ESSAYS ON INSTITUTIONS OF INTERNATIONAL TRADE

By

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CHAPTER I

INTRODUCTION

This dissertation is an economic analysis of the legal aspects of international trade institutions. In particular, I analyze the system of remedies, the role of a court for international trade disputes, and settlement bargaining in an international setting.

In the next chapter, I take a mechanism-design approach to characterize a politically optimal trade agreement under the assumptions that negotiations occur in the presence of uncertainty about future political pressures and governments have asymmetric information about realized political pressures. The solution to this problem characterizes the optimal remedy system for breach of trade agreements. The main finding of this chapter is that an optimal mechanism involves less-than-proportional retaliation against deviating parties. This result is in contrast to some proposals to allow for more-than-proportional retaliation in the WTO. I also consider an institutional structure in which only commensurate retaliation is practical but governments can employ a public randomizing device to authorize retaliation. I show that it is optimal to authorize retaliation only randomly. This suggests a potential role for the WTO dispute settlement process as a public randomizing device.

In Chapter III, 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 issues nonbinding rulings 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 actually improve the self-enforceability of trade agreements. My analysis also shows that the WTO court can improve the parties' expected welfare by adopting a strategic anti-trade or pro-trade bias.

In Chapter IV, I utilize canonical models of settlement bargaining under asymmetric information (namely, Bebchuk 1984, and Reinganum and Wilde 1986) to analyze the dispute settlement patterns in the World Trade Organization. I extend these models to study the determinants of out-of-court settlement in a situation where the parties' relationship is characterized by a prisoners' dilemma— a feature of most trade partnerships. This added feature alters the prediction of the classic models that the allocation of litigation costs between disputants has no bearing on the likelihood of settlement. In particular, I find that the likelihood of settlement is more sensitive to the defendant's litigation costs than to the complainant's litigation costs.

In Chapter V, I estimate the bargaining models introduced in Chapter IV, using a database of the WTO disputes. I conduct both structural and reduced form analysis and I find evidence in support of the bargaining models as extended in this paper. In particular, the distribution of litigation costs between the disputants is an important determinant of settlement likelihood. My empirical analysis also suggests that the existence of third parties that may be affected by the outcome of the dispute has a significantly positive effect on the

likelihood of out-of-court settlement.

CHAPTER II

OPTIMAL REMEDIES IN INTERNATIONAL TRADE AGREEMENTS

Introduction

Viewing international trade agreements as contracts among politically-motivated governments has been a popular thesis among scholars. Following this paradigm, different aspects of trade agreements have been analyzed using insights from contract theory. In particular, attempts have been made to understand the renegotiation and compensation provisions in trade agreements as mechanisms to promote efficient breach of contracts. This paper contributes to this literature by characterizing the most efficient remedy system for violation of trade agreements among politically-motivated governments.

In this paper, I take the view that by signing trade agreements, governments try to maximize their political welfare in an uncertain political and economic environment. In the absence of cooperation, each government uses its trade policy instruments too aggressively so that the political welfare reaped by one government comes at a higher cost to other governments. Governments can escape from this Prisoners' Dilemma by entering into an agreement that limits their ability to manipulate trade policy instruments.[1] Nevertheless, governments may occasionally find themselves under intense pressure from domestic interest groups to deviate from their international trade obligations. In such circumstances, taking a protectionist measure to dissipate political pressures in the importing country may cause more political gains to the government of the importing country than costs to the

[1] Bagwell and Staiger (1999) and Bagwell and Staiger (2002, chapter 2) provide an elegant formulation of this idea.

government of the exporting country. In other words, abiding with the agreement in the presence of intense political pressure causes a net loss in terms of joint political welfare.

Under most trade agreements, signatories are free to suspend or withdraw their obligations without the consent of other contracting parties. In response to this initial violation, however, the affected parties will be also free to suspend substantially equal obligations or concessions. Withdrawal of previously granted concessions by the victim countries can be interpreted as a form of remedy for breach of contracts. Sykes (1991) and Schwartz and Sykes (2002) interpret the authorization of reciprocal reaction to an initial deviation as an award of "expectation damages", which places the victim in as good a position as it would have been in if the violator had honored its obligations. Following this definition, Schwartz and Sykes (2002, p. S182) argue that "expectation damages thus deter inefficient breach because the promisor will not wish to violate and pay expectation damages unless the promisor gains more from the breach than the promisee loses, in which case breach is efficient."

In this paper, however, I argue that a system that employs expectation damages, the so-called liability rule system, is not the most efficient mechanism for handling breach of international trade agreements. The point of departure is the observation that an injured party in an international trade setting usually receives compensations by withdrawing its own concessions that have been previously granted to the offending country. This method of compensation is efficiency-reducing since, as discussed above, withdrawal of concessions in normal situations causes a net loss to the contracting parties. In fact, an important underlying assumption on which the efficiency of a liability rule mechanism is established is the availability of cash transfer, or other efficiency-neutral side payments, as a method of compensation. When such efficiency-neutral side payments are not available, it is in the

best interest of all parties, ex ante, to agree on a remedy system that awards the smallest possible damages to victims.

Notwithstanding its inefficiency, awards to the victim cannot be reduced to zero if governments have private information regarding the state of the world. That is because in the absence of a system that imposes sufficient costs on breaching parties, governments will have the incentive to exaggerate the political and economic costs of honoring their trade obligations in order to legitimize their protectionist pursuits.

I model a trade agreement as an optimal mechanism whose objective is to maximize the joint political welfare of the governments while it induces truthful revelation of private information by all parties. The main finding is that an optimal mechanism involves less-than-proportional retaliation against deviating parties.

This result conflicts with the proposals to allow for more-than-proportional retaliation against a violating country in the WTO. I argue that these proposals do not follow an efficiency rationale; instead, these are motivated by the observation that reciprocity does not compensate a breached-upon party for all of its loss. As Bagwell (2007) correctly points out, *"commensurate retaliation preserves the terms of trade but results in a reduced trade volume. Hence, [...] commensurate retaliation leaves the foreign government with less welfare than it would have enjoyed at the initially negotiated tariffs."* In other words, a liability rule mechanism prescribes a more-than-proportional retaliation, which, as I show in this paper, is not optimal.

I also consider an institutional setting in which disproportionate retaliation is not practical but a public randomizing device is available that can be used to authorize retaliation on a random basis. This institutional configuration may have some practical appeal. First, as Howse and Staiger (2005) and Bagwell (2007) point out, important measurement

problems significantly limit the feasibility of a system with disproportionate retaliation. Second, one can interpret the WTO dispute settlement system as a public randomizing device that authorizes retaliation with a fixed probability. I find that the optimal probability of retaliation is strictly less than one. Optimality of random, rather than certain, retaliation once again indicates the fact that reciprocal retaliation is too severe to induce efficient behavior by governments.

Before concluding this chapter I will discuss the fairness of the optimal remedy system. One may argue against a system that authorizes less-than-proportional retaliation by questioning the fairness of the system. In fact, as noted above, a victim is not fully-compensated under an optimal remedy system in the WTO. However, ex ante, that is, when political pressures are not yet realized, the expected value of the agreement is the same to both governments. Therefore, governments maintain a balance of concessions ex ante, although such a balance may not materialize ex post. Moreover, if governments have repeated interaction over time, a country that stands to lose from an optimal remedy system in some periods will be overcompensated in periods when it finds it optimal to suspend its obligations in response to domestic pressures. In other words, governments can maintain an intertemporal balance of concessions under an optimal trade agreement through repeated interactions.

Basic setup

Consider a pair of distinct goods x and y with demand functions in the home

country (no *) and the foreign country (*) given by:

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

where p (with the appropriate index) represents the price of a good in a certain country. Specific import tariffs, τ and τ^*, that are 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:

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

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

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

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

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

$$\pi_x(\tau) \equiv \int_{0}^{p_x(\tau)} Q_x(u)\,du,\ \pi_y(\tau^*) \equiv \int_{0}^{p_y(\tau^*)} Q_y(u)\,du.$$

The government's tariff revenue is given by

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

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

For reasons that will be clear later, I assume that there is another pair of goods, which are produced and consumed in an identical manner as above. This duplicate economy will make the modelling of the retaliation scheme very simple.

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. The home government's

welfare is increasing in the home tariff and decreasing in the foreign tariff when these tariffs are sufficiently low.

Private Political Pressures

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

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

where, $0 < \rho < 1$.

This probability distribution ensures that in each country there is at least one import-competing industry that exerts low political pressure. I assume that this low-political-pressure industry is used by the government to retaliate against a deviating country when retaliation is authorized. This structure allows me to focus my analysis on the import tariffs of the home country in the potentially high-political-pressure sector, and the retaliatory tariffs of the foreign country in the low-political-pressure sector. Due to symmetry, the foreign (home) country's import (retaliatory) tariffs are identical to those of the home (foreign) country. Therefore, in what follows I restrict my attention to the home country's import tariff in the potentially high-political-pressure sector and the foreign country's retaliatory tariffs that are implemented in the low-political pressure sector.

Benchmarks: The first-best agreement and non-cooperation

In this Section, I characterize the first-best agreement as well as the non-cooperative trade policies in order to set a benchmark to discuss the optimal trade agreement under information asymmetry, which will be presented in Section 4.

In the absence of cooperation, the home government 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

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

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 $v(\tau)$. The foreign country's non-cooperative tariff, $\tau^{*N}(\theta^*)$, can be defined similarly.[2]

In a first-best situation where governments have symmetric information regarding the state of the world and they can commit to their promises, the most efficient agreement is one that maximizes the joint political welfare, or $u(\tau;\theta)+v(\tau)$. In other words, the politically-efficient import tariff, $\tau^{PE}(\theta)$, is given by

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

Given the two levels of political pressure, $\underline{\theta}$ and $\overline{\theta}$, a politically-efficient agreement specifies a two-step tariff schedule, namely, $l=\tau^{PE}(\underline{\theta})$ and $s=\tau^{PE}(\overline{\theta})$, where $l<s$. The low tariff rate, l, can be interpreted as the tariff rate to be set by governments under normal

[2]My analysis relies 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. I assume that political pressures are sufficiently low such that $\tau^N(\overline{\theta})<\tau_{proh.}$, where $\tau_{proh.}$ denotes the lowest prohibitive tariff rate.

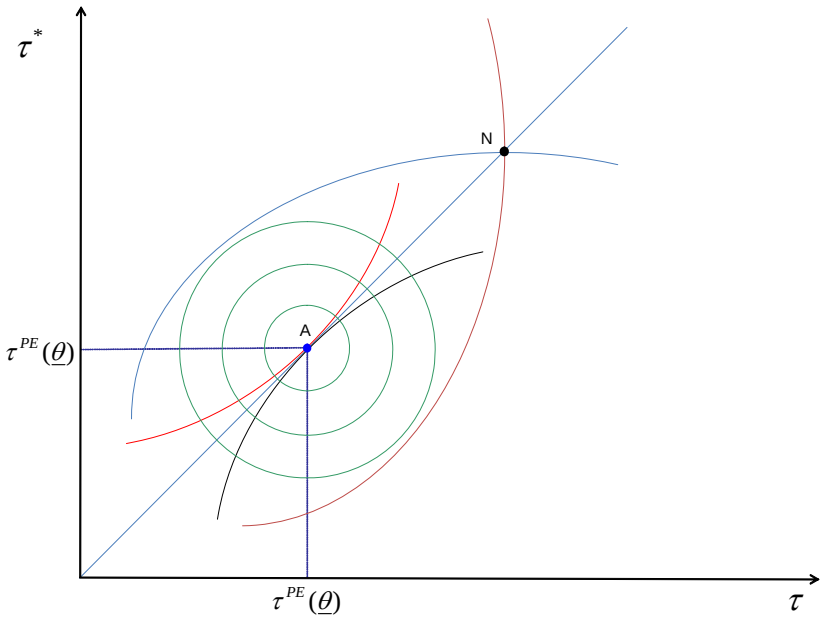

Figure 1. Nash and Politically Efficient tariffs when both governments face low political pressure

situations, that is, when $\theta = \underline{\theta}$, and s can be interpreted as the safeguard-level tariff rate that governments can choose when they face high political pressure. Alternatively, setting $s = \tau^{PE}\left(\overline{\theta}\right)$ when a government truly faces a high political pressure can be interpreted as efficient breach of an agreement that specifies a low tariff rate, that is, $l = \tau^{PE}\left(\underline{\theta}\right)$.[3]

Points N and A in Figure 1 respectively show the non-cooperative and politically-efficient tariff pairs for the case where $\theta = \theta^* = \underline{\theta}$. Governments can gain by mutually reducing their tariff rates from $\tau^N\left(\underline{\theta}\right)$ to $\tau^{PE}\left(\underline{\theta}\right)$, or equivalently, by moving from N to A. The joint-welfare contours are also drawn in Figure 1. As can be seen on the graph, point A is at the center of the joint-welfare contours and it is associated with the highest joint welfare.

Figure 2, on the other hand, depicts a situation where the home country faces high

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

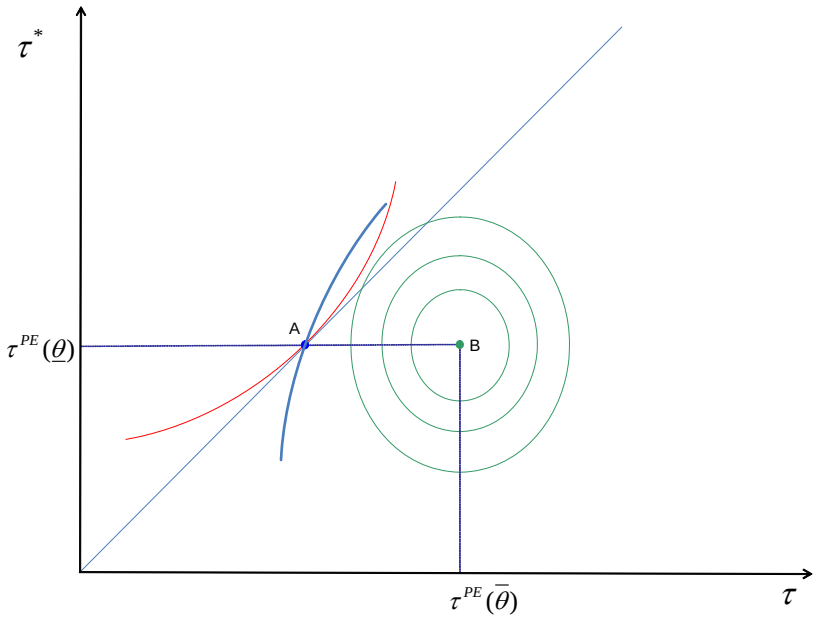

Figure 2. The initial tariff pair, A, is no longer optimal when the home government faces high political pressure

political pressure. Note that as a result of the political shock in the home country, the iso-welfare curve of the home country has changed so that the two countries' welfare contours are no longer tangent at point A. Figure 2 also depicts the new joint-welfare contours that are centered around B. Point B is the politically-efficient tariff pair when the home country is faced with high political pressure.

A politically-efficient agreement is thus a complete contract that prescribes the tariff pair A to the contingency where the home country is facing low political pressure, and the tariff pair B to the contingency where the home country is facing high political pressure.[4] Note that since retaliation is efficiency-reducing the politically-efficient agreement prescribes no retaliation against a safeguard-imposing country. However, this first-best agreement is feasible only if political pressures are publicly observable. In the next Section, I characterize the most efficient contract in the presence of information asymmetry regarding political

[4]Remember that my analysis is focused on the case where the home country is a potential safeguard-imposing country and the foreign country is the potential affected party (see section II.2.2).

pressure.

Optimal remedies and efficient breach

The first best agreement set out above can be achieved only if political pressures are publicly observable and, hence, contractible. However, in the presence of information asymmetry regarding political pressure, the agreement must operate as a revelation mechanism that gives the governments proper incentives to reveal their private information truthfully. To find the optimal mechanism, I assume that the agreement will specify a three-step tariff schedule, denoted by (l, s, r), where l and s have the same interpretation as before and r denotes the tariff rates that the exporting country (i.e., the foreign country) can choose in response to a safeguard in the importing country (i.e., the home country). I assume that the negotiators choose (l, s, r) to maximize the expected joint political welfare of the governments, or,

$$\max_{l,s,r} 2(1-\rho)\left[u(l;\underline{\theta}) + v(l)\right] + \rho\left[u\left(s;\overline{\theta}\right) + v(r) + u(r;\underline{\theta}) + v(s)\right], \tag{II.5}$$

subject to incentive compatibility constraints, which are given by

$$u(s;\underline{\theta}) + v(r) \leq u(l;\underline{\theta}) + v(l), \tag{II.6}$$

and

$$u\left(l;\overline{\theta}\right) + v(l) \leq u\left(s;\overline{\theta}\right) + v(r). \tag{II.7}$$

The first term in $(II.5)$ is the joint welfare of the governments when the home country faces low political pressure multiplied by the probability of this contingency, $(1-\rho)$. Similarly, the second term in this objective function is the joint welfare of the governments when the home country faces high political pressure multiplied by the probability of this contingency,

ρ. Inequality $(II.6)$ represents the truth-telling, or incentive compatibility, condition for the home government when it faces a low political pressure. The left-hand side of this inequality shows the political welfare of the government that misrepresents its political pressure when it actually faces low political pressure. The first term on the left-hand side, $u(s;\underline{\theta})$, is the political welfare that the home government derives from the import sector by imposing a safeguard when $\theta = \underline{\theta}$. The second term, $v(r)$, is the political welfare driven from the export sector that faces retaliatory tariff rates from the foreign country. Inequality $(II.7)$, which is the truth-telling condition when $\theta = \overline{\theta}$, has a similar interpretation.

