Third-Party-Assisted Renegotiation of Trade Agreements*

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(Prelimanary and Incomplete)†

Abstract

I study the design and implementation of trade agreements under the assumption that governments have private information about the fluctuating political pressure they face from domestic interest groups to restrict trade. The Dispute Settlement Body (DSB) of the World Trade Organization is modeled as an impartial entity that provides 'recommendations' for the resolution of disputes based on its imperfect observation of the state of the world. The novel feature of my approach is to model post-ruling bargaining between the parties, who regard the recommendations of the DSB as a reference point. The recommendations of the DSB have the effect of framing the renegotiations in favor of the party who is more likely to have a legitimate claim. This renegotiation framing affects the efficiency of the bargaining outcome by reducing the cost of providing incentive for revelation of private information. The model has rich predictions regarding the behavior of the disputing parties and the ruling pattern of the DSB. In particular, noncompliance with the DSB rulings emerges as a potential outcome on the equilibrium path. Moreover, the model predicts that the rulings

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of the DSB are always at least partly against the defending party, which may explain the observed pro-trade bias in the DSB rulings.

1 Introduction

What is the role of a court in international trade institutions? This issue has become one of the most debated topics in the economic and legal studies of trade agreements in recent years. The Dispute Settlement Body (DSB) of the World Trade Organization (WTO), for example, is a quasi-legal system of dispute resolution that features a 'dispute panel' and an 'appellate body'. However, whether an international tribunal like the DSB can provide any external power to enforce agreements among sovereign governments is questionable. In fact, an important feature of the WTO's legal system is that the disputing parties are not bound to comply with the rulings of the DSB.[1]

For example, in the Hormones dispute between the European Communities (as defendant) and the United States and Canada (as complainants), the Dispute Panel found that the EC ban on imports of meat and meat products from cattle treated with some specific hormones for growth promotion purposes was inconsistent with EC's obligations under the Agreement on Sanitary and Phytosanitary Measures (SPS Agreement). Nevertheless, the European Communities declined to comply with the DSB's ruling and continued its ban on such imports for several years (WTO 1999).

The increased use of the WTO legal system, despite the non-binding nature of its rulings, and the potential influence of this system on the ex ante negotiation of trade agreements makes it increasingly important to understand the ways in which this system of dispute settlement affects the outcomes. In this paper, I take a popular view that the dispute settlement process of the WTO is effectively a "renegotiation" process in which governments try to adjust their trade

[1] The text of the WTO dispute Settlement Understanding considers the rulings of the DSB as binding, but as will be discussed later noncompliance by a party leads only to the re-establishment of the balance of economic concessions between the parties.

policies to reflect changes in political and economic situations. My contribution to this ongoing debate is the modeling of trade renegotiations in the presence of the DSB as a non-binding arbitration system.

I study the design and implementation of trade agreements under the assumption that governments have private information about the fluctuating political pressure they face from domestic interest groups to restrict trade. A dispute naturally arises if there are contingencies that are not symmetrically observable to the public. Allowing for renegotiation of the agreement is then interpreted as a means to settle potential disputes through an ex-post bargaining process. I model the Dispute Settlement Body (DSB) of the WTO as an impartial entity that provides 'recommendations' for the resolution of disputes based on its imperfect observation of the state of the world. No enforcement power or informational advantage is assumed on behalf of the DSB. The novel feature of my approach is to model post-ruling bargaining between the parties, who regard the recommendations of the DSB as a reference point. The recommendations of the DSB have the effect of framing the renegotiations in favor of the party who is more likely to have a legitimate claim. This renegotiation framing affects the efficiency of the bargaining outcome by reducing the cost of providing incentive for revelation of private information.

This interpretation of the DSB fits quite well with the role that has been assigned to the dispute panels in the WTO. Article 11 of the Dispute Settlement Understanding gives the dispute panels the authority to make "objective assessment of the facts" of the dispute case concerned and to make "recommendations" to help the disputing parties to develop a mutually satisfactory solution (WTO 1995). This implies that the rulings of the DSB are not binding in the sense that a convicted party can decline to comply with the rulings. The rulings of the DSB, however, change the prospect of any negotiations by altering the outside options of the parties. In particular, in the event that the recommendations and rulings of the DSB are not implemented within a reasonable period of time, the complaining party will be authorized to suspend the application of concessions or other obligations under the covered agreements on a discriminatory basis vis-à-vis the defending member. Therefore, in a post-ruling bargaining between the disputing parties, the

winning party will be able to bargain more aggressively and increase its share of the pie.

