(l^W)] + [v(l^W) - v(l^G)] \\ &\quad + [u(s^G, \bar{\theta}) + v(s^G) - u(s^W, \bar{\theta}) - v(s^W)] < 0. \end{aligned}$$

To see why this inequality holds, first note that at $\gamma = \hat{\gamma}$ the incentive compatibility constraint under the WTO is binding and, thus, $s^W = s^{Wr}$ and $l^W = l^{Wr}$. Moreover, according to Proposition 1 and Lemmas 3 and 7, we have $s^G < s^{Wr} < \tau^N(\bar{\theta})$ and $\tau^{PE}(\underline{\theta}) = l^G < l^{Wr}$. Therefore, each of the first four brackets above has a negative value. Moreover, by investigating P^G and P^W it is evident that in order to have $P^G = P^W$ (which is the case when $\gamma = \hat{\gamma}$) we must have $u(s^G, \bar{\theta}) + v(s^G) < u(s^W, \bar{\theta}) + v(s^W)$, since otherwise $P^G > P^W$. Therefore $C^W(\bar{\theta}) < C^G(\bar{\theta})$. ■

The remainder of the appendix is related to the court's optimality problem introduced in section 9.

Lemma 12 *The optimal solution involves $(1 - \alpha)\beta = 0$ and $\alpha \geq \beta$.*

Proof. The court's optimization problem can be written as

$$\begin{aligned} W(l, s, \alpha, \beta) &\equiv \rho [u(s; \bar{\theta}) + u(s; \underline{\theta}) + 2v(s)] + 2(1 - \rho) [u(l; \underline{\theta}) + v(l)] \\ &\quad + \rho [\gamma\alpha + (1 - \gamma)\beta] \{ [u(l; \underline{\theta}) + v(l)] - [u(s; \underline{\theta}) + v(s)] \}. \end{aligned}$$

s.t. $u(s; \underline{\theta}) + [1 - \alpha(1 - \gamma) - \beta\gamma]v(s) \leq u(l; \underline{\theta}) + [1 - \alpha(1 - \gamma) - \beta\gamma]v(l)$.

To prove $\alpha \geq \beta$, by way of contradiction, assume that $\alpha < \beta$. In that case W can be increased by switching the values of α and β , while the incentive compatibility constraint will be still satisfied. To see this, note that since $\gamma > \frac{1}{2}$, the objective function improves if we switch the values of α and β . Moreover, since $\gamma > \frac{1}{2}$, the coefficient of $v(\cdot)$ in the constraint increases by switching the values of α and β . An increase in the coefficient of $v(\cdot)$ relaxes the constraint and, thus, the incentive compatibility constraint will continue to hold.

Given that $\alpha \geq \beta$, in order to prove $(1 - \alpha)\beta = 0$, it is sufficient to show that an optimal solution cannot involve $0 < \alpha < 1$ and $0 < \beta < 1$ simultaneously. By way of contradiction, assume that $0 < \alpha < 1$ and $0 < \beta < 1$. This implies that $\frac{dL}{d\alpha} = \frac{dL}{d\beta} = 0$, where L is the Lagrangian of the above problem. It is straightforward to check that $\frac{dL}{d\alpha} = \frac{dL}{d\beta} = 0$ implies $\gamma = \frac{1}{2}$. Therefore, for $\gamma > \frac{1}{2}$ we have $(1 - \alpha)\beta = 0$. ■

Lemma 13 *There exists $\bar{\gamma}_2 \in (\frac{1}{2}, 1)$ such that for $\gamma \geq \bar{\gamma}_2$ the optimal solution involves $0 < \beta < 1$ and $\alpha = 1$.*

Proof. Remember that when court is a pure public signalling device, that is when $\alpha = 1$ and $\beta = 0$, the incentive compatibility constraints are not binding when $\gamma > \gamma_2$ (Lemma 5). Therefore, since the expected joint welfare function is always increasing in α and β , the optimal solution must

involve $\beta > 0$ for $\gamma > \gamma_2$. Finally, as long as $\gamma < 1$, no optimal solution can involve $\alpha = \beta = 1$ since otherwise the incentive compatibility constraint will be violated. Therefore, there exists $\bar{\gamma}_2 \in (\frac{1}{2}, \gamma_2]$, or $\bar{\gamma}_2 \in (\frac{1}{2}, 1)$, such that for $\gamma \geq \bar{\gamma}_2$ the optimal solution involves $0 < \beta < 1$ and $\alpha = 1$. ■

Lemma 14 *There exists $\bar{\gamma}_1 \in (\frac{1}{2}, 1)$ such that for $\gamma \leq \bar{\gamma}_1$ the optimal solution involves $\beta = 0$ and $0 < \alpha < 1$.*

Proof. According to Proposition 2, for $\gamma < \hat{\gamma}$, the joint political welfare of the countries is higher under the GATT (i.e., when $\alpha = \beta = 0$) than under a WTO system that works as a public signalling device (i.e., when $\alpha = 1$ and $\beta = 0$). Therefore, $\alpha = 1$ and $\beta = 0$ cannot be optimal for sufficiently small γ . As a result, since $\alpha \geq \beta$ and $\beta(1 - \alpha) = 0$ (Lemma 12), for sufficiently small γ we have $\beta = 0$ and $\alpha < 1$. Finally, $\alpha = \beta = 0$ (i.e., the GATT reciprocity rule) cannot be optimal because under the GATT the incentive compatibility constraint is not binding while the welfare can be improved by increasing α ($\frac{dW}{d\alpha} > 0$ for $l = l^G$ and $s = s^G$). ■

Lemma 15 $\bar{\gamma}_1 < \bar{\gamma}_2$. *Moreover, for $\gamma \in (\bar{\gamma}_1, \bar{\gamma}_2)$ the optimal solution involves $\alpha = 1$ and $\beta = 0$.*

Proof. If $\bar{\gamma}_1 > \bar{\gamma}_2$, then Lemmas 13 and 14 cause a contradictory result that $\beta = 0$ and $\beta > 0$ for $\gamma \in (\bar{\gamma}_2, \bar{\gamma}_1)$. ■

Proof of Proposition 5. This proposition follows from Lemmas 12-15. ■

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