Denoting the optimal solution to the above problem with superscript *Optimal*, we can state the following:

Proposition 1 $\tau^{PE}(\underline{\theta}) = l^{Optimal} < r^{Optimal} < s^{Optimal} < \tau^{PE}(\overline{\theta})$.

This Proposition is illustrated in Figure 3. This figure depicts the welfare contours of the home country and the joint-welfare contours when the home country faces low and high political pressure, respectively. The optimal agreement is given by two tariff pairs at points A and C. Point $A = \left(l^{Optimal}, l^{Optimal}\right)$ is the politically optimal (and politically efficient) tariff pair when political pressure in the home country is low. On the other hand, point $C = \left(s^{Optimal}, r^{Optimal}\right)$ is the politically optimal tariff pair under high political pressure in the home country. The politically optimal agreement maximizes the joint political welfare while it leaves the home country indifferent between the two tariff schedules, A and C, when it faces low political pressure. As can be seen in Figure 3, points A and C are located on the same welfare contour of the home country under low political pressure. This welfare contour is also tangent to the joint-welfare contour at point C, which ensures that point C generates the highest joint welfare among the incentive compatible tariff schedules.

Since C is located below the 45-degree line from the origin, the politically optimal

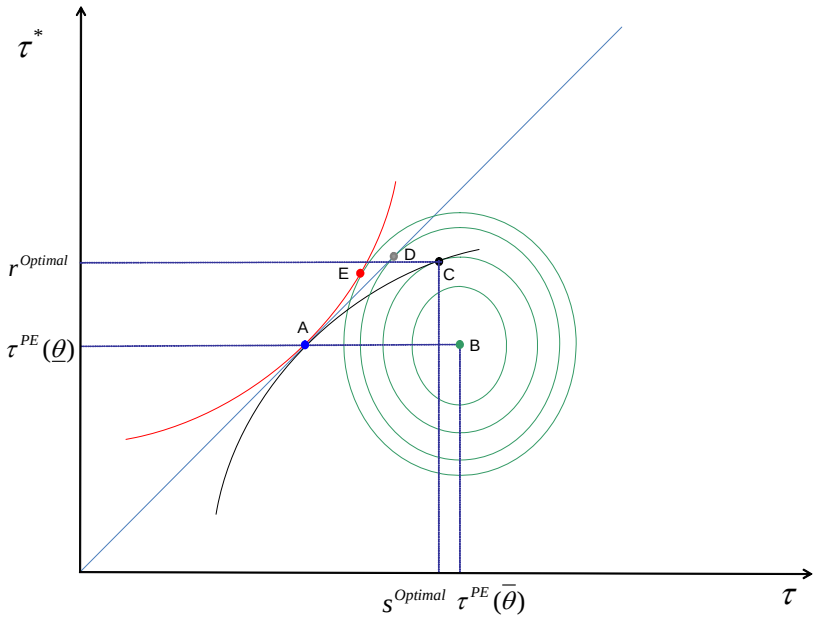

Figure 3. Graphical illustration of Proposition 1

retaliatory tariff, $r^{Optimal}$, is smaller than the politically optimal safeguard tariff, $s^{Optimal}$. Given symmetric countries, the fact that $r^{Optimal} < s^{Optimal}$ implies that:

Corollary 1 *Optimal retaliation is less than proportional to the offense committed by the safeguard-imposing country.*

In particular, this result suggests that reciprocal retaliation is not politically optimal. If we impose reciprocity as a requirement, the most efficient tariff schedule is given by point D at which the 45-degree line is tangent to the joint-welfare contour. Note that the tariff schedule (A, D) is incentive compatible because the home government prefers A to D when $\theta = \underline{\theta}$, and prefers D to A when $\theta = \overline{\theta}$. However, as can be seen in Figure 3, point D is located on a lower joint welfare contour compared to point C. As a result, the best tariff schedule under reciprocity, which is given by (A, D), results in a lower expected joint welfare than the tariff schedule (A, C).

A second observation from Proposition 1 is that the safeguard tariff, $s^{Optimal}$, is smaller than the politically-efficient tariff, $\tau^{PE}\left(\overline{\theta}\right)$, when a government faces high political

pressure. In fact, point B on Figure 3, which is the politically-efficient tariffs pair when the home country faces high pressure, is not incentive compatible. Therefore, as a second corollary to Proposition 1, we have:

Corollary 2 *When governments have asymmetric information, the optimal safeguard tariff is smaller than the politically-efficient tariff under high political pressure.*

This under-utilization of the safeguard measures can be interpreted as an attempt to curb efficiency-reducing retaliations that are triggered by the imposition of safeguard measures. That is because if a higher safeguard tariff is authorized under the agreement, a higher retaliatory tariff is required to maintain incentive compatibility. However, note that one critical assumption behind this result is the unavailability of cash payments or any other efficiency-neutral method of compensation. If such side payments were available and enforceable, an agreement can ensure efficient breach by requiring a breaching party to fully compensate the affected party through side payments. That is, a liability rule can ensure efficient performance of the agreement if, and only if, side payments such as cash are available.

Randomized retaliation

In the previous Section, I assumed that trade negotiators specify a retaliatory tariff rate, r, to be used against a safeguard-imposing country. Then I showed that an optimal trade agreement should prescribe less-than-proportional retaliation against a violating country. However, most international trade agreements follow a principle of reciprocity that specifies commensurate retaliation. For example, Article XIX of GATT allows a country that is affected by a safeguard measure to withdraw "substantially equivalent concessions" against the safeguard-imposing country. One practical appeal of the reciprocity principle

is its simplicity compared to a disproportionate retaliation scheme. That is because, as pointed out by Howse and Staiger (2005), the use of a disproportionate remedy system may cause important measurement problems due to the subtle political and economic welfare effects of trade policy adjustments.

In this Section I impose a reciprocity constraint, that is, $s = r$, on the negotiators' problem, but allow for randomized retaliation against a violating country. Specifically, I assume that the negotiators can design a public randomizing device that authorizes retaliation with probability $\alpha \in [0, 1]$. In fact, according to the WTO Agreement on Safeguards, commensurate retaliation is subject to the approval of the WTO dispute settlement system whose rulings are uncertain. Therefore, one may interpret the WTO dispute settlement system as a randomizing device. This way of modeling the dispute settlement system is similar to that of Reinhardt (2001) and Rosendorff (2005), but they stop short of finding the optimal randomization strategy.

I assume that the negotiators choose α, l, and s to maximize the expected joint welfare of the governments, that is,

$$\max_{l,s,\alpha} 2(1-\rho)\left[u\left(l;\underline{\theta}\right)+v\left(l\right)\right]+\rho\left[u\left(s;\overline{\theta}\right)+v\left(s\right)+\alpha\left[u\left(s;\underline{\theta}\right)+v\left(s\right)\right]+(1-\alpha)\left[u\left(l;\underline{\theta}\right)+v\left(l\right)\right]\right], \tag{II.8}$$

subject to incentive compatibility constraints, which are given by

$$u\left(s;\underline{\theta}\right)+\alpha v\left(s\right)+(1-\alpha)\,v\left(l\right)\leq u\left(l;\underline{\theta}\right)+v\left(l\right), \tag{II.9}$$

and

$$u\left(l;\overline{\theta}\right)+v\left(l\right)\leq u\left(s;\overline{\theta}\right)+\alpha v\left(s\right)+(1-\alpha)\,v\left(l\right). \tag{II.10}$$

Denoting optimal values with superscript R, the following can be stated about an optimal agreement with commensurate but randomized retaliation:

Proposition 2 $l^R < s^R$ *and* $0 < \alpha^R < 1$.

Since α^R is strictly less than 1, a safeguard-imposing country may face no retaliation. In fact, this random retaliation scheme that involves commensurate retaliation and non-retaliation with positive probabilities, can be interpreted as less than-proportional retaliation against an initial offense. Therefore, this proposition provides a similar intuition as Proposition 1.

In the absence of a randomizing device, that is, when α is set equal to 1, a remedy system that is based on the principle of reciprocity is similar to the GATT escape clause, which prescribes commensurate retaliation against a violating country with certainty. On the other hand, the WTO dispute settlement system can be interpreted as a public randomizing device that authorizes commensurate retaliation with a probability less than one. Therefore, this proposition suggests that the dispute settlement system of the World Trade Organization can improve the value of trade agreements by reducing the rate of retaliation.

Fairness and the balance of concessions

Under the politically optimal trade agreement characterized in Proposition 1, an exporting country that is adversely affected by a safeguard measure will not be fully compensated for its loss. Therefore, the "liability rule" that requires a breaching party to make the breached-upon party whole, is not an optimal remedy scheme for the breach of trade agreements. In fact, as pointed out by Bagwell (2007), in order for the injured country to remain whole, it should be allowed to retaliate more than proportionately against an offending country. This is shown graphically in Figure 3. Remember that point A represents

the optimal tariffs pair when both countries face low political pressure. When there is a high political pressure in the home country, the tariff pair that maximizes the joint welfare while leaves the foreign (that is, the affected exporting country) whole is given by point E at which the foreign country's welfare contour through A is tangent to the joint-welfare contour. At point E, which is located above the 45-degree line, the offending country's tariff is smaller than the injured country's retaliatory tariff. Therefore retaliation is more than proportional at point E. In contrast, the optimal tariff pair is given by point C at which retaliation is less than proportional and the injured country is worse off compared to its initial situations at point A.

The above discussion shows that when governments face different political pressures, an optimal tariff schedule violates the balance of concessions between the parties. Nevertheless, ex ante, that is, when political pressures are not yet realized, the expected value of the agreement is the same to both governments. Therefore, the governments maintain a balance of concessions ex ante, although such a balance may not materialize ex post.

Moreover, in a changing environment where political pressures are swinging over time, a country that is affected by a safeguard measure in one period may turn out to be a safeguard-imposing country in another period. Therefore, while a country may stand to lose from an optimal remedy system in some periods, it would be overcompensated in periods when it finds it optimal to violate its obligations in response to domestic pressures. In other words, governments can maintain an intertemporal balance of concessions under an optimal trade agreement even though an instantaneous balance is not maintained.

It is, however, important to note that an optimal agreement results in an intertemporal balance of concessions only if countries are symmetric in size and political environment. For example, consider an extreme case where the foreign country never faces high political

pressure while the home country faces high pressure with probability $\rho \in (0,1)$. An optimal agreement for this pair of countries will be exactly the same as the agreement derived in Section 3. Nevertheless, by signing such an agreement, the foreign country is giving more concessions to the home country than it receives. Therefore, if negotiations follow a reciprocity norm (even in an intertemporal or ex ante sense), governments with asymmetric political environments would fail to achieve an optimal agreement if side payments are not available. In practice, however, a major trade agreement may be reached in conjunction with a few side agreements. These side agreements may be more favorable to the party who stands to gain less from the trade agreement so that an overall balance of concessions is achieved between the two parties.

Conclusion

This paper is the first to show that an optimal remedy system in the WTO constitutes a less-than-proportional retaliation scheme against an offending country. This remedy system implies that the injured parties are not fully compensated for their loss. This is in contrast to the findings of the contract theory literature regarding optimal remedies in domestic settings. In particular, I show that a liability rule does not result in the most efficient remedy system. The analysis of this paper, therefore, indicates discords with the proposals to allow for more-than-proportional retaliation against a violating country in the WTO.

The main result of this paper hinges on the assumption that governments are unable to transfer cash between themselves as a method of compensation, and as a result an injured country may receive compensation only by imposing tariffs on the imports from the violating country. This assumption implies that a) compensating an injured country is efficiency-reducing and b) a compensation award smaller than the initial harm is sufficient

to induce a government to reveal truthfully its private political pressures.

Under a politically optimal agreement, governments maintain an intertemporal balance of concessions if they are symmetric in size and political environment. If one government is faced more frequently with high political pressure its gain is relatively higher from a politically optimal agreement and a balance of concession is not maintained between the two countries. An interesting extension to this paper would be to impose an intertemporal reciprocity constraint in the negotiators' problem when countries are politically asymmetric, that is, when the probability of a high political pressure is different across countries. A similar analysis when countries are asymmetric in size will be interesting as well.

Appendix

Proof of Proposition 1. The Lagrangian of the maximization problem is as follows

$$\begin{aligned}\mathcal{L} &= 2(1-\rho)\left[u(l;\underline{\theta})+v(l)\right] \\ &\quad +\rho\left[u\left(s;\overline{\theta}\right)+v(s)+u(r;\underline{\theta})+v(r)\right] \\ &\quad -\lambda_1\left[u(s;\underline{\theta})+v(r)-u(l;\underline{\theta})-v(l)\right] \\ &\quad -\lambda_2\left[u\left(l;\overline{\theta}\right)+v(l)-u\left(s;\overline{\theta}\right)-v(r)\right]\end{aligned}$$

First-order necessary conditions for optimality are:

$$\begin{aligned}\frac{\partial\mathcal{L}}{\partial l} &= \left[2(1-\rho)+(\lambda_1-\lambda_2)\right]\left[u'(l;\underline{\theta})+v'(l)\right]=0 \\ \frac{\partial\mathcal{L}}{\partial s} &= \rho\left[u'\left(s;\overline{\theta}\right)+v'(s)\right]-(\lambda_1-\lambda_2)u'(s;\underline{\theta})=0 \\ \frac{\partial\mathcal{L}}{\partial r} &= \rho\left[u'(r;\underline{\theta})+v'(r)\right]-(\lambda_1-\lambda_2)v'(r)=0\end{aligned}$$

$$
\begin{aligned}
u\left(s;\underline{\theta}\right)+v\left(r\right) &\leq u\left(l;\underline{\theta}\right)+v\left(l\right), \\
u\left(l;\overline{\theta}\right)+v\left(l\right) &\leq u\left(s;\overline{\theta}\right)+v\left(r\right). \\
\lambda_1 &\geq 0 \\
\lambda_2 &\geq 0
\end{aligned}
$$

$$
\begin{aligned}
\lambda_1\left[u\left(s;\underline{\theta}\right)+v\left(r\right)-u\left(l;\underline{\theta}\right)-v\left(l\right)\right] &= 0 \\
\lambda_2\left[u\left(l;\overline{\theta}\right)+v\left(l\right)-u\left(s;\overline{\theta}\right)-v\left(r\right)\right] &= 0
\end{aligned}
$$

First, remember that the unconstrained maximization yields optimal values that do not satisfy the constraints of the problem and, hence, we cannot have $\lambda_1 = \lambda_2 = 0$. Moreover, at most one of the constraints is binding and we cannot have $\lambda_1, \lambda_2 > 0$. In what follows I consider the remaining cases, which are $(\lambda_1 > 0, \lambda_2 = 0)$ and $(\lambda_1 = 0, \lambda_2 > 0)$

Case 1: $\lambda_1 > 0, \lambda_2 = 0$

$$u\left(s;\underline{\theta}\right)+v\left(r\right)=u\left(l;\underline{\theta}\right)+v\left(l\right) \tag{II.11}$$

$$\frac{\partial\mathcal{L}}{\partial l}=\left[2\left(1-\rho\right)+\lambda_1\right]\left[u'\left(l;\underline{\theta}\right)+v'\left(l\right)\right]=0 \tag{II.12}$$

$$\frac{\partial\mathcal{L}}{\partial s}=-\lambda_1 u'\left(s;\underline{\theta}\right)+\rho u'\left(s;\overline{\theta}\right)+\rho v'\left(s\right)=0 \tag{II.13}$$

$$\frac{\partial\mathcal{L}}{\partial r}=\rho\left[u'\left(r;\underline{\theta}\right)+v'\left(r\right)\right]-\lambda_1 v'\left(r\right)=0. \tag{II.14}$$

Condition $(II.12)$ implies that:

$$u'\left(l;\underline{\theta}\right)+v'\left(l\right)=0.$$

That is $l^{Optimal}=\tau^{PE}\left(\underline{\theta}\right)$. Moreover, condition $(II.13)$ implies that $u'\left(s;\overline{\theta}\right)+\rho v'\left(s\right)$ is strictly positive, which in turn, implies that $s^{Optimal}<\tau^{PE}\left(\overline{\theta}\right)$. Condition $(II.14)$ implies that $u'\left(r;\underline{\theta}\right)+v'\left(r\right)<0$, which in turn implies that $r^{Optimal}>\tau^{PE}\left(\underline{\theta}\right)$, or $r^{Optimal}>$

$l^{Optimal}$.

To complete the proof, I need to show that $s^{Optimal} > r^{Optimal}$. On the contrary, suppose that $s^{Optimal} = r^{Optimal}$ or $s^{Optimal} < r^{Optimal}$. If $s^{Optimal} = r^{Optimal}$ then, given that $l^{Optimal} = \tau^{PE}(\underline{\theta})$ and $u(\tau;\underline{\theta}) + v(\tau)$ is concave with its peak at $\tau^{PE}(\underline{\theta})$, we have $l^{Optimal} = s^{Optimal} = r^{Optimal}$. Substituting $l^{Optimal}$ for r in $(II.14)$ and noting that $u'\left(l^{Optimal};\underline{\theta}\right) + v'\left(l^{Optimal}\right) = 0$ implies that This result implies that $\lambda_1 = 0$, which is in contradiction with the assumption that $\lambda_1 \neq 0$. On the other hand, if $s^{Optimal} < r^{Optimal}$. then $v\left(s^{Optimal}\right) > v\left(r^{Optimal}\right)$. Therefore, we can substitute $r^{Optimal}$ for $s^{Optimal}$ in the following inequality that holds because $l^{Optimal}$ maximizes $u(\tau;\underline{\theta}) + v(\tau)$:

$$u\left(s^{Optimal};\underline{\theta}\right) + v\left(s^{Optimal}\right) < u\left(l^{Optimal};\underline{\theta}\right) + v\left(l^{Optimal}\right).$$

In other words,

$$u\left(s^{Optimal};\underline{\theta}\right) + v\left(r^{Optimal}\right) < u\left(l^{Optimal};\underline{\theta}\right) + v\left(l^{Optimal}\right).$$

This inequality is in contradiction with condition $(II.11)$. Therefore, $s^{Optimal} > r^{Optimal}$.