Post-ruling negotiation is a common practice in the dispute settlement process of the WTO. An example of post-ruling negotiation is provided by the Canada-Dairy dispute, in which United States and New Zealand accused Canada of taking illegal measures regarding the importation of milk and the exportation of dairy products. In this case the DSB's ruling against Canada was followed by a long period of negotiations between disputing parties. After more than three years of negotiations, the parties achieved a mutually accepted solution that was different from the original ruling of the DSB (WTO 2003).

Similarly, in the Hormones Dispute mentioned above, EC's noncompliance with the DSB's ruling prompted a bargaining process between the disputing parties to determine the extent of sanctions to be imposed on EC by the complaining countries. This dispute was finally concluded after the Unites States and Canada were authorized to retaliate against EC by suspending their concessions to EC to an amount equal to US$116.8 million and CDN$11.3 million per year, respectively (WTO 1999).

Another type of post-ruling bargaining between disputing parties is on the "reasonable period of time" that the defending party will be given to implement the recommendations of the DSB. Rather than requiring immediate implementation of the recommendations, the Dispute Settlement Understanding allows a convicted party to negotiate a reasonable period of time to implement the recommendations of the DSB. This can be interpreted as an indirect way to allow for partial compliance with the recommendations.[2]

I follow a common approach in the bargaining literature (for example, Samuelson 1984) in modeling the bargaining game as an incentive-compatible direct revelation mechanism. The underlying game can be summarized as follows. Before the realization of the state of the world, governments commit to a set of bargaining rules and procedures. Next, the state of the world is

[2] Consider, for example, disputes regarding safeguard measures. A safeguard measure is a trade barrier that is proposed for a specific period of time. Two aspects of a propesed safeguard that determine its benefits to the importing country, as well as its harm to the exporting countries, are the size of the barrier and the lenght of time that this barrier will be in place. Therefore, bargaining over a reseanoable period of time to comply with the DSB ruling is effectively the same thing as bargaining over the size of the barrier itself.

realized and the importing country observes it privately. Then the DSB conducts an investigation and obtains a noisy signal about the realized state of the world, and announces it publicly. After the public announcement (i.e., ruling) of the DSB, parties enter a bargaining game that is conducted based on the agreed-upon bargaining rules.[3]

An interesting feature of this model is that noncompliance with the DSB rulings emerges as an on-the-equilibrium-path outcome. Moreover, the model predicts that the rulings of the DSB are always at least partly against the defending party, which may explain the observed pro-trade bias in the DSB rulings.

After reviewing the relevant literature in the following Subsection, in Section 2 I introduce the economic and political environment in which trade agreements are negotiated and implemented. In Section 3, I introduce a tariff bargaining game that is not assisted by a third party. In Section 4, I lay out a model of the DSB and post-ruling renegotiation of trade agreements, and characterize the optimal direct revelation mechanism. In Section 5, I offer an alternative institution for dispute settlement that resembles the actual DSB while generating the same outcome as the optimal mechanism characterized in Section 4.

1.1 Literature Survey

Two recent papers that provide formal models of the Dispute Settlement Body (DSB) of the WTO are Beshkar (2007) and Maggi and Staiger (2008). These models investigate alternative roles that an international tribunal like the DSB can play. Both papers view the DSB as an arbitrator that '*imposes*' a settlement on the disputing parties with the objective to maximize the parties' joint payoff. This is in contrast to the approach that I take here in which I view the DSB's rulings as non-binding recommendations.

In Beshkar (2007), as in the current paper, the governments may disagree on the nature of the

[3] It is assumed that the result of the investigation is imperfectly correlated with the true state of the world and, moreover, these findings are privately observed by the investigator. Therefore, the advantage of the DSB over the uninformed negotiator in conducting the investigation is its impartiality that puts it in an appropriate position to announce its findings truthfully.

prevailing contingency due to their asymmetric information of the state of the world. The DSB resolves the dispute by determining the trade policies to be taken by the parties as a function of the parties' announcements and its privately-observed signal of the state of the world.