Case 2: $\lambda_1 = 0, \lambda_2 > 0$

This case is not possible since the relevant first-order conditions imply that $\lambda_2 < 0$. The first-order conditions for this case are as follows:

$$u\left(l;\overline{\theta}\right) + v(l) = u\left(s;\overline{\theta}\right) + v(r) \tag{II.15}$$

$$\frac{\partial \mathcal{L}}{\partial l} = 2(1-\rho)\left[u'(l;\underline{\theta}) + v'(l)\right] - \lambda_2\left[u'\left(l;\overline{\theta}\right) + v'(l)\right] = 0 \tag{II.16}$$

$$\frac{\partial \mathcal{L}}{\partial s} = \rho\left[u'\left(s;\overline{\theta}\right) + v'(s)\right] + \lambda_2 u'\left(s;\overline{\theta}\right) = 0 \tag{II.17}$$

$$\frac{\partial \mathcal{L}}{\partial r} = \rho\left[u'(r;\underline{\theta}) + v'(r)\right] + \lambda_2 v'(r) = 0 \tag{II.18}$$

From conditions $(II.17)$ and $(II.18)$ we have

$$-\frac{u'(r;\underline{\theta})+v'(r)}{u'\left(s;\overline{\theta}\right)+v'(s)}=-\frac{v'(r)}{u'\left(s;\overline{\theta}\right)}.$$

The left-hand side of this equation is the slope of the joint-welfare contours that are ellipses centered at $\left(\tau^{PE}(\underline{\theta}),\tau^{PE}\left(\overline{\theta}\right)\right)$, and the right-hand side is the slope of the home country's welfare contours when it faces high political pressure. If $\lambda_2>0$, then $(II.17)$ implies that $u'\left(s;\overline{\theta}\right)+v'(s)<0$, or $s^{Optimal}>\tau^{PE}\left(\overline{\theta}\right)$. Similarly, $(II.18)$ implies that $u'(r;\underline{\theta})+v'(r)>0$, or $r^{Optimal}<\tau^{PE}(\underline{\theta})$. Therefore, the slope of the home country's welfare contour under high pressure is positive. Moreover, this welfare contour goes through $r^{optimal}<\tau^{PE}(\underline{\theta})$ and $\tau^{PE}\left(\overline{\theta}\right)<s^{optimal}<\tau^{N}\left(\overline{\theta}\right)$. Therefore, the home country's welfare contour that goes through the optimal point does not cross the 45-degree line. This means that the first-order condition $(II.15)$ does not hold. Therefore, $\lambda_2<0$. ■

Proof of proposition 2. I first show that $s\geq l$. On the contrary assume that $s<l$. Since $u(\tau;\theta)+\alpha v(\tau)$ is a quadratic function of τ, conditions $(II.9)$ and $(II.10)$ can be written, respectively, as $\frac{s+l}{2}\leq m(\underline{\theta};\alpha)$ and $\frac{s+l}{2}\geq m\left(\overline{\theta};\alpha\right)$, where, $m(\theta,\alpha)=\arg\max_{\tau}u(\tau;\theta)+\alpha v(\tau)$. Now since $m(\theta,\alpha)$ is increasing in θ, and $\underline{\theta}<\overline{\theta}$, we have

$$\frac{s+l}{2}\leq m(\underline{\theta};\alpha)<m\left(\overline{\theta};\alpha\right)\leq\frac{s+l}{2},$$

or $\frac{s+l}{2}<\frac{s+l}{2}$, which is not possible. Hence $s\geq l$.

The maximization problem in the Lagrangian form is given as follows

$$\begin{aligned}\mathcal{L} &= [2-\rho(1+\alpha)]\left[u(l;\underline{\theta})+v(l)\right]+\rho\left[u\left(s;\overline{\theta}\right)+v(s)\right]+\alpha\rho\left[u(s;\underline{\theta})+v(s)\right] \quad \text{(II.19)}\\ &\quad -\lambda_1\left[u(s;\underline{\theta})+\alpha v(s)-u(l;\underline{\theta})-\alpha v(l)\right]\\ &\quad -\lambda_2\left[u\left(l;\overline{\theta}\right)+\alpha v(l)-u\left(s;\overline{\theta}\right)-\alpha v(s)\right]\end{aligned}$$

Case 1: $\lambda_1 > 0$ *and* $\lambda_2 = 0$

The first-order conditions:

$$\frac{\delta \mathcal{L}}{\delta l} = [2 - \rho(1+\alpha)]\left[u'(l;\underline{\theta}) + v'(l)\right] + \lambda_1\left[u'(l;\underline{\theta}) + \alpha v'(l)\right] = 0, \tag{II.20}$$

$$\frac{\delta \mathcal{L}}{\delta s} = \rho\left[u'\left(s;\overline{\theta}\right) + v'(s)\right] + \alpha\rho\left[u'(s;\underline{\theta}) + v'(s)\right] - \lambda_1\left[u'(s;\underline{\theta}) + \alpha v'(s)\right] = 0, \tag{II.21}$$

$$\frac{\delta \mathcal{L}}{\delta \alpha} = -\rho\left[u(l;\underline{\theta}) + v(l)\right] + \rho\left[u(s;\underline{\theta}) + v(s)\right] - \lambda_1\left[v(s) - v(l)\right] = 0, \tag{II.22}$$

$$\frac{\delta \mathcal{L}}{\delta \lambda_1} = u(s;\underline{\theta}) + \alpha v(s) - u(l;\underline{\theta}) - \alpha v(l) = 0. \tag{II.23}$$

Condition $(II.23)$ implies

$$\alpha = \frac{u(s;\underline{\theta}) - u(l;\underline{\theta})}{v(l) - v(s)}.$$

Condition $(II.22)$ implies

$$\begin{aligned}
\lambda_1 &= \rho\frac{\left[u(l;\underline{\theta}) + v(l)\right] - \left[u(s;\underline{\theta}) + v(s)\right]}{v(l) - v(s)} \\
&= \rho\left(1 - \frac{u(s;\underline{\theta}) - u(l;\underline{\theta})}{v(l) - v(s)}\right) \\
&= \rho(1-\alpha)
\end{aligned}$$

Substituting α and λ_1 into $(II.20)$ yields:

$$\frac{\delta \mathcal{L}}{\delta l} = [2 - \rho(1+\alpha)]\left[u'(l;\underline{\theta}) + v'(l)\right] + \rho(1-\alpha)\left[u'(l;\underline{\theta}) + \alpha v'(l)\right] = 0$$

or, equivalently,

$$\frac{1}{2(1-\alpha\rho)}\frac{\delta \mathcal{L}}{\delta l} = u'(l;\underline{\theta}) + \frac{\left(2 - (1+\alpha)^2\rho\right)}{2(1-\alpha\rho)}v'(l) = 0 \tag{II.24}$$

Since $0 < \frac{2-(1+\alpha)^2\rho}{2(1-\alpha\rho)} < 1$, we have $l > \tau^{PE}(\underline{\theta})$.

As was shown above, in optimum we have $s \geq l$. Here, I show that in optimum s is strictly greater than l. On the contrary, suppose that $l = s$. Since $l > \tau^{PE}(\underline{\theta})$, the derivative

of the objective function with respect to l is negative. Moreover, when $l = s$, by reducing l marginally, both incentive compatibility constraints will be still satisfied. Therefore, the optimal solution must involve $l < s$.

Since $s > l > \tau^{PE}(\underline{\theta})$, we have

$$u(l;\underline{\theta}) + v(l) > u(s;\underline{\theta}) + v(s)$$

which implies that

$$\alpha = \frac{u(s;\underline{\theta}) - u(l;\underline{\theta})}{v(l) - v(s)} < 1.$$

Case 2: $\lambda_1 = 0, \lambda_2 > 0$

First-order conditions:

$$\frac{\partial \mathcal{L}}{\partial l} = [2 - \rho(1+\alpha)]\left[u'(l;\underline{\theta}) + v'(l)\right] - \lambda_2\left[u'\left(l;\overline{\theta}\right) + \alpha v'(l)\right] = 0 \tag{II.25}$$

$$\frac{\partial \mathcal{L}}{\partial s} = \rho\left[u'\left(s;\overline{\theta}\right) + v'(s)\right] + \alpha\rho\left[u'(s;\underline{\theta}) + v'(s)\right] + \lambda_2\left[u'\left(s;\overline{\theta}\right) + \alpha v'(s)\right] = 0 \tag{II.26}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda_2} = -\left[u\left(l;\overline{\theta}\right) + \alpha v(l) - u\left(s;\overline{\theta}\right) - \alpha v(s)\right] = 0 \tag{II.27}$$

$$\frac{\partial \mathcal{L}}{\partial \alpha} = -\rho\left[u(l;\underline{\theta}) + v(l)\right] + \rho\left[u(s;\underline{\theta}) + v(s)\right] - \lambda_2\left[v(l) - v(s)\right] = 0 \tag{II.28}$$

Condition $(II.27)$ implies

$$\alpha = \frac{u(s;\underline{\theta}) - u(l;\underline{\theta})}{v(l) - v(s)}$$

Condition $(II.28)$ implies

$$\lambda_2 = -\rho\left(1 - \frac{u(s;\underline{\theta}) - u(l;\underline{\theta})}{v(l) - v(s)}\right)$$

Therefore, we either have $\lambda_2 < 0$ or $\alpha \geq 1$. If $\alpha \geq 1$, we have a corner solution in which

$\alpha = 1$ and $\lambda_2 = 0$, and the relevant conditions for optimality are

$$\frac{\partial \mathcal{L}}{\partial l} = 2(1-\rho)\left[u'(l;\underline{\theta}) + v'(l)\right] = 0 \tag{II.29}$$

$$\frac{\partial \mathcal{L}}{\partial s} = \rho\left[u'\left(s;\overline{\theta}\right) + v'(s)\right] + \rho\left[u'(s;\underline{\theta}) + v'(s)\right] = 0 \tag{II.30}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda_2} = -\left[u\left(l;\overline{\theta}\right) + v(l) - u\left(s;\overline{\theta}\right) - v(s)\right] = 0 \tag{II.31}$$

$$\frac{1}{\rho}\frac{\partial \mathcal{L}}{\partial \alpha} = \left[u(s;\underline{\theta}) + v(s)\right] - \left[u(l;\underline{\theta}) + v(l)\right] \geq 0 \tag{II.32}$$

Condition $(II.29)$ implies $l = \tau^{PE}(\underline{\theta})$. If $l = \tau^{PE}(\underline{\theta})$, then the condition $(II.32)$ implies that $s = l = \tau^{PE}(\underline{\theta})$. However, when $s = \tau^{PE}(\underline{\theta})$, condition $(II.30)$ is not satisfied. Thus, $\lambda_2 < 0$, and this solution is not optimal. ■

CHAPTER III

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

Introduction

The role of GATT and its successor, the WTO, in reducing trade barriers has been widely accepted. 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. 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. My purpose in this paper is to incorporate new features brought about by the WTO into an economic analysis of this institution.

Bagwell and Staiger (1999, 2002) have introduced a unified framework for economic analysis of GATT. They note that when a government imposes import tariffs, some of the cost of this policy is shifted to foreign exporters, whose products sell at less favorable terms of trade. Therefore governments face a Prisoners' Dilemma when they set their tariff policies unilaterally. Bagwell and Staiger interpret the principles of reciprocity and nondiscrimination as "pillars" of GATT that have assisted governments to escape a terms-of-trade-driven Prisoners' Dilemma. According to the reciprocity principle, if a country decides to increase its tariffs above the previously bound levels, other countries will be free to retaliate by increasing their respective tariffs proportionately. Bagwell and Staiger show that conformity to this principle eliminates the governments' ability to affect terms of trade through trade policy manipulations. Under the WTO, however, this principle has

been weakened, such that a country can increase its tariffs under certain conditions without facing retaliation from affected countries. The governments are therefore able to alter their terms of trade under the WTO, and one can characterize the principle of reciprocity as the WTO's "weakening" pillar.

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.

Trade agreements under GATT and the WTO are subject to an escape clause. An escape clause allows a country to abandon its obligations under the agreement if some of its domestic industries are injured substantially because of a surge in imports.[1] The use of this clause was regulated under the GATT Article XIX, which was replaced by the Agreement on Safeguards after the establishment of the WTO. Consistent with the reciprocity principle, Article XIX stated that a GATT signatory who sought protection in the form of safeguards, was subject to commensurate retaliation by the affected countries. Under the new Agreement on Safeguards, however, it is possible for a country to use the escape clause for a period of three years without facing retaliation from the affected countries. This loosening of the safeguard discipline warrants explanation since a country that bears

[1]This policy is intended to safeguard the endangered industries against a sudden disruption in their operation, which is thought to be needed for a smooth structural transition of the economy.

no cost by invoking the escape clause has the incentive to exaggerate its need for increased protection in order to improve its terms of trade.

In this paper, I provide a model of the WTO Dispute Settlement Process and apply it to the Agreement on Safeguards. I consider state-contingent and self-enforcing agreements when parties have asymmetric information about the prevailing contingency. The DSP is modeled as an impartial arbitrator that investigates the state of the world and issues a non-binding ruling about the culpability of the safeguard-imposing country, that is, whether the situation in the defending country justifies a safeguard measure. I assume that the dispute panel cannot 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.

Including an escape clause in an agreement is an attempt towards writing a contingent, or a more complete, contract that specifies different actions for different states of the world. In order to implement such contingent agreements successfully, the prevailing state of the world in the implementation stage must be identifiable to the negotiating parties. In practice, however, it is more likely that the negotiating parties have private information about the state of the world. Therefore, the prevailing contingency cannot be identified publicly unless it is in the best interest of the relevant parties to disclose their private information truthfully.

Following Bagwell and Staiger (2005), I use a simple political trade model with private political shocks to show that the reciprocity principle embodied in the GATT Article XIX can ensure truthful revelation of private information. Based on the reciprocity principle, if a government invokes the escape clause in response to domestic political pressures,

the affected negotiating parties will be free to withdraw equivalent concessions immediately, 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 escape clause induces the governments to use the clause only when they are faced with intense protectionist pressures.[2] 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 of the compensation and retaliation provisions associated with escape clause actions..."[3]

However, in this paper I show that if an impartial entity, such as the WTO dispute panel, provides the trading partners with reliable (but not necessarily perfect) judgments about the state of the cooperation, they can coordinate on an incentive-compatible strategy profile that does not require an "instantaneous" balance of concessions.[4] In my model, an impartial arbitrator investigates the state of the world in the defending country and announces its opinion on the legitimacy of the defendant's safeguard action. The judgment of the impartial arbitrator provides a new piece of information that can mitigate the infor-

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

[3]Bagwell and Staiger point out that the Agreement on Safeguards imposes a dynamic constraint on the use of the escape clause. They introduce a model in which if a government uses the escape clause in this period, then it must wait a period before it can use the escape clause again. They demonstrate that this sort of constraint, which is a way to introduce a cost to invoking the escape clause, can work to address the incentive-compatibility problem.

[4]Although the concessions are no longer in balance instantaneously, an "intertemporal" balance of concessions is still maintained.

mation asymmetry among the negotiating parties. Private investigations by the disputing parties cannot generate the same public signal since the parties may act strategically in disclosing their findings. In contrast, the arbitrators have the proper incentive to disclose their findings truthfully, since they are impartial entities whose judgment does not affect their payoffs.

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. It is therefore fair to call the DSP the "third pillar" of the WTO that has been erected to support its weakening pillar, i.e., the principle of reciprocity.

This paper can be viewed in the tradition of the economic theory of contract remedies. 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 1970.) 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 can 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 business and civil disputes, however, compensation is in monetary terms, while compensation is transferred through policy adjustments such as withdrawal of equivalent concessions in disputes among trading partners. 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. 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 that reflects the fact 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 all constituencies' welfare, where a larger weight is given to the welfare of the organized political lobby groups) as well as social welfare (defined as a simple sum of all constituencies' welfare). 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 WTO in terms of political welfare when the DSP cannot generate high-quality judgments. The third possible change

in welfare is due to differences in enforcement capabilities across institutions, which will be discussed below.

I study the enforcement of trade agreements in a repeated-game framework. I show that if the governments are sufficiently patient, then the self-enforcing constraint is not binding. However, an important result is that the minimum patience (i.e., discount factor) needed to satisfy the self-enforcing constraint is lower under the WTO than under GATT. In other words, in comparison with GATT, the WTO's self-enforcing constraint is nonbinding for a larger set of discount factors. This analysis therefore suggests that, despite having no teeth, the dispute panels of the WTO can improve the enforceability of trade agreements. Moreover, the improved enforcement capability introduces a third channel for welfare gain. Consider the range of discount factors under which the self-enforcing constraint is binding under GATT but not under the WTO. For this range of discount factors, satisfying the self-enforcing constraint under GATT requires a further deviation from efficient tariffs, which can be avoided by an institutional transition to the WTO with a sufficiently reliable quasi-legal system.

As an extension to the main model, I consider the situations where the court behaves strategically to improve the expected political welfare of the member countries. I characterize the optimal behavior of a"strategic" court and conclude that the member countries will, in fact, benefit from a systematic bias towards protectionism if the court is sufficiently accurate. In other words, a sufficiently accurate court can improve the parties' expected welfare by ruling pro-defendant more frequently. In contrast, a systematic bias towards free trade is desired when the court is not sufficiently accurate.

Some scholars have interpreted the loosening of the safeguard discipline as an attempt to divert protectionist policies from relying heavily on antidumping measures and

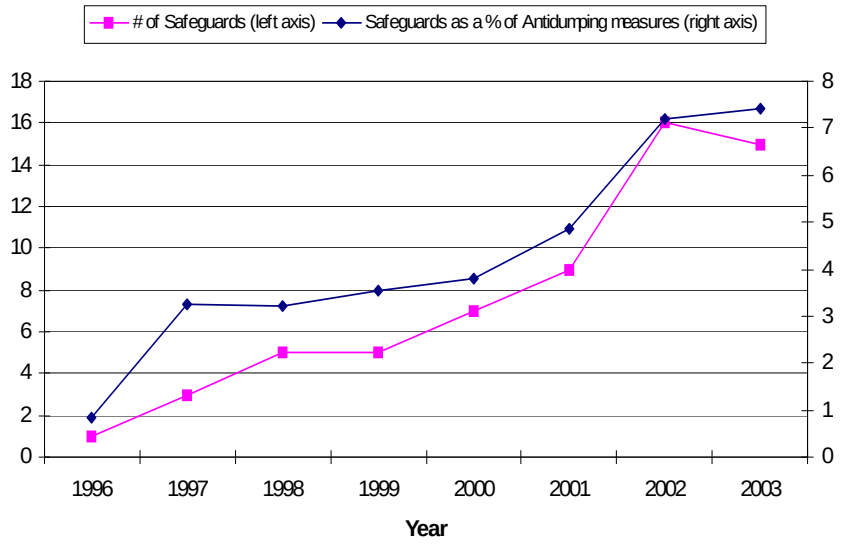

Figure 4. The use of the safeguard measure over time. (Source: The World Bank and the WTO.)

Voluntary Export Restraints (VERs) towards safeguard measures. In fact, the use of safeguard measures has been on the rise under the WTO (Figure 4) even though these measures still remains relatively unpopular compared to antidumping measures. Economists typically prefer that a country resort to safeguard measures, which are consistent with the Most-Favored Nation (MFN) principle, in lieu of antidumping measures 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).[5] This paper takes a different approach to explain the virtues of the reforms in the escape clause by demonstrating the potential efficiency gains resulting from the new Agreement on Safeguards.

A number of studies have explored the informational role of the WTO. Furusawa

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

(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 (2005) studies the escape 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. Multilateral punishment is particularly helpful when a complaining country does not have the capacity to retaliate against the deviating country.

The model of non-binding arbitration under asymmetric information developed here can also shed light on the role of non-binding arbitration in other contexts. One such context is a business relationship where, instead of pursuing a dispute in a court of law, independent agents may rely on non-binding arbitration by an impartial third party to settle their disputes.

After characterizing the economic environment under which trade agreements are implemented in the next section, I will find the incentive-compatible agreement that maximizes political welfare under the GATT escape clause. Then 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. To address the issue of enforcement, I employ a repeated-game framework to determine the conditions under which trade agreements are self-enforcing. Finally,

I introduce extensions to the main model by considering the behavior of courts who pursue specific objectives. Proofs are provided in the Appendix.

The Model

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:

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

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:

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

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

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

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

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

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

$$\pi_x(\tau) \equiv \int_{0}^{p_x(\tau)} Q_x(u)\,du,\ \pi_y(\tau^*) \equiv \int_{0}^{p_y(\tau^*)} Q_y(u)\,du.$$

The government's tariff revenue is given by

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

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

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

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

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

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

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

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

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

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

When side payments are not practical, countries with different realizations of political pressure may fail to reach an efficient agreement if they want to maintain a balance of concessions. That is because a balance of concessions between symmetric countries requires equal tariffs,[7] while efficient tariffs are not equal across countries when they experience different political pressures. In other words, if the home country increases its tariff in response to high political pressures, the foreign country will have to reciprocate by raising

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

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

its respective tariff in order to maintain an *instantaneous* balance of concessions. This resembles the tariff schedule suggested by the GATT escape clause (Article XIX) based on which countries are supposed to maintain reciprocity in setting their tariffs at all times. However, in a changing environment where political pressures are swinging over time, the countries can maintain an *intertemporal* balance of concessions without requiring equal tariffs across countries in each period. In particular, if θ and θ^* are drawn independently from the same distribution function, the countries can maintain an intertemporal balance of concessions by negotiating fully-contingent and politically-efficient tariffs, i.e., $\tau = \tau^{PE}(\theta)$ and $\tau^* = \tau^{PE}(\theta^*)$. Such a tariff agreement is reminiscent of the Safeguard Agreement of the WTO, which under certain conditions authorizes a country to raise its tariffs without suffering retaliation from affected countries.

Private Political Pressures, Monitoring, and Contingent Agreements

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

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

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

much simpler. I also maintain the following assumption throughout the paper.

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

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

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

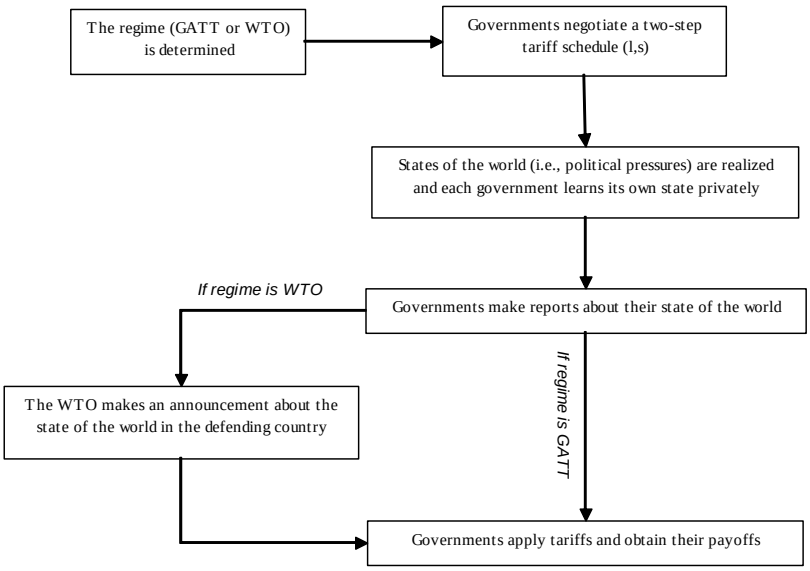

Figure 5. The sequence of events under the GATT and the WTO.

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 (5). After adopting a regime (i.e., GATT or WTO), the governments negotiate a two-step tariff schedule (l, s), where $l < s$. The governments are supposed to adopt the negotiated low tariff, l, for their low-pressure industries, and to use the negotiated safeguard tariff, s, for their high-pressure industries. Each country privately observes its domestic state of the world and makes a public announcement about it, denoted by $\widehat{\theta}$ and $\widehat{\theta}^*$ where $\widehat{\theta}, \widehat{\theta}^* \in \left\{\underline{\theta}, \overline{\theta}\right\}$. 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.

Trade Agreements under GATT: No Public Monitoring

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

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

If both countries announce their state of the world truthfully, the expected per-

Table 1. GATT Strategy Profile

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

period payoff to the home government is given by:

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

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 $u\left(s;\overline{\theta}\right)+u\left(s;\underline{\theta}\right)$ from its importing sectors and $v\left(s\right)+v\left(s\right)$ from its exporting sectors. Welfare under other contingencies can be calculated similarly. Simplifying the above expression gives the expected per-period welfare of a country under GATT as a function of the negotiated tariffs, l and s:

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

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

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

expected payoff from claiming low pressure is

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

while its expected payoff from lying is

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

Therefore, truth-telling requires

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

Similarly, truthful revelation of high pressure is ensured if

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

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

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

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

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

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

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

But $\left(III.9\right)$ is also a sufficient condition for $\left(III.6\right)$ and $\left(III.7\right)$ to be satisfied. To see this,

recall that according to Lemma 2, $u(\tau;\theta)+v(\tau)$ is concave and attains its maximum at $\tau=\tau^{PE}(\theta)$. This implies that $(III.6)$ and $(III.7)$ are satisfied as long as $\tau^{PE}(\underline{\theta})\leq l\leq s\leq\tau^{PE}(\overline{\theta})$. Formally,

Proposition 3 *The incentive compatibility constraints are not binding in the GATT negotiators' problem* $(III.8)$, *and the best incentive-compatible negotiated tariff schedule under GATT is given by* (l^G,s^G). *Moreover,* $\tau^{PE}(\underline{\theta})=l^G<s^G<\tau^{PE}(\overline{\theta})$.

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

Modelling the WTO as a randomizing device ignores the ability of this institution to investigate the disputed actions. By investigating a dispute case, an expert may obtain valuable information regarding the true state of the world, which can be used to mitigate the information asymmetry among the disputing parties. In the next Section, the WTO is modeled as an impartial arbitrator that investigates a dispute case and truthfully reveals its (possibly imperfect) findings about the state of the world (i.e., the culpability of the

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

defendant). Similar to the case of a public randomizing device, the negotiating parties make their post-dispute actions contingent on the arbitrator's findings.

Trade Agreement under WTO: Public Monitoring Provided by DSP

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

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

If the home country announces high political pressure, i.e., $\widehat{\theta} = \overline{\theta}$, which also indicates its intention to implement a safeguard measure on one of its imports, it should defend its case before the dispute panel. The dispute panel investigates the truthfulness

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

Payoffs under WTO

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

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

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

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

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

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

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

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

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

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

Incentive constraints

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

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

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

or, equivalently

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

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

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

or, equivalently, by

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

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

$$\max_{l,s} P^{W}\left(l,s\right) \tag{III.13}$$

$$\text{subject to incentive constraints } (III.11) \text{ and } (III.12).$$

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

Lemma 4 *Assuming that* $0\leq\alpha\leq1$, $u\left(\tau;\theta\right)+\alpha v\left(\tau\right)$ *is a concave function of* τ *and is symmetric around* $\tau=m\left(\theta,\alpha\right)$, *where*

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

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

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

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

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

or, equivalently,

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

Figure 6. The incentive constraint $(III.12)$ is non-binding.

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

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

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

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

Therefore, the incentive constraint $(III.12)$ is not binding. (See Figure 6 for a graphical representation.)

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

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

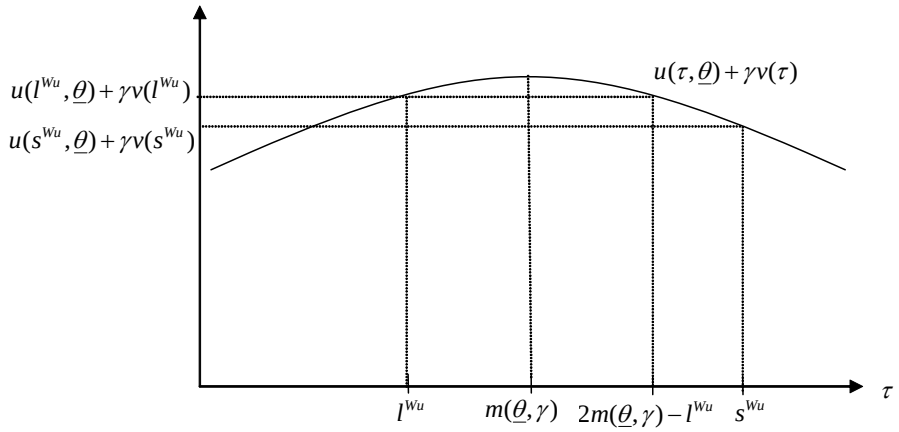

Figure 7. An example where the incentive constraint $(III.11)$ is satisfied, i.e., when $s^{Wu} \geq 2m\left(\underline{\theta},\gamma\right) - l^{Wu}$.

Figure 7 depicts a situation where this inequality, and hence, the incentive constraint $(III.11)$, is satisfied. This inequality is violated if $\gamma = 0$ (because $l^{Wu} < s^{Wu}\left(\gamma = 0\right) < m\left(\underline{\theta},0\right)$)[9] and is satisfied if $\gamma = 1$ (because $l^{Wu} = m\left(\underline{\theta},1\right) < s^{Wu}\left(\gamma = 1\right) = m\left(\overline{\theta},1\right)$). Moreover, the left-hand side of this inequality is increasing in γ (Lemma 3) while its right-hand side is decreasing in γ (Lemma 4). Therefore,

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

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

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

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

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

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

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

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

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.

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, $2\rho\left(1-\gamma\right)$, 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.[10] Therefore, the second channel through which governments may benefit from the reduced rate of retaliation is that they can agree on a politically more efficient, i.e., higher, tariff rate for periods of intense political pressures.

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

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

The expression on the second line is positive because

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

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

The expression on the third line is also positive because

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

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

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

Political welfare under the WTO for different levels of γ is depicted in Figure (8). 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 $(III.11)$ is not binding. The lower curve, $P^W\left(l^{Wr}(\gamma),s^{Wr}(\gamma)\right)$, represents the political payoff under the WTO when the incentive constraint $(III.11)$ is binding. These two curves are tangent at $\gamma=\gamma_2$. Furthermore, as was noted in Lemma 6, for $\gamma<\gamma_1$ the negotiated agreement under the WTO is a non-contingent contract which is represented by the line segment ab on the graph. Therefore, political welfare under the WTO is depicted by the segments ab (when tariffs are non-contingent), bc (when the incentive constraint $(III.11)$ is binding), and cd (when the incentive constraints are not binding).

Political welfare under GATT, $P^G\left(l^G,s^G\right)$, which is independent of γ, is represented by a horizontal line in Figure 8. As depicted on the graph, $P^G\left(l^G,s^G\right)$ always lie below the upper curve, $P^W\left(l^{Wu},s^{Wu}\right)$, and it intersects with the lower curve, $P^W\left(l^{Wr},s^{Wr}\right)$, at $\gamma=\widehat{\gamma}\in(\gamma_1,\gamma_2)$. In other words:

Proposition 4 *There exists $\widehat{\gamma}\in(\gamma_1,\gamma_2)$, such that the negotiated tariffs under the WTO Safeguard Agreement generate a higher expected political payoff than does the negotiated tariffs under the GATT escape clause, if and only if $\gamma>\widehat{\gamma}$. Moreover, these expected payoffs are equal if and only if $\gamma=\widehat{\gamma}$.*

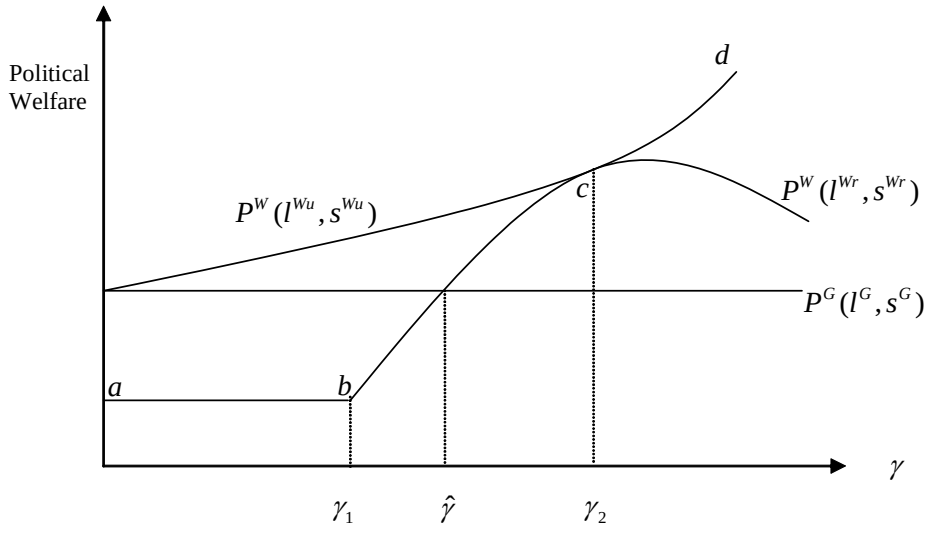

Figure 8. Comparing Expected Political Welfare under WTO and GATT.

Social welfare under WTO vs. GATT

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

As was noted in the previous section, the governments' gains from transition to WTO are twofold. First, the safeguard agreement of the WTO reduces the pain to the governments from protecting their industries in periods of high political pressure, by restricting the use of the retaliation provision. Second, under the auspices of the safeguard agreement, the governments will be protecting their troubled industries more vigorously.

The latter channel of political gain is certainly bad news from a social welfare point of view, as a higher rate of protection in any situation translates to lower social welfare.[11] However, social welfare is improved through the former channel of political gains, as lower frequency of trade skirmishes reduces the average tariff rates. But it turns out that the social costs of the new escape clause outweigh its social gains and, thus, social welfare is undermined as a result of the reforms in the escape clause:

Proposition 5 *Social welfare is higher under the GATT escape clause (Article XIX) than under the WTO escape clause (the safeguard agreement).*[12]

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

Enforcement

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

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

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 (in terms of inducing truthful reporting of the state of the world), but also self-enforcing. In this Section, I adopt a repeated-game framework to account for the enforcement issue. If governments are sufficiently patient, the incentive-compatible agreements characterized above are self-enforcing. The minimum level of patience required to sustain an agreement, however, can differ across institutions. Therefore, introducing the enforcement problem can alter our analysis on the relative performance of 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 $\tau^N\left(\overline{\theta}\right)$ on the imports of the sector where political pressure is high, and to set $\tau^N\left(\underline{\theta}\right)$ on the imports of the sector with low political pressure. Therefore, the expected per-period welfare of the government when there is no cooperation is given by

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

The discounted future value of cooperation under agreement $A=\{W,G\}$, can be written

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

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

and

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

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

Proposition 6 *For $\delta = \delta^G$ and $\gamma = \widehat{\gamma}$, the WTO's enforceability conditions are not binding and the best incentive-compatible tariff schedule under the WTO,i.e., $\left(l^W, s^W\right)$, is self-enforcing. Moreover, $\delta^W(\widehat{\gamma}) < \delta^G$.*

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.