Maggi and Staiger (2008) consider a costly contracting setting that leads the governments to write incomplete contracts and provide the DSB with a mandate to fill the gaps when disputes arise. By writing an incomplete contract, the governments can avoid the cost of identifying all potential future contingencies. If countries find themselves in a contingency that is not specified by their ex ante contract, the DSB will fill the gap in the contract by determining a trade policy to be adopted by the parties. In making its policy determination, the DSB's objective is to maximize the expected joint payoff of the governments, given its best guess about the governments' preferences.

These models assume that the parties cannot seek a settlement that differs from the DSB's determination even if they can mutually improve their welfare through ex post negotiations. Although these models provide important insights about the role of the DSB, they cannot explain some observed facts about the dispute settlement in the WTO, including the post-DSB negotiations between parties and noncompliance by some convicted parties, some examples of which were discussed above.

Several models explore the problem of binding arbitration, while in this paper my objective is to explain the role of institutions that offer non-binding arbitration. For example, Myerson (1979, 1991) provides a model of binding arbitration in which negotiating parties communicate their private information to the arbitrator confidentially and non-cooperatively, and then the arbitrator selects a choice (e.g., a settlement package) using the information provided by the parties. The problem of the arbitrator, therefore, is to design a mechanism that induces the parties to reveal their private information truthfully to the arbitrator.

Farber (1980) and Gibbons (1988) analyze binding arbitration in case of Final-Offer Arbitration (FOA), which is a specific dispute settlement institution suggested by Stevens (1966). FOA is a form of binding arbitration under which each party submits a proposed award to the

arbitrator, and the arbitrator chooses one award without modification. This approach gives each party an incentive to offer a reasonable proposal in the hope that it will be accepted by the arbitrator. It is worth noting that these models consider a zero-sum bargaining situation. As a result of this assumption all arbitration outcomes are equally efficient and differ only in distributional consequences. The arbitrator's objective in these models is to be "fair", while the fair outcome is an uncertain variable regarding which parties and the arbitrator have asymmetric information. This assumption is obviously not satisfied in a wide range of real world situations, including the case of tariff bargaining.[4] The decision of the arbitrator in these situations has both distributional and efficiency consequences.

Nevertheless, the focus of these models on fairness rather than efficiency may be justified using the argument of the Coase Theorem that parties can reach an efficient outcome through independent bargaining as long as the bargaining process is not hindered by transaction costs or other impediments. In the case of trade agreements, an important limitation in the bargaining process is the political cost of monetary transfers that leads governments to bargain almost exclusively over policy adjustments. In contrast to monetary transfer, policy adjustment is not a zero-sum transaction, which makes arbitration outcomes efficiency-relevant. Therefore, in designing a dispute settlement mechanism in cases where Coase Theorem does not apply, it is not appropriate to focus solely on a notion of fairness.

The dispute settlement mechanism of the WTO is apparently very different from FOA. However, FOA might be a useful settlement mechanism when parties are trying to determine the size of concessions to be suspended by exporting countries in cases of noncompliance.

[4] In general, the choice of settlement outcome in disputes over future actions affects efficiency. For example consider a dispute regarding the size of a relationship-specific investment that should be undertaken by one party. In this case any decision by the arbitrator has efficiency consequences.

2 Basic setup

The setup that I use here is similar to Beshkar (2007, 2008), which is based on a simple trade model frequently used in the literature (see, for example, Bagwell and Staiger 2005). Consider a pair of distinct goods x and y with demand functions in the home country (no *) and the foreign country (*) given by:

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

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

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

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.

2.1 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, $W(\tau, \tau^*; \theta) = u(\tau; \theta) + v(\tau^*)$ represents the political welfare of the home government, which is additively separable in functions of the home and foreign tariffs. The foreign country's welfare, $W^*(\tau^*, \tau; \theta^*)$, can be defined in a similar fashion. It can be verified that for sufficiently low tariffs, the home government's welfare is increasing in the home tariff and decreasing in the foreign tariff, i.e., $\partial W(\tau, \tau^*; \theta) / \partial \tau > 0$ and $\partial W(\tau, \tau^*; \theta) / \partial \tau^* < 0$.