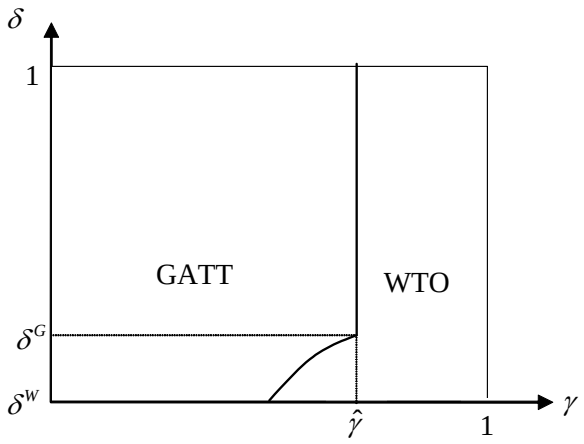

Figure 9. For impatient governments (i.e., when $\delta^W < \delta < \delta^G$), WTO outperforms GATT for a larger range of γ.

Corollary 3 *If $\delta^W(\widehat{\gamma}) \leq \delta < \delta^G$, the minimum judgment quality for which the political welfare is higher under the WTO than under GATT is less than $\widehat{\gamma}$.*[13]

This Corollary is shown in Figure (9). For $\delta > \delta^G$, the critical value of γ is what we obtained under full commitment, i.e., $\gamma = \widehat{\gamma}$. However, as δ falls below δ^G the critical value of γ, above which the political welfare is higher under the WTO than under GATT, decreases. This analysis suggests that the dispute settlement process of the WTO can improve the enforceability of trade agreements despite the fact that it does not provide any external enforcement.

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

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

must be reciprocal) to characterize the court's ruling behavior that maximizes the expected joint political welfare.

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

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

or, equivalently,

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

Moreover, the incentive compatibility constraints are

$$\begin{aligned} & u(s;\underline{\theta})+(1-\gamma)\left[\alpha v(l)+(1-\alpha)v(s)\right]+\gamma\left[\beta v(l)+(1-\beta)v(s)\right] \\ \leq\ & u(l;\underline{\theta})+v(l) \end{aligned} \tag{III.16}$$

and

$$\begin{aligned} & u\left(s;\overline{\theta}\right)+\gamma\left[\alpha v(l)+(1-\alpha)v(s)\right]+(1-\gamma)\left[\beta v(l)+(1-\beta)v(s)\right] \\ \geq\ & u\left(l;\overline{\theta}\right)+v(l) \end{aligned} \tag{III.17}$$

The following proposition summarizes the optimal ruling strategy.

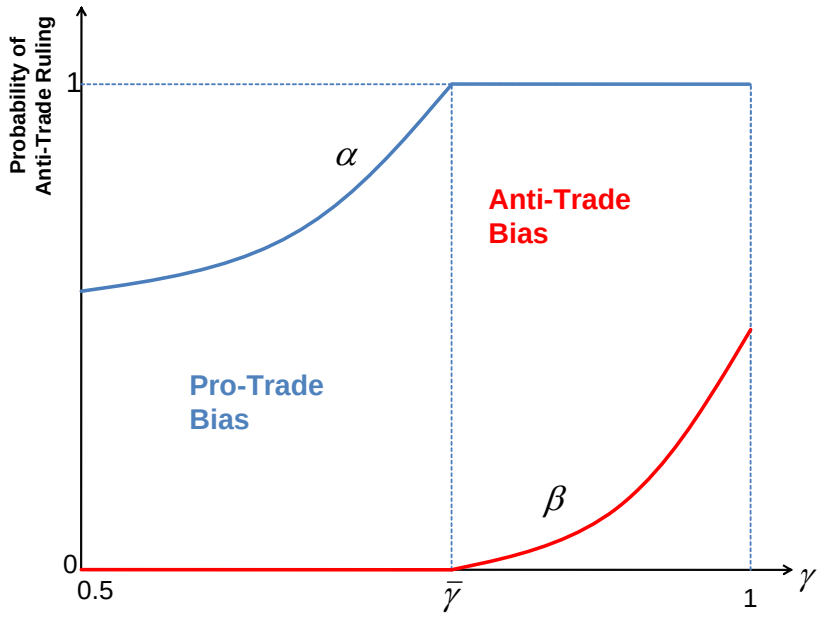

Figure 10. Anti-Trade and Pro-Trade Bias of an Optimal Court

Proposition 7 *α and β are weakly increasing in γ. Moreover, there is $\overline{\gamma} \in \left[\frac{1}{2}, 1\right]$ such that*

$$\begin{cases} 0 < \alpha < 1,\ \beta = 0 & \text{if} \quad \gamma < \overline{\gamma}, \\ \alpha = 1,\ 0 < \beta < 1 & \text{if} \quad \gamma > \overline{\gamma}. \end{cases}$$

$\overline{\gamma}$ is decreasing in ρ, and is strictly less than one. Finally, there exists $\widehat{\rho}$ such that for $\rho > \widehat{\rho}$ we have $\overline{\gamma} = \frac{1}{2}$.

Figures (10) and (11) illustrate this proposition for the cases where $\rho < \widehat{\rho}$ and $\rho > \widehat{\rho}$, respectively. The vertical axis is the probability of a pro-defendant or anti-trade ruling by the court and the horizontal axis is the court's judgment quality. As can be seen on the graph, α and β are weakly increasing in the judgment quality.

In comparison with the ruling behavior of a public signalling device, an optimal court shows a pro-trade (or, pro-complainant) bias when γ is sufficiently small, while for a large γ the optimal court shows an anti-trade (or, pro-defendant) bias. Formally,

Corollary 4 *If $\rho > \widehat{\rho}$, the optimal court is pro-defendant (or, anti-trade) for all values of $\gamma \in \left(\frac{1}{2}, 1\right)$. If $\rho < \widehat{\rho}$, then the optimal court is pro-defendant if $\gamma > \overline{\gamma}$, and is pro-complainant if $\gamma < \overline{\gamma}$.*

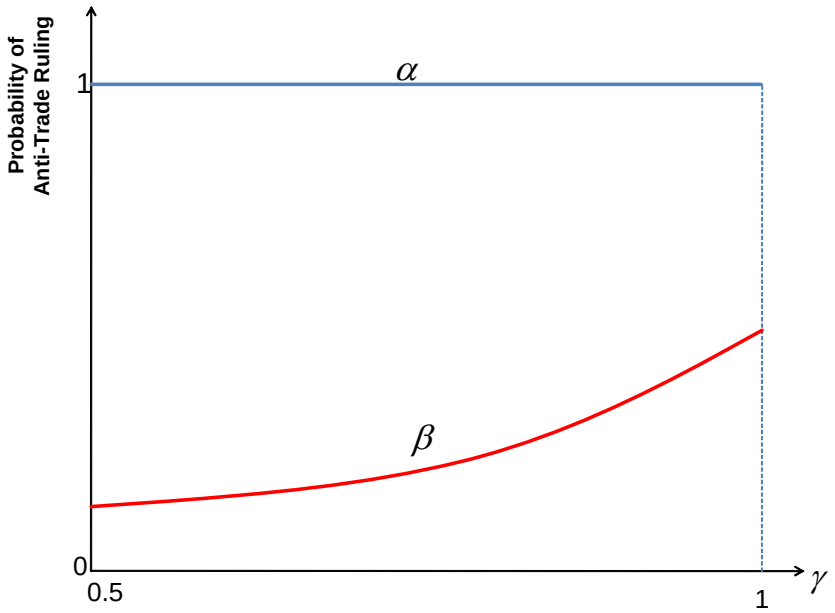

Figure 11. Optimal ruling when the probability of a high shock is sufficiently large.

For an intuition of this result, 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 an anti-trade bias because such a ruling strategy reduces the rate of trade skirmishes without violating the incentive compatibility constraint.

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.

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 escape clause. This improvement arises through three different channels. First governments are better off by cutting back on the frequency of efficiency-reducing trade skirmishes under the WTO. Second, the governments will be able to coordinate on a more politically efficient tariff schedule under the WTO. Finally, the self-enforceability of trade agreements is improved by the introduction of the dispute settlement process of the WTO. This allows the negotiating countries to coordinate on more cooperative trade policies that improve the political welfare of the governments.

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

Appendix

Equilibrium prices. World market clearing condition for good x is

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

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

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

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

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

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

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

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

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

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

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

The import demand is given by:

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

Therefore, the government's tariff revenue is

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

■

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

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

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

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

For further use, note that

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

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

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

and,

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

■

Nash tariff. Non-cooperative (Nash) tariff, τ^N, as a function of political pressure

solves $u'\left(\tau^N;\theta\right)=0$. Rearranging yields

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

■

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

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

Solving for τ yields:

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

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

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

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

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

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

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

$v''(\tau^*) = \frac{4(1+b)}{(3+b)^2} > 0$. ■

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

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

Rearranging yields

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

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

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

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

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

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

and

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

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

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

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

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

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

■

Proof of Lemma 4. Note that

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

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

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

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

Since $u\left(\tau;\underline{\theta}\right)+\gamma v\left(\tau\right)$ is concave in τ and symmetric around $\tau=m\left(\underline{\theta},\gamma\right)$, the above equality

holds if and only if one of the following equations hold:

$$l + s = 2m(\underline{\theta}, \gamma), \tag{III.18}$$

$$l = s. \tag{III.19}$$

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

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

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

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

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

of the following should hold:

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

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

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

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

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

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

$(III.13)$ can be written as

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

and the FOC is given by

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

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

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

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

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

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

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

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

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

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

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

Proof of Proposition 4. When $\gamma = 0$ we have $P^W(l,s) \equiv P^G(l,s)$ which implies that $l^{Wu} = l^G$ and $s^{Wu} = s^G$. It then follows that when $\gamma = 0$, we have $P^W\left(l^{Wu}, s^{Wu}\right) = P^G\left(l^G, s^G\right)$. Moreover $P^W\left(l^{Wu}, s^{Wu}\right)$ is increasing in γ, while $P^G\left(l^G, s^G\right)$ is independent of γ. This proves that $P^G\left(l^G, s^G\right)$ is below $P^W\left(l^{Wu}, s^{Wu}\right)$ for $\gamma \in (0,1]$.

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

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

and

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

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

■

Proof of Proposition 5. Social welfare under GATT, denoted by S^G, can be written as follows:

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

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

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

where,

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

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

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

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

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

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

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

constraint can be raised by decreasing l^{Wr}. Therefore, $W^{Sr}(\gamma) < W^{Su}(\gamma)\ \forall\gamma \in [0, \gamma_2]$. ■

Lemma 8 *In optimum, it is impossible to have α and β simultaneously and strictly between zero and one.*

Proof. On the contrary assume that $0 < \alpha,\ \beta < 1$. Then, a necessary condition for optimality is:

$$\frac{\frac{\partial W(l,s,\alpha,\beta)}{\partial \alpha}}{(1-\gamma)(v(l)-v(s))} = \frac{\frac{\partial W(l,s,\alpha,\beta)}{\partial \beta}}{\gamma(v(l)-v(s))}$$

or

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

or

$$\frac{\gamma}{1-\gamma} = \frac{1-\gamma}{\gamma}$$

which is not satisfied for $\gamma > \frac{1}{2}$. ■

Lemma 9 *α and β are weakly increasing in γ. Moreover, $\alpha > \beta$.*

Lemma 10 *For sufficiently large γ we have $\alpha = 1$ and $\beta > 0$.*

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). Moreover, under this situations welfare is increasing in α and β. Therefore the optimal solution must involve $\beta > 0$ for $\gamma > \gamma_2$. ■

Lemma 11 *When the court is a pure randomizing device, that is, when $\gamma = \frac{1}{2}$, the optimal probability of pro-defendant ruling, denoted by η, is increasing in ρ. Moreover, there exist $\widehat{\rho}$ such that for $\rho > \widehat{\rho}$, we have $\eta > \frac{1}{2}$ and for $\rho \leq \widehat{\rho}$, $\eta \leq \frac{1}{2}$.*

Lemma 12 *When $\gamma = \frac{1}{2}$, for $\rho > \widehat{\rho}$, we have $\alpha = 1$ and $\beta > 0$. For $\rho \leq \widehat{\rho}$, we have $\alpha < 1$ and $\beta = 0$.*

Proof. Note that when $\gamma = \frac{1}{2}$, we have $\eta = \frac{1}{2}(\alpha + \beta)$. If $\rho > \widehat{\rho}$, then according to Lemma 11 we have $(\alpha + \beta) > \frac{1}{2}$. But since in optimum, it is impossible to have α and β

simultaneously and strictly between zero and one, we must have $\alpha = 1$ and $\beta > 0$. Similarly, if $\rho \leq \widehat{\rho}$, we have $\alpha < 1$ and $\beta = 0$. ■

Proof of Proposition 7. This proposition follows from Lemmas 8-12. ■

CHAPTER IV

A MODEL OF DISPUTE SETTLEMENT IN THE WORLD TRADE ORGANIZATION

Introduction

Engaging in the Dispute Settlement Process (DSP) of the World Trade Organization (WTO) can be quite costly for the WTO member countries. Therefore, one may expect that if any dispute arises it should be settled in the early stages of DSP in order to save on the costs of negotiations and litigation. However, the pattern of dispute settlements shows that only 45 percent of all disputes are resolved in the consultation stage and more than 30 percent of cases reach the Appellate Body ruling or further stages[1] (Figure 12).

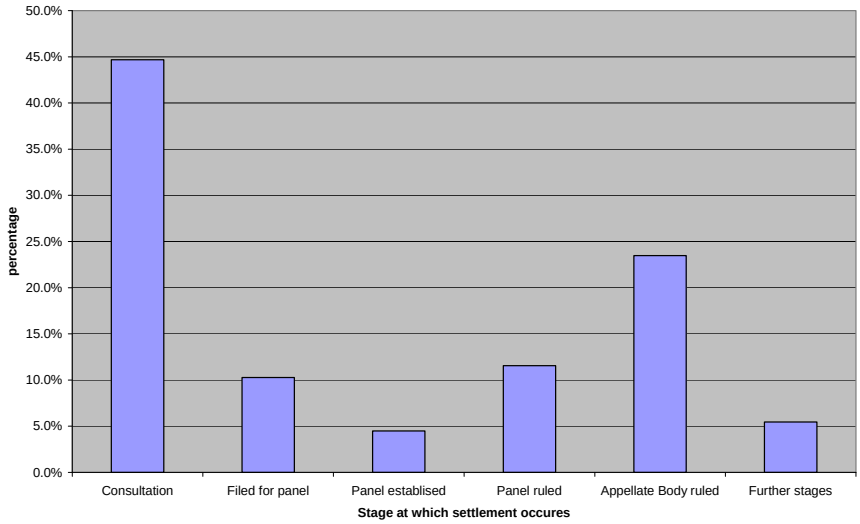

Figure 12. Settlement Rates at different stages of the WTO Dispute Settlement Process (1995-2005)

[1]The main stages of WTO DSP are Consultation (pre-trial negotiations between disputants), Dispute Panel, and Appellate Body. See Beshkar and Bond (2008) for a summary of the DSP.

Under a domestic court setting, the models of settlement bargaining with asymmetric information provide an explanation for the failure of settlement negotiations between two disputants that leads to the costly process of the court. Two classic models in this literature are Bebchuk (1984) and Reinganum and Wilde (1986). A central theme of those models is that, disputing parties engage in pre-trial negotiations to reach a settlement in order to avoid costs of pursuing the dispute in a court of law. Pretrial negotiations, however, may fail due to asymmetric information regarding amount of damages that the plaintiff has suffered or whether or not the defendant is responsible for the damages.

In disputes between private parties, a settlement normally involves a cash transfer from the defending party to the complaining party. However, cash transfer has rarely been used in the WTO to settle a trade dispute. Instead, a complaining country is usually compensated through policy adjustments, such as a reduction in import tariffs in the defending country. The type of available compensation mechanisms determines the payoff structure in the bargaining process, which may also affect the outcome of the process. In particular, while cash transfer is a zero-sum transaction, a policy adjustment is not necessarily zero-sum. For example, as is well-known in the trade literature, a reduction in import tariffs in an importing country generates more gains for the exporting country than losses to the importing country.

In this chapter, I show that due to differences in methods of compensation in private and the WTO disputes, classic models of settlement bargaining cannot correctly explain the settlement pattern in the WTO. To show this, I extend those models to study the determinants of out-of-court settlement under situations where the available compensation mechanism features a positive-sum transaction. This added feature alters some of the important predictions of the classic models. The models of Bebchuk (1984) and Reinganum

and Wilde (1986) imply that the allocation of litigation costs between disputants has no bearing on the likelihood of settlement. In contrast, I show that under a positive-sum compensation mechanism, the likelihood of settlement is more sensitive to the defendant's litigation costs than to the complainant's litigation costs. This analysis has important policy implications, as it suggests that for the sake of a more efficient dispute settlement process, i.e., one that results in a higher settlement rate, a larger fraction of litigation costs should be allocated to the defending parties in the WTO.[2]

Settlement Bargaining under the Allegation of Direct Breach

A country's benefits from a trade agreement might be impaired or nullified by the policies of the other country of the agreement. These policies might be direct or indirect breach of the agreement. An example of *direct breach* is increasing the tariff rate above the agreed-upon level[3]. An *indirect breach*, however, nullifies the benefits of the breached-upon country through indirect policies such as subsidies in case of tariff-reduction agreements or lack of property-right enforcement in case of TRIPs agreements. In either case, an injured country is entitled to remedies from the infringer.

In this Section, I focus on the case of direct breach. In a direct breach, the dispute is on the nature of the prevailed contingency. If such a case is litigated, the court issues its opinion on the nature of the contingency and rules whether the defendant is in violation of its obligation or not. If ruling is against the defendant, the defendant is supposed to reduce its tariff rate to a lower level (possibly the agreed-upon level) as specified by the court. Similarly, a settlement schedule is a tariff rate (lower than the disputed tariff rate) offered

[2]The DSP can manipulate the allocation of litigation costs by adopting appropriate rules about the allocation of the burden of proof, for example.

[3]As will be explained below, an increase in the tariff rate does not always constitute a breach of the agreement.

by one of the two parties.

In this Section I employ both screening and signaling models to analyze the settlement bargaining problem when the defending party is accused of a direct breach in the WTO.

Basic Setup

The defendant's tariff rate on the imports from the complainant at the time of the dispute is denoted by τ^d, while τ^a $\left(\leq \tau^d\right)$ denote the tariff rate that the defendant should adopt in order to be in compliance with its obligations. When a dispute arises, *renegotiation* takes place in order to deal with the dispute. It may result in a "mutually agreed solution" which could be an adjustment in the defendant's policy, an adjustment in the complainant's policy (e.g., withdrawal of past concessions), or both. If a mutually agreed solution is not achieved, the case will escalate to the dispute panel. Generally, if defendant is found in violation of its obligations, the panel will also specify a retaliatory policy that complainant can adopt in case defendant does not comply with the panel ruling. However, since in this paper the panel rulings are assumed to be enforceable, I ignore the possibility of retaliation. Moreover, I assume that settlement is based on the adjustment in the defendant's policy. Suppose that the defendant adopts a new policy τ $\left(< \tau^d\right)$. The welfare of defendant and complainant as functions of the defendant's new tariff rate are given by $W_D(\tau)$ and $W_C(\tau)$, where $W_D'(\tau) \geq 0$ and $W_C'(\tau) \leq 0$. Moreover, define:

$$\Omega(\tau) \equiv W_D\left(\tau^d\right) - W_D(\tau)$$

and

$$\Delta(\tau) \equiv W_C(\tau) - W_C\left(\tau^d\right).$$

As is clear from these definitions, $\Omega(\tau)$ is the defendant's welfare loss from lowering its tariff from the disputed level (i.e., τ^d) to τ, while $\Delta(\tau)$ is the complainant's benefits from this policy adjustment.

Assuming that trade is a positive-sum game, any increase in tariff rates by one party would decrease the two parties' aggregate payoff. So if deviation from the agreement benefits one party it should hurt the other party to a larger extent. Similarly, the defendant's loss from reducing its tariff rate is smaller than the complainant's benefits from this policy adjustment, i.e. $\Omega(\tau) < \Delta(\tau)$. For the sake of the tractability of the model I impose more restriction on the functions Ω and Δ as follows:

Assumption 1: $\Omega(\tau) = \alpha\Delta(\tau)$ *for all* $0 \leq \tau \leq \tau^d$, *where* $\alpha < 1$.

As will be seen in the following subsections, modifying the classical models of settlement bargaining (e.g., Bebchuk (1984) and Reinganum and Wilde (1986)) according to this assumption, reveals some interesting features of the settlement bargaining in the WTO.

A Screening Model

Consider a case in which the defendant has better information about the dispute case. In the case of implementing safeguard measures, for example, the defendant is better informed about the economic conditions surrounding its import-competing industries. Therefore, the defendant can make a better prediction about the ruling of the dispute panel in case of litigation. On this basis, I assume that the probability of an adverse ruling against the defendant, p, is private knowledge of the defendant, while the complainant knows only that p is distributed over interval $\left[\underline{p}, \overline{p}\right]$ by a distribution function $F(.)$. Here, p is interpreted as the defendant's type.

The Bebchuk (1984) framework can be readily employed to model this situation. Suppose that the complainant demands that the defendant adopts τ^s rather than τ^d. If the defendant fulfills this demand the case is settled, the complainant earns $\Delta(\tau^s)$ and the defendant incurs a cost of $\Omega(\tau^s)$. On the other hand, if the defendant does not accept this offer, the parties would bring the case before the dispute panel, in which case each of them should pay their respective legal fees, namely, c_D and c_C.

Assuming that the panel ruling is enforceable, the defendant accepts τ^S if and only if:

$$\Omega(\tau^s) \leq (1-p) \times 0 + p\Omega(\tau^a) + c_D \tag{IV.1}$$

or, equivalently, if and only if:

$$p \geq \frac{\Omega(\tau^s) - c_D}{\Omega(\tau^a)} \tag{IV.2}$$

Hence, the defendant will accept τ^s if and only if its type p is equal to or higher than $q(\tau^s)$, where $q(\tau^s)$ is the marginal defendant type defined by

$$q(\tau^s) = \frac{\Omega(\tau^s) - c_D}{\Omega(\tau^a)}.$$

On the other hand, the complainant's expected payoff from demanding τ^s is given by

$$\begin{aligned} A(\tau^s) &= \{1 - F[q(\tau^s)]\}\Delta(\tau^s) \\ &\quad + F[q(\tau^s)]\left\{-c_C + \frac{\Delta(\tau^a)\int_{\underline{p}}^{q(\tau^s)} xf(x)\,dx}{F[q(\tau^s)]}\right\} \end{aligned}$$

Therefore, the FOC is given by $A'\left(\tau^S\right)=0$, where

$$\begin{aligned} A'(\tau^s) &= -f\left[q\left(\tau^s\right)\right]q'\left(\tau^s\right)\Delta\left(\tau^s\right)+\left\{1-F\left[q\left(\tau^s\right)\right]\right\}\Delta'\left(\tau^s\right) \\ &\quad -f\left[q\left(\tau^s\right)\right]q'\left(\tau^s\right)c_C+\Delta\left(\tau^a\right)q\left(\tau^s\right)f\left(q\left(\tau^s\right)\right)q'\left(\tau^s\right) \\ &= \left\{1-F\left[q\left(\tau^s\right)\right]\right\}\Delta'\left(\tau^s\right)-f\left[q\left(\tau^s\right)\right]q'\left(\tau^s\right)\left[\Delta\left(\tau^s\right)+c_C-\Delta\left(\tau^a\right)q\left(\tau^s\right)\right] \end{aligned}$$

Substituting $q\left(\tau^s\right)=\frac{\Omega(\tau^s)-c_D}{\Omega(\tau^a)}$, and $q'\left(\tau^s\right)=\frac{\Omega'(\tau^s)}{\Omega(\tau^a)}$ in this equation and then applying Assumption 1, i.e. $\Omega\left(\tau\right)\equiv\alpha\Delta\left(\tau\right)$, yield:

$$\begin{aligned} A'(\tau^s) &= \left\{1-F\left[q\left(\tau^s\right)\right]\right\}\Delta'\left(\tau^s\right)-f\left[q\left(\tau^s\right)\right]\frac{\Omega'\left(\tau^s\right)}{\Omega\left(\tau^a\right)}\left[\Delta\left(\tau^s\right)+c_C-\Delta\left(\tau^a\right)\frac{\Omega\left(\tau^s\right)-c_D}{\Omega\left(\tau^a\right)}\right] \\ &= \left\{1-F\left[q\left(\tau^s\right)\right]\right\}\Delta'\left(\tau^s\right)-f\left[q\left(\tau^s\right)\right]\frac{\alpha\Delta'\left(\tau^s\right)}{\alpha\Delta\left(\tau^a\right)}\left[\Delta\left(\tau^s\right)+c_C-\Delta\left(\tau^a\right)\frac{\alpha\Delta\left(\tau^s\right)-c_D}{\alpha\Delta\left(\tau^a\right)}\right] \\ &= \left\{\left\{1-F\left[q\left(\tau^s\right)\right]\right\}-f\left[q\left(\tau^s\right)\right]\frac{c_C+\frac{c_D}{\alpha}}{\Delta\left(\tau^a\right)}\right\}\Delta'\left(\tau^s\right) \end{aligned}$$

Thus, the FOC can be written as:

$$\frac{f\left[q\left(\tau^s\right)\right]}{1-F\left[q\left(\tau^s\right)\right]}=\frac{\Delta\left(\tau^a\right)}{c_C+\frac{c_D}{\alpha}} \tag{IV.3}$$

Moreover,

$$\begin{aligned} A''(\tau^s) &= -\left\{f\left[q\left(\tau^S\right)\right]+f'\left[q\left(\tau^S\right)\right]\frac{c_C+\frac{c_D}{\alpha}}{\Delta\left(\tau^A\right)}\right\}q'\left(\tau^S\right)\Delta'\left(\tau^S\right) \\ &= -\left\{f\left[q\left(\tau^S\right)\right]+f'\left[q\left(\tau^S\right)\right]\frac{c_C+\frac{c_D}{\alpha}}{\Delta\left(\tau^A\right)}\right\}\frac{\left[\Delta'\left(\tau^S\right)\right]^2}{\Delta\left(\tau^A\right)}. \end{aligned}$$

Therefore, the SOC, $A''\left(S\right)<0$, is given by:

$$f\left[q\left(\tau^s\right)\right]+f'\left[q\left(\tau^s\right)\right]\frac{c_C+\frac{c_D}{\alpha}}{\Delta\left(\tau^a\right)}>0. \tag{IV.4}$$

Assuming a monotonic and increasing hazard function for distribution function F, the SOC will be always satisfied and the First-Order condition given in $(IV.3)$ yields a unique equilibrium.

Litigation costs and the likelihood of early settlement

Under the baseline model of Bebchuk (i.e., when $\alpha = 1$ in this setting), settlement rate is equally sensitive to the changes of the litigation costs of either party. However, under the current model (i.e., when $\alpha < 1$), settlement rate is more responsive to changes in the defendant's costs than to changes in the complainant's costs. To see this, denote the equilibrium value of $q(\tau^s)$ by q^* and rewrite the first-order condition ($IV.3$) as follows

$$\frac{f(q^*)}{1 - F(q^*)} = \frac{\Delta(\tau^A)}{\frac{c_D}{\alpha} + c_C}. \tag{IV.5}$$

Since we assume a monotonically increasing hazard function, an increase in the RHS of this equation results in a higher equilibrium value for q^*, or equivalently, a lower equilibrium settlement rate. Therefore, the settlement rate is increasing in the litigation costs of either party.

Proposition 8 *The equilibrium settlement rate is increasing in the litigation costs of either party.*

Moreover, since $\alpha < 1$, a reduction in the defendant's litigation costs reduces the likelihood of settlement to a greater extent than does a reduction in the complainant's costs. Formally,

Proposition 9 *The equilibrium settlement rate is more sensitive to changes in the defendant's costs than to changes in the complainant's costs.*

Denoting the equilibrium settlement rate by R^*, Propositions 8 and 9 imply:

$$\frac{dR^*}{dc_D} > \frac{dR^*}{dc_C} > 0.$$

Example 1 *Suppose that p is distributed according to Beta distribution with shape parameters given by $(2, 2)$, i.e.,*

$$f(p) = \frac{\Gamma(4)}{\Gamma(2)\Gamma(2)} p(1-p),$$

where $p \in [0,1]$ *and* Γ *is the gamma function. The hazard function of this probability distribution is given by*

$$\frac{\frac{\Gamma(4)}{\Gamma(2)\Gamma(2)} p\,(1-p)}{1-\frac{\Gamma(4)}{\Gamma(2)\Gamma(2)}\int_0^p t\,(1-t)\,dt} = \frac{6p}{1+p-2p^2}.$$

Using this hazard function, the equilibrium condition $(IV.5)$ *can be written as*

$$\frac{6q^*}{1+q^*-2q^{*2}} = \frac{\Delta\left(\tau^A\right)}{\frac{c_D}{\alpha}+c_C}.$$

Solving for q^* *yields:*

$$q^* = \frac{\Phi - 6 + \sqrt{-12\Phi + 9\Phi^2 + 36}}{4\Phi},$$

where, Φ *is equal to the right-hand side of* $(IV.5)$*. Thus, the likelihood of settlement,* $R^* = 1 - F\left(q^*\right)$*, is given by*

$$\begin{aligned} r^* &= 1 - \frac{\Gamma(4)}{\Gamma(2)\,\Gamma(2)} \int_0^{q^*} t\,(1-t)\,dt \\ &= 1 - \frac{3}{16\Phi^2}\left(\Phi - 6 + \sqrt{9\Phi^2 - 12\Phi + 36}\right)^2 + \frac{1}{32\Phi^3}\left(\Phi - 6 + \sqrt{9\Phi^2 - 12\Phi + 36}\right)^3 \end{aligned}$$

As is depicted in the following graph, R^* *is a decreasing function of* $\Phi \equiv \frac{\Delta\left(\tau^A\right)}{\frac{c_D}{\alpha}+c_C}$*, and Propositions 8 and 9 are verified.*

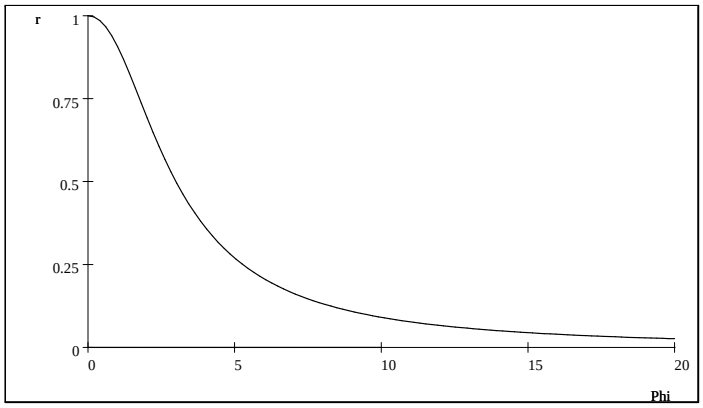

Figure 13. Equilibrium settlement rate, R^*, as a function of $\Phi \equiv \frac{\Delta\left(\tau^A\right)}{\frac{c_R}{\alpha}+c_C}$.

A Signaling Model

In the previous section I assumed that in the settlement bargaining game the uninformed party offers a settlement proposal and the informed party decides whether to accept or reject this proposal. In contrast, in this section I assume that the informed party is the one that offers a settlement and the uninformed party may accept or reject the offer. Reinganum and Wilde (1986) introduce a signaling model in which the informed party signals its type by making a settlement offer.

As in the previous section, I assume that the defendant has private information about its probability of losing the case in the court, denoted by p. The signaling game is as follows. The defendant offers a reduction in its import tariff from τ^d to τ^s. The complainant's strategy, on the other hand, is a function, $r(\tau^s)$, which specifies the probability that it rejects the the defendant's policy adjustment proposal. The expected payoffs of the complainant, if she chooses a rejection probability of ρ, is given by

$$\Pi_C(\tau^s, \rho; b) = [1-\rho]\,\Delta(\tau^s) + \rho\,[b(\tau^s)\,\Delta(\tau^a) - c_C]. \tag{IV.6}$$

where, $b(\tau^s)$ represents the complainant's belief about p given the defendant's offer, τ^s.

Given function $r(.)$, the expected payoff of the defendant from offering τ^s is

$$\Pi_D(\tau^s; r(.)) = -[1-r(\tau^s)]\,\alpha\Delta(\tau^s) - r(\tau^s)\,[p\alpha\Delta(\tau^a) + c_D]. \tag{IV.7}$$

An equilibrium for this problem is characterized by a triple (b^*, r^*, τ^{s*}). An interior solution for the complainant's problem requires:

$$\frac{\partial \Pi_C}{\partial \rho} = -\Delta(\tau^s) + b(\tau^s)\,\Delta(\tau^a) - c_C = 0. \tag{IV.8}$$

Moreover, consistency requires $b(\tau^s) = p$. Therefore, $(IV.8)$ implies:

$$\Delta(\tau^{s*}) = p\Delta(\tau^a) - c_C \tag{IV.9}$$

Furthermore, τ^{s*} must maximize the defendant's expected payoff, given $r^*(\cdot)$. That is, it should satisfy the defendant's first-order condition:

$$r'(\tau^{s*})\,\alpha\Delta(\tau^{s*}) - [1 - r(\tau^{s*})]\,\alpha\Delta'(\tau^{s*}) - r'(\tau^{s*})\,[p\alpha\Delta(\tau^a) + c_D] = 0$$

or, equivalently,

$$-\alpha\Delta'(\tau^{s*}) + \alpha\Delta'(\tau^{s*})\,r(\tau^{s*}) - [\alpha c_C + c_D]\,r'(\tau^{s*}) = 0 \tag{IV.10}$$

Equation $(IV.10)$ has a one-parameter family of solutions $r^*(\Delta'(\tau^s)) = 1 + \lambda \exp\left\{-\frac{\Delta'(\tau^s)}{\alpha c_C + c_D}\right\}$. The appropriate boundary condition is $r^*(\Delta'(\underline{\tau^s})) = 0$, where $\Delta'(\underline{\tau^s}) = \overline{p}\Delta'(\tau^a) - c_C$.[4] This implies that

$$\lambda = -\exp\left\{\frac{\overline{p}\Delta'(\tau^a) - c_C}{\alpha c_C + c_D}\right\}.$$

Therefore, the equilibrium probability of rejection as a function of τ^s will be given by:

$$\begin{aligned} r^*(\tau^s) &= 1 - \exp\left\{\frac{\overline{p}\Delta'(\tau^a) - c_C}{\alpha c_C + c_D}\right\}\exp\left\{-\frac{\Delta'(\tau^s)}{\alpha c_C + c_D}\right\} && \text{(IV.11)} \\ &= 1 - \exp\left\{\frac{\overline{p}\Delta'(\tau^a) - \Delta'(\tau^s) - c_C}{\alpha c_C + c_D}\right\} && \text{(IV.12)} \end{aligned}$$

Finally, for a particular value of p, the equilibrium settlement rate, $R^* = 1 - r^*$, can be obtained by substituting $\Delta(\tau^{s*})$ from $(IV.9)$ into $(IV.11)$, namely:

$$\begin{aligned} R^* &= \exp\left\{\frac{\overline{p}\Delta'(\tau^a) - p\Delta'(\tau^a) + c_C - c_C}{\alpha c_C + c_D}\right\} \\ &\quad \exp\left\{\frac{\overline{p} - p}{\alpha c_C + c_D}\Delta'(\tau^a)\right\} \end{aligned}$$

[4] For a discussion of this boundary condition see Reinganum and Wilde (1986).

In contrast with the Reinganum and Wilde's (1986) original model, in the present formulation the probability of trial depends on the allocation of litigation costs. In particular, probability of trial is more responsive to changes in the defendant's litigation costs than to the complainant's litigation costs. Therefore, Propositions 8 and 9 hold under the signaling model as well.

Settlement Bargaining under the Allegation of Indirect Breach

In this Section, I consider disagreements over policies that are not explicitly restricted by the trade agreement but can potentially nullify or impair the benefits of a contracting party that were intended under the agreement. Such actions, if proved to nullify the effect of the agreement, may be categorized as indirect breach of the contract. In an indirect breach, while keeping its tariff rates fixed at the agreed-upon levels, the defendant adopts a policy, such as subsidies, etc, that potentially nullifies/impairs the benefits of the complainant from the agreement. If such a case is litigated, the court determines the extent to which the defendant's policy has nullified the complainant's gains from the agreement. If the court's ruling is against the defendant, the defendant is supposed to take mitigating actions that restore the benefits of the complainant from the agreement.

In this type of disagreement, the dispute is over the extent of damages imposed on the complaining party. Such disagreements may arise due to asymmetric information of the disputing parties about the size of the compensation, denoted by Δ, that the dispute panel would award to the complainant in case of litigation. I assume that Δ is the private information of the complaining party, while the defending party only knows that Δ is distributed according to $G(\cdot)$ on the interval $\left(\underline{\Delta}, \overline{\Delta}\right)$. I also maintain Assumption 1, which implies that the cost to the defendant of conforming to the panel's ruling is given by $\alpha\Delta$,

where $0 < \alpha < 1$.

In this Section, I employ the signalling model of Reinganum and Wilde (1986) to analyze the settlement bargaining problem in the WTO. More specifically, I consider a bargaining process in which the informed party, i.e., the complainant, demands a policy adjustment on behalf of the defendant in exchange for settlement. Let S denote the benefit of the proposed policy adjustment to the complaining party. I continue to maintain Assumption 1, which implies that the cost of this policy adjustment to the defending party is given by αS.

The complainant's strategy is to demand S to maximize its expected payoff. The defendant's strategy, on the other hand, is a function, $r(S)$, which specifies the probability that it rejects the the complainant's policy adjustment proposal. The expected payoffs of a defendant who has received a settlement demand S and has a rejection probability of ρ, is given by

$$\Pi_D(S, \rho; b) = -[1-\rho]\alpha S - \rho[\alpha b(S) + c_D]. \tag{IV.13}$$

where, $b(S)$ represents the defendant's belief about Δ given the complainant's demand, S.

Expected payoffs of a complainant who would receive an award of the size Δ by the dispute panel, demands S to settle, and takes as given the strategy $r(S)$ of the defendant, is given by

$$\Pi_C(S; r) = [1 - r(S)]S + r(S)[\Delta - c_C]. \tag{IV.14}$$

An equilibrium for this problem is characterized by a triple (b^*, r^*, S^*). An interior

solution for the defendant's problem requires:

$$\frac{\partial \Pi_D}{\partial \rho} = \alpha S - \alpha b\left(S\right) - c_D = 0. \tag{IV.15}$$

Moreover, consistency requires $b\left(S\right) = \Delta$. Therefore, $(IV.15)$ implies:

$$S^* = \Delta + \frac{c_D}{\alpha}. \tag{IV.16}$$

Furthermore, S^* must maximize the complainant's expected payoff, given $r^*\left(\cdot\right)$. That is, it should satisfy the complainant's FOC:

$$\left[1 - r\left(S^*\right)\right] + \left[1 - r'\left(S^*\right)\right] S^* + r'\left(S^*\right)\left[\Delta - c_C\right] = 0,$$

or, equivalently,

$$1 + S^* - r\left(S^*\right) - \left(c_C + \frac{c_D}{\alpha}\right) r'\left(S^*\right) = 0 \tag{IV.17}$$

Equation $(IV.17)$ has a one-parameter family of solutions $r^*\left(S\right) = 1 + \lambda \exp\left\{-\frac{S}{c_C + \frac{c_D}{\alpha}}\right\}$. Applying appropriate boundary conditions, the equilibrium probability of rejection as a function of S will be given by:

$$r^*\left(S\right) = 1 - \exp\left\{-\frac{S - \underline{\Delta} - \frac{c_D}{\alpha}}{c_C + \frac{c_D}{\alpha}}\right\} \tag{IV.18}$$

Finally, for a particular value of Δ, the equilibrium settlement rate, $R^* = 1 - r^*$, can be obtained by substituting S^* from $(IV.16)$ into $(IV.18)$, namely:

$$R^* = \exp\left\{-\frac{\Delta - \underline{\Delta}}{\frac{c_D}{\alpha} + c_C}\right\}$$

In contrast with the Reinganum and Wilde's (1986) original model, in the present formulation the probability of trial depends on the allocation of litigation costs. In particular, probability of trial is more responsive to changes in the defendant's litigation costs

than to the complainant's litigation costs. Therefore, Propositions 1 and 2 hold under the signaling model as well.

Conclusion

My objective in this paper was to highlight the effect of the compensation mechanism that is available to disputing parties on the outcome of pre-trial negotiations. In particular, I considered trade disputes among the WTO members in which trade policy adjustments, rather than cash payments, are used to transfer wealth among the member countries. As opposed to cash payments, policy adjustments are not zero-sum transactions, in the sense that the payee receives a different amount than is paid by the payer. I extended the classical settlement bargaining models, which consider cash payments as the method of compensation, to study settlement bargaining in an environment where compensations are implemented through policy adjustment.

I showed that when policy adjustment is the only compensation mechanism, the litigation costs of the defending party has a pronounced effect on the likelihood of pre-trial settlement. Thus, the classic result regarding the independence of the settlement likelihood and the allocation of litigation costs does not follow under this alternative compensation mechanism. This result suggests that legal procedures that allocate a larger fraction of the burden of proof on the defending party should result in a higher settlement rate.

This theory can explain some stark differences between the behavior of the large versus small counties in the dispute settlement process of the WTO. In a dispute between a large and a small economy, the likelihood of settlement is significantly lower when the large country is named as the defending party. Assuming that smaller countries, which are also poorer countries in my data set, have higher litigation costs, this observation can be

interpreted as an indication of the pronounced effect of the defending countries' litigation costs in pre-trial negotiations.

CHAPTER V

EMPIRICAL ANALYSIS OF DISPUTE SETTLEMENT IN THE WORLD TRADE ORGANIZATION

Introduction

In this chapter, I use a database of the WTO disputes to estimate the settlement bargaining models introduced in Chapter IV. I conduct both structural and reduced form analysis and I find evidence in support of the bargaining models as extended in the previous chapter.

The theoretical analysis of the previous chapter sheds light on some of the settlement patterns in the WTO. A close look at the dispute settlement pattern in the WTO reveals some specific relationships between the likelihood of settlement and the type of disputing countries. A first observation is that countries with larger economies settle a dispute with a lower probability. As demonstrated in Table (2), having a large country, as opposed to a small country, as the defending party, decreases the likelihood of settlement by 16.4 percentage points (i.e., from 70.2% to 53.8%). Similarly, A large-economy defendant decreases the likelihood of settlement by 24 percentage point. A more interesting observation is that in a dispute between a large country and a small country, an early settlement is less likely when the small country is the complaining party. As is shown in Figure 2, 62.5 percent of disputes in which a large country presses charges against a small country is settled without establishing a dispute panel. In contrast, if a small country presses charges against a large country, only 47.8 percent of disputes are settled without establishing a dispute panel.

Table 2. Settlement rate and the size of the defending and complaining parties

	Small-Economy Complainant	Large-Economy Complainant	All
Small-Economy Defendant	85.3% (34 cases)	62.5% (40 cases)	73.0% (74 cases)
Large-Economy Defendant	47.8% (23 cases)	49.3% (77 cases)	49.0% (100 cases)
All	70.2 (57 cases)	53.8% (117 cases)	59.2% (174 cases)

A potential explanation for the latter observation may be offered by the political science literature that attributes settlement behavior in an international setting to the relative power of disputing parties. A power-based view of the DSP would explain this observation by the inability of a small-country complainant to induce the large-country defendant to give concessions without the involvement of the WTO dispute settlement body. In this chapter, I provide an alternative explanation for different settlement behavior of small and large countries, which is based on relative litigation costs of these countries. I construct a measure of litigation costs based on the assumption that the cost of pursuing a dispute in the DSP is greater for poorer countries. It is a widely held view among observers of the WTO that less developed countries have relatively higher costs of legal work in the dispute settlement process. For example, Shaffer (2003) points out that "lack of legal expertise in WTO law and the capacity to organize information concerning trade barriers and opportunities to challenge them [... and] lack of financial resources, including for the hiring of outside legal counsel," are challenges faced by the developing countries in using the WTO legal system effectively. In response to a survey, the WTO delegations from developing countries have cited the high cost of litigation or a lack of private sector support as main reasons for not pursuing a complaint (Busch, Reinhardt, and Shaffer, 2008).[1] I also construct a measure of the "stake at dispute" based on the volume of export in the disputed

[1]In fact, in response to concerns about the relatively high costs of legal works for poorer countries, the Advisory Centre on WTO Law (ACWL) was established in 2001 to provide developing countries with subsidized legal aid for participation in the DSP. Developing countries can access legal aid through ACWL for an hourly charge that ranges from $25 for the least developed countries to $200 for the highest income developing countries (see www.ACWL.ch).

sector from the complaining country to the defending country. Using a Maximum Likelihood Estimation (MLE), I show that the probability of settlement is positively correlated with the litigation costs of the disputants and negatively correlated with the stake at dispute. These observations are consistent with the prediction of the classic models as well as the extended model introduced in Chapter IV.

It is also empirically verified in this chapter that the litigation costs of the defending party has a significantly larger effect on the likelihood of settlement than the litigation costs of the complaining party. While consistent with the prediction of my model, this observation is at odds with the prediction of the classical settlement bargaining models, where the total litigation costs of the disputants –not the distribution of costs– is what matters for the likelihood of settlement.

I also provide empirical evidence regarding the effect of third-parties and multiplicity of complainants in the bargaining process. I show that a case with multiple complainants is less likely to be settled without trial. However, I find no or little evidence regarding the effect of third parties in the pre-trial negotiations. The latter observation is in contrast to the findings of Busch and Reinhardt (2001) who argue that the presence of third parties in a dispute hinders the negotiation process and increases the likelihood of litigations. I show that their result is generated by an endogeneity problem in their empirical work. Once I correct for this endogeneity problem, this effect is reversed under some specifications of my model, while it is statistically insignificant under other specifications.

Retaliatory capacity of the complaining parties is also shown to be an important factor in inducing early settlement. I show that an early settlement is more likely the larger is the defending country's volume of exports to the complaining countries. A large volume of exports from the defending country to the complaining countries gives the complaining

countries the capacity to impose retaliatory trade barriers against the defending country if it does not comply with its obligations.

My empirical observations also suggest that the defending country's import in the disputed sector from third parties has also a significant effect on the likelihood of pre-trial settlement, so that the larger is imports from the rest of the world the higher is the likelihood of a pre-trial settlement. I provide two alternative explanation for this phenomenon, one which draws on the terms-of-trade argument for protection and one which concerns the adverse effects of publicizing a dispute in the WTO.

In the past decade there has been a growing number of empirical studies of the dispute settlement process of GATT and the WTO.[2] Guzman and Simmons (2002) consider the relationship between the nature of the dispute and likelihood of an early settlement. They hypothesize that if the subject matter of the dispute has an all-or-nothing character and leaves little room for compromise (for example, health and safety regulations), the parties' ability to reach an agreement is limited and a higher rate of litigation is expected for such disputes. They find empirical support for their hypothesis only among democratic states. Busch and Reinhardt (2003) consider the success of developing countries as complainants in this process by investigating the level of concessions that they have been able to induce from defending countries. In particular, they find that the introduction of a more legalized system of dispute settlement under the WTO has exaggerated the gap between developed and developing complainants with respect to their ability to get defendants to liberalize disputed policies. Nevertheless, Bown (2004 a) provides evidence that developing country complainants have had more economic success in resolving trade disputes under the WTO than was the case under the GATT.

[2]Busch and Reinhardt (2002) provide a survey of this literature.

A number of papers study the determinants of the decision to initiate a formal dispute. Bown (2005) investigates the determinants of participation in the DSP and examines whether the new regulations of the DSP under the WTO discourages active engagement by developing countries. He finds that the size of exports at stake and legal capacity are important factors in deciding whether to initiate a dispute. Wilckens (2007) also finds that a country is more likely to file a complaint if its retaliatory capacity is large. Horn, Mavroidis, and Nordstrom (1999), however, argue that the bias in the pattern of disputes that have been initiated under the WTO is due to the fact that developed counties have a larger diversity of imports and exports that naturally leads to more disputable trade policies and a more frequent use of the DSP by the developed countries.

Data

Data on the disputes filed under the DSU from 1995 to 2004 is taken from Horn and Mavroidis (2006). This includes information about the disputing parties, the status of each dispute (i.e., the most recent stage of the dispute), and the Harmonized System (HS) codes of the products that are subject to dispute. I updated the information regarding the status of the dispute by checking for new information released on the WTO website. I also modified the data in cases where the range of products at dispute, as reported by the complaining parties, was exaggerated or mis-specified. When several parties have similar complaints against a defending party, they may file a single complaint as co-complainants or they may file separate complaints. In either case, similar complaints are addressed as a single case by the DSB. Therefore, when similar cases are filed separately, I combine them into one single dispute case with multiple complainants. Moreover, in instances where the same dispute between a pair of member countries is filed multiple times, I eliminated all

but the most recently-filed case.

Data on trade volume in disputed sectors comes from Feenstra et. al. (2005) for year 1999. In cases where this piece of data was not available from Feenstra et al, I took the corresponding 2001 trade volume from the UNComtrade database.

Measure of the stake at dispute

I use $\ln(trade)$ as a measure of the stake at dispute, where *trade* is the size of the bilateral trade that is affected by the disputed policy. Ideally, the magnitude of the alleged trade barrier as well as the elasticities of demand and supply in the disputed sector should be also included in the calculation of the size of the stake at dispute. However, I don't have reliable data on these variables.

The stake at dispute may be also affected by the defending country's volume of imports from third countries. In a three-country model of trade where the defending party imports from the complaining party as well as the rest of the world, it can be shown that the stake at dispute for the defending party is decreasing in its import volume from the rest of the world. To account for this effect, I also include $\ln(I\_ROW)$ in the regression model, where I_ROW is the defending party's volume of imports in the disputed sector from the rest of the world.

Measure of litigation costs

It is a widely held view among observers of the WTO that less developed countries have relatively higher costs of legal work in the dispute settlement process. For example, Shaffer (2003) points out that "lack of legal expertise in WTO law and the capacity to organize information concerning trade barriers and opportunities to challenge them [... and] lack of financial resources, including for the hiring of outside legal counsel," are challenges faced by the developing countries in using the WTO legal system effectively. In fact, in

response to concerns about the relatively high costs of legal works for poorer countries, the Advisory Centre on WTO Law (ACWL) was established in 2001 to provide developing countries with subsidized legal aid for participation in the DSP.[3]

On this basis, I use $\frac{\ln(GDP\_US)\ln(\overline{c})}{\ln(GDP\_D)}$ and $\frac{\ln(GDP\_US)\ln(\overline{c})}{\ln(GDP\_C)}$ as a measure of D's and C's litigation costs, respectively, where $\overline{c}$ is the average legal fees paid by disputing countries in case of litigation, GDP_D and GDP_C are gross domestic product in D and C, and GDP_US is the GDP of the United States. This measure only depends on the disputing party's GDP and not on the characteristics of the case, e.g., the complexity of the legal issues involved. While it would be interesting to include case-specific factors in the construction of this measure, it has been pointed out by observers that litigation costs are more or less independent of the commercial stakes involved in a dispute (Nordström and Shaffer, 2008).

I construct an alternative measure of litigation costs using the information about the size of the country's mission to the WTO in Geneva. This data is taken from Michalopoulos (1999). The idea is that if a country has a larger mission to the WTO in Geneva, it will face a smaller *marginal cost* of pursuing a dispute case in the DSP, while a country with a small or no permanent mission will have to hire additional staff to represent the country in the DSP. The cost of maintaining a permanent mission will be considered a sunk cost at the time that a government makes a decision about pursuing a dispute and, thus, it does not affect the litigation decision.

Other control variables

As was mentioned above, some disputes involve multiple complaining parties or third parties that join the dispute as interested parties. The existence of multiple parties in a dispute can have a significant effect on the outcome. To control for these potential effects,

[3]Developing countries can access legal aid through ACWL for an hourly charge that ranges from $25 for the least developed countries to $200 for the highest income developing countries (see www.ACWL.ch).

I include multiple-complainant and third-party dummy variables in the estimation models below.

The Econometric Models

I use several econometric models to test the predictions of the model set out in Chapter IV. I first take a structural approach and estimate the parameters of the screening model set out above. Recall from the screening model presented in Chapter IV that p denotes the probability of a guilty determination by the dispute panel and $q(c_C, c_D, \Delta)$ denotes an equilibrium cutoff point such that a settlement is achieved iff $p \geq q(c_C, c_D, \Delta)$. Therefore, the probability of settlement as a function of c_C, c_D, and Δ, is given by

$$\Pr[p \geq q(c_C, c_D, \Delta)] = 1 - F[q(c_C, c_D, \Delta)],$$

and the likelihood function can be written as

$$L = (1 - F[q(c_C, c_D, \Delta)])^s (F[q(c_C, c_D, \Delta)])^{1-s},$$

where s is the settlement dummy. In order to run an MLE, some functional forms should be assumed for F and q. Since $0 \leq p \leq 1$, a natural choice for F is the Beta Distribution, whose support is $[0, 1]$. As shown in Example 1, assuming $F \tilde{} Beta(2, 2)$, the equilibrium probability of settlement is given by

$$\begin{aligned} \Pr(s = 1 | c_C, c_D, \Delta) &= 1 - \frac{3}{16\Phi^2}\left(\Phi - 6 + \sqrt{9\Phi^2 - 12\Phi + 36}\right)^2 \\ &\quad + \frac{1}{32\Phi^3}\left(\Phi - 6 + \sqrt{9\Phi^2 - 12\Phi + 36}\right)^3, \end{aligned} \tag{V.1}$$

where, $\Phi = \frac{\Delta}{\beta_1 c_D + \beta_2 c_C}$, and β_1 and β_2 are structural parameters to be estimated. Note that Propositions 1 and 2 predict that $\beta_1 > \beta_2 > 0$, and my objective is to test this prediction

empirically.

One difficulty in estimating β_1 and β_2 is the high correlation between $\frac{c_D}{\Delta}$ and $\frac{c_C}{\Delta}$, which are the explanatory variables in this econometric model. The cause of the high correlation is the common denominator, Δ, used in the construction of these variables. One approach to solve this colinearity problem is to use the average value of Δ in the above formulation. I normalize this average value to 1 so that $\Phi = \frac{1}{\beta_1 c_D + \beta_2 c_C}$.

I also estimate probability models that are not based on the above model but can be used to test the correlation between the settlement decision and relevant explanatory variables. In one specification, I relax some of the structure that was introduced by the theoretical model, by assuming a linear relationship between q, i.e., the marginal type of the defendant, and the explanatory variables. In particular, I consider the following probability model:

$$\Pr(s = 1|X) = \Pr\left(1 - p < \beta' X\right), \tag{V.2}$$

where, X is the vector of explanatory variables and β is the vector of parameters to be estimated. As before, I assume that p is distributed according to the Beta distribution with shape parameters given by $(2, 2)$. The results of a Maximum Likelihood Estimation of this model is reported in Table 3.

Finally, I take a fully non-structural approach and estimate probit and logit models.

Empirical Results

In this Section, I evaluate the following hypotheses that are derived from Propositions 8 and 9 of Chapter IV:

Hypothesis 1: Settlement rate is negatively correlated with the trade volume between the disputing parties in the disputed sector.

Hypothesis 2: Settlement rate is positively correlated with the measures of litigation costs.

Hypothesis 3: Settlement rate is more sensitive to changes in the litigation costs of the defending party than to changes in the litigation costs of the complaining party.

In addition to these hypotheses, I will also be able to discuss other factors that may influence the outcome of settlement negotiations, including the existence of third parties and co-complainants, and relevant trade flows.

Table 2 reports the estimated values of the parameters of the structural probability model given in ($V.1$). This estimation provides strong support for Hypothesis 2, which states the likelihood of settlement is positively correlated with the litigation costs of each party. In specifications 2, 3, 5, and 6, I control for different trade flows that are potentially related to the dispute, including the total exports from the complainants to the defendant in the disputed sector. Consistent with Hypothesis 1, the likelihood of settlement is negatively correlated with this trade volume. Hypothesis 3, which states that settlement likelihood is sensitive to the allocation of litigation costs, is also supported empirically when we control for relevant trade flows. As seen in columns 2 and 3, this hypothesis is rejected with probability 0.05 and 0.1 respectively.

Similar results are obtained from the other empirical models that were introduced in the previous Section. The coefficient for the bilateral trade volume in the disputed sector is always negative and statistically significant across all models. Therefore, Hypothesis 1 cannot be rejected. Also consistent with Hypothesis 2, the coefficient for the litigation cost of the defending party is positive and significant across all models. The coefficient for the

litigation of the complaining party is also generally consistent withe Hypothesis 2. These models also provide empirical evidence in support of Hypothesis 3. In each table, I report the result of a one-sided t-test that the coefficient for the defending party's litigation cost is larger than that of the complaining party's litigation cost. As in the structural model, these estimations are consistent with Hypothesis 3 when we control for relevant trade flows.

Is three a crowd?

What is the effect of third parties on the outcome of pre-trial negotiations? Busch and Reinhardt (2006) hypothesize that third parties undermine pre-trial negotiations by increasing the negotiation costs. In fact, as they point out, "61 percent of disputes with no third parties ended in early settlement, in contrast to 26 percent of disputes with third parties. Likewise, nine percent of disputes without third parties ended in a ruling, whereas fully 45 percent of disputes with third parties went the legal distance." However, it is important to note that most third parties join a dispute after pre-trial negotiations break down. Therefore, one can argue that this is the breakdown of pre-trial negotiations that attracts third parties to join the dispute, and not the other way around.

To analyze the effect of third parties on the pre-trial negotiations, I define a third-party dummy variable that is equal to 1 if at least one third party joined the negotiations *prior* to the establishment of a WTO dispute panel. My estimation does not provide evidence in support of the Busch and Reinhardt hypothesis. As can be seen in Tables 2-5, the third-party dummy is not statistically significant in most of the models. Moreover, in specifications where this dummy variable is statistically significant (column 4 in Table 2 and column 5 in Table 3), the sign of the coefficient is positive. In other words, my empirical results indicate that if third parties have any effect on pre-trial negotiations, it is an increase

in the likelihood of out-of-court settlement.

While I do not find strong empirical evidence regarding the influence of third parties in pre-trial negotiations, I do find evidence regarding the effect of multiplicity of complainants in the outcome of negotiations. As can be seen in Tables 2-5, the coefficient of the multiple-complainant dummy is negative and statistically significant in almost all specifications. The existence of multiple complainants may reduce the likelihood of settlement by increasing the stake at dispute. However, this result is robust even if we control for measures of the stake at dispute such as the disputed trade volume between the defendant and the complaining parties.

Retaliation capacity

The Dispute Settlement Process of the WTO does not provide any external enforcement of the agreement. Instead the system relies on the retaliatory power of the injured countries against the offending countries to enforce trade agreements. Therefore, the retaliatory capacity of the complaining parties may influence the outcome of the pre-trial negotiations. Retaliatory actions are normally in the form of import restrictions in the injured country against the products from the offending country. Thus, the volume of export from the defending country to the complaining countries can be used as a measure of the complainants' retaliation capacity.

My empirical observation suggests that total volume of exports from the defending country to the complaining countries has a positive effect on the likelihood of settlement. In other words, when the threat of retaliation is more serious a settlement is more likely. It might indicate the fact that a defending country is more willing to give concessions when the prospect of retaliations is stronger.[4]

[4]My study, however, does not provide direct support for this hypothesis since I do not have information

Imports from the rest of the world: the terms-of-trade argument and the effect of nondiscrimination clause

My empirical observation suggests that the defending country's import in the disputed sector from third parties has also a significant effect on the likelihood of pre-trial settlement. In most of the specifications, the coefficient of this variable is positive and statistically significant. That is, while the volume of the defendant's imports from the complaining countries has a negative effect on the likelihood of settlement, its volume of imports from the rest of the world (ROW) is positively correlated with the probability of pre-trial settlement.

There are two potential channels through which the defendant's volume of imports from the ROW can affect the likelihood of settlement. First, consider a three-country world, with countries labeled as D (for defendant), C (for complainant) and ROW (for rest of the world), in which D imports a particular product from C and ROW. Suppose that D imposes a tariff on imports from C while it maintains free trade with the ROW (i.e., D discriminates against C). D can gain from the tariffs imposed on the imports from C by improving its terms of trade. However, it can be shown that D's terms-of-trade gains are diluted if imports from the ROW picks up in response to a reduction in imports from C. In other words, a defending country's stake at dispute is inversely related to its volume of imports in the disputed sector from the rest of the world. Therefore, the positive coefficient of this variable is consistent with Hypothesis 1. Moreover, this observation is consistent with the findings of Bagwell and Staiger (2006) that trade negotiators are concerned with the terms-of-trade externality of trade policies.

regarding the level of concessions offered in pre-trial negotitations. Bown (2004) uses the increase in the exports from the complaining country to the defending country in the disputed sector as a measure of concessions given by the defending country, and shows that this measure is positively correlated with a measure of retaliatory capacity of the complaining country. In another paper (Bown 2004) he shows that power consideration also affects the countries' decision to choose from different types of protectionist poslicies.

Now consider a case where D imposes a non-discriminatory trade barrier against imports from all foreign countries, i.e., C and ROW, but only C challenges the policy through a formal WTO dispute. The countries in the ROW may not want to initiate a dispute due to high costs of negotiations or their low individual stake at dispute.[5] However, once the dispute panel rules against the disputed action, all affected countries, including those in the ROW, will also benefit from the ruling. This is because a policy adjustment in the defending country must conform to the Most Favored Nation (MFN) clause.

As a result of the MFN clause, the cost to the defending party of losing in the court is potentially much larger than the cost of compensating the complaining party. Therefore, a defending party has more incentive to settle without a formal trial in order to avoid attracting more interested parties to the dispute. This incentive to settle is stronger, the larger is the defending country's volume of import in the disputed sector from the ROW.

Conclusion

In this chapter I tested some of the empirical predictions of the dispute settlement models introduced in Chapter IV. It is empirically verified that settlement likelihood is positively correlated with the litigation costs of the disputing parties, and negatively correlated with measures of stake at dispute. In this empirical work I focused on the determinants of early settlements, while interesting questions regarding the policy adjustments as a result of settlement negotiations remain unexplored in this paper. Nevertheless, Bown (2004b) and Busch and Reinhardt (2003), provide interesting empirical observations regarding the effect of pursuing a dispute in the WTO on trade policies of the defending party.

[5] Another reason that may prevent a country from filing a dispute is its lack of information regarding the alleged violations of the defending party. Daughety and Reinganum (1999) provide a model of settlement bargaining in which litigation can attract more plaintiffs by publicizing the information regarding the culpability of the defendant.

Table 3. Estimated Parameters for the Semi-Structural Model using Beta Distribution

Beta Distribution (semi-structural)	1	2	3	4	5	6
	GDP used to construct a measure of litigation costs			Mission-size dummy used to construct a measure of litigation costs		
Litigation costs of the defending party (β1)	0.136	0.342	0.331	0.153	0.098	0.103
	(0.058)**	(0.096)***	(0.097)***	(0.045)***	(0.037)***	(0.037)***
Litigation costs of the complaining party (β2)	0.106	0.205	0.218	0.119	0.061	0.064
	(0.056)*	(0.079)***	(0.081)***	(0.045)***	0.038	(0.038)*
Total exports from Complainants to Defendant in the disputed sector		-0.073	-0.075		-0.031	-0.031
		(0.015)***	(0.016)***		(0.016)*	(0.016)*
Defendant's imports from the ROW in the disputed sector		0.068	0.068		0.021	0.02
		(0.010)***	(0.010)***		(0.010)**	(0.009)**
Total exports from Defendant to the Complainants		0.056	0.056		0.017	0.016
		(0.023)**	(0.023)**		0.011	0.011
Multiple Complainant Dummy	-0.148	-0.094	-0.101	-0.126	-0.139	-0.152
	(0.058)**	0.064	0.065	(0.052)**	(0.062)**	(0.062)**
Third-party Dummy	0.068		0.072	0.141		0.088
	0.083		0.085	(0.081)*		0.084
Constant	-1.195	-4.202	-4.189			
	(0.508)**	(1.349)***	(1.359)***			
Observations	174	173	173	174	173	173
log likelihood	-108.32	-104.38	-103.99	-114.14	-106.71	-106.09
Probability of the rejection of Hypothesis 3 ((β1>β2)	0.359	0.052	0.101	0.348	0.285	0.273

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4. Maximum Likelihood Estimation Results using Beta Distribution (Non-Structural)

Beta Distribution (non-structural)	1	2	3	4	5	6	7	8
	GDP used to construct a measure of litigation costs			Mission-size dummy used to construct a measure of litigation costs			No cost measure included	
Litigation costs of the defending party	0.112	0.117	0.238	0.155	0.166	0.12		
	(0.041)***	(0.041)***	(0.081)***	(0.021)***	(0.022)***	(0.026)***		
Litigation costs of the complaining party	0.063	0.072	0.1	0.138	0.137	0.062		
	(0.038)*	(0.038)*	(0.058)*	(0.022)***	(0.022)***	(0.026)**		
Total exports from Complainants to Defendant in the disputed sector			-0.04			-0.034	-0.039	-0.035
			(0.015)***			(0.014)**	(0.015)***	(0.015)**
Defendant's imports from the ROW in the disputed sector			0.036			0.027	0.019	0.018
			(0.010)***			(0.009)***	(0.009)**	(0.009)**
Total exports from Defendant to the Complainants			0.028			0.021	-0.013	-0.017
			0.021			(0.009)**	0.012	0.012
Multiple Complainant Dummy		-0.159	-0.153		-0.14	-0.179		-0.131
		(0.058)***	(0.061)**		(0.043)***	(0.060)***		(0.059)**
Third-party Dummy		0.068	0.051		0.148	0.102		
		0.07	0.073		(0.051)***	0.072		
Constant	-0.627	-0.691	-2.151				0.965	1.023
	(0.312)**	(0.326)**	(1.140)*				(0.145)***	(0.151)***
Observations	174	174	173	174	174	173	173	173
log likelihood	-111.34	-107.65	-100.69	-133.98	-127.35	-104.53	-108.13	-105.64
Probability of the rejection of Hypothesis 3	0.224	0.24	0.029	0.337	0.245	0.1	N/A	N/A

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5. Probit Estimation Results

Probit	1	2	3	4	5	6	7	8
	GDP used to construct a measure of litigation costs			Mission-size dummy used to construct a measure of litigation costs			No cost measure included	
Litigation costs of the defending party	0.454	0.941	0.968	0.306	0.251	0.294		
	(0.170)***	(0.331)***	(0.338)***	(0.111)***	(0.101)**	(0.145)**		
Litigation costs of the complaining party	0.274	0.426	0.411	0.192	0.079	0.067		
	(0.160)*	(0.246)*	(0.249)*	(0.111)*	0.106	0.152		
Total exports from Complainants to Defendant in the disputed sector		-0.167	-0.159		-0.151	-0.138	-0.147	-0.136
		(0.061)***	(0.062)**		(0.058)***	(0.060)**	(0.059)**	(0.060)**
Defendant's imports from the ROW in the disputed sector		0.14	0.145		0.088	0.09	0.07	0.071
		(0.044)***	(0.046)***		(0.035)**	(0.039)**	(0.035)**	(0.036)**
Total exports from Defendant to the Complainants		0.129	0.118		0.016	-0.009	-0.051	-0.065
		0.082	0.084		0.036	0.066	0.047	0.048
Multiple Complainant Dummy			-0.533	-0.71		-0.674		-0.514
			(0.237)**	(0.235)***		(0.245)***		(0.231)**
Third-party Dummy				0.385		0.366		
				0.281		0.287		
Constant	-4.708	-10.969	-10.898	-0.466		0.305	1.804	2.017
	(1.440)***	(4.703)**	(4.805)**	(0.259)*		1.296	(0.598)***	(0.614)***
Observations	174	173	173	174	173	173	173	173
log likelihood	-111.2	-103.91	-101.36	-108.13	-107.28	-103.13	-108.33	-105.83
Probability of the rejection of Hypothesis 3	0.239	0.038	0.029	0.25	0.166	0.107	N/A	N/A

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6. Logit Estimation Results

Logit	1	2	3	4	5	6	7	8
	GDP used to construct a measure of litigation costs			Mission-size dummy used to construct a measure of litigation costs			No cost measure included	
Litigation costs of the defending party	0.749	1.568	1.527	0.495	0.407	0.463		
	(0.285)***	(0.562)***	(0.574)***	(0.186)***	(0.168)**	(0.169)***		
Litigation costs of the complaining party	0.462	0.738	0.72	0.312	0.124	0.282		
	(0.269)*	(0.421)*	(0.428)*	(0.185)*	0.175	(0.169)*		
Total exports from Complainants to Defendant in the disputed sector		-0.275	-0.262		-0.243	-0.062	-0.236	-0.222
		(0.102)***	(0.104)**		(0.096)**	(0.027)**	(0.096)**	(0.099)**
Defendant's imports from the ROW in the disputed sector		0.233	0.234		0.142		0.113	0.117
		(0.077)***	(0.081)***		(0.059)**		(0.058)*	(0.061)*
Total exports from Defendant to the Complainants		0.216	0.184		0.026		-0.084	-0.105
		0.136	0.14		0.059		0.077	0.079
Multiple Complainant Dummy			-0.917	-1.154		-1.104		-0.841
			(0.403)**	(0.390)***		(0.393)***		(0.378)**
Third-party Dummy			0.398	0.638		0.669		
			0.487	0.464		0.46		
Constant	-7.841	-18.527	-17.616	-0.758			2.92	3.273
	(2.476)***	(7.994)**	(8.114)**	(0.424)*			(0.995)***	(1.022)***
Observations	174	173	173	174	173	174	173	173
log likelihood	-111.17	-103.97	-101.24	-113.09	-107.42	-107.23	-108.43	-105.91
Probability of the rejection of Hypothesis 3	0.244	0.043	0.056	0.342	0.169	0.261	N/A	N/A

Standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

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