2.2 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, denoted by τ, and the foreign country's retaliatory tariffs, denoted by r, that are implemented in the low-political pressure sector.

3 Tariff Bargaining under Asymmetric Information (No DSB)

In this section I consider a tariff bargaining game between the home country, who may face a low or high political pressure, and the foreign country who faces a low political pressure. At the beginning of a given period, the political pressure is realized in the home country and is privately observed by the home government. Then countries enter a bargaining game to negotiate a pair of tariffs, (τ, r), to be adopted by the home and the foreign countries, respectively. This is a bargaining game under incomplete information that can be recast as a direct revelation game (see, Samuelson 1984). In this case, the government of the home country holds private information. Thus, in the revelation game the home government announces its political pressure and it directly determines the tariff rates of the home and the foreign country. The objective of an optimal mechanism is to maximize the expected welfare of the countries, while it gives the home country proper incentive to announce its political pressure truthfully. Denoting the countries' tariffs as a function of the home announcement by $\tau(\theta)$ and $r(\theta)$, respectively, the incentive compatibility constraints are given by

$$W\left(\tau\left(\overline{\theta}\right), r\left(\overline{\theta}\right); \overline{\theta}\right) \geq W\left(\tau\left(\underline{\theta}\right), r\left(\underline{\theta}\right); \overline{\theta}\right), \tag{3}$$

and

$$W\left(\tau\left(\underline{\theta}\right), r\left(\underline{\theta}\right); \underline{\theta}\right) \geq W\left(\tau\left(\overline{\theta}\right), r\left(\overline{\theta}\right); \underline{\theta}\right). \tag{4}$$

The first inequality above implies that the home government is better off by announcing a high political pressure, when it actually faces a high pressure. Similarly, the second inequality ensures the home government's truthfulness at the time of a low political pressure.

The expected joint welfare of the governments is given by

$$\begin{aligned} &\rho\left[W\left(\tau\left(\overline{\theta}\right),r\left(\overline{\theta}\right);\overline{\theta}\right)+W^{*}\left(r\left(\overline{\theta}\right),\tau\left(\overline{\theta}\right);\underline{\theta}\right)\right] \\ &+(1-\rho)\left[W\left(\tau\left(\underline{\theta}\right),r\left(\underline{\theta}\right);\underline{\theta}\right)+W^{*}\left(r\left(\underline{\theta}\right),\tau\left(\underline{\theta}\right);\underline{\theta}\right)\right] \end{aligned} \tag{5}$$

The first line of the above expression indicates the joint welfare of the governments when the home country faces a high political pressure, multiplied by the probability of a high political pressure in the home country. The second line gives the joint welfare when political pressure is low, multiplied by the probability of a low shock.

An optimal mechanism is one that maximizes the expected joint welfare of the governments, (5), subject to the incentive compatibility constraints (3) and (4) . The equilibrium of this game can be shown graphically using Figure (1). In this figure, points A and A' represent the first-best tariff pairs under low and high political pressures, respectively. The circular curves centered around A (A') are the joint political welfare contours when political pressure at home is low (high). The outcome of the bargaining game is given by points B and B'. The curve that goes through B and B' is one of the home country's welfare contours under low political pressure. This implies that when political pressure in the home country is low, the home government is indifferent between B and B'. Therefore, the tariff pair given by B will be implemented when the home country is facing low political pressure. On the other hand, B' will be the tariff pair implemented under high political pressure, as under such conditions the home government will be strictly better off at point B'.

As high shocks become more likely, i.e., if ρ goes up, the curve B-B' shifts to down and right. As a result of this shift, the bargaining outcome under high political pressure becomes more efficient (since B' gets closer to A'), while the bargaining outcome under low pressure becomes less efficient (since B gets farther away from A). In an extreme case where $\rho = 1$, B' coincides with A', meaning that the bargaining outcome under high political pressure coincides with the first-best outcome. That is because when $\rho = 1$, there is no asymmetric information and the bargaining outcome must be efficient. Similarly, when $\rho = 0$, B coincides with A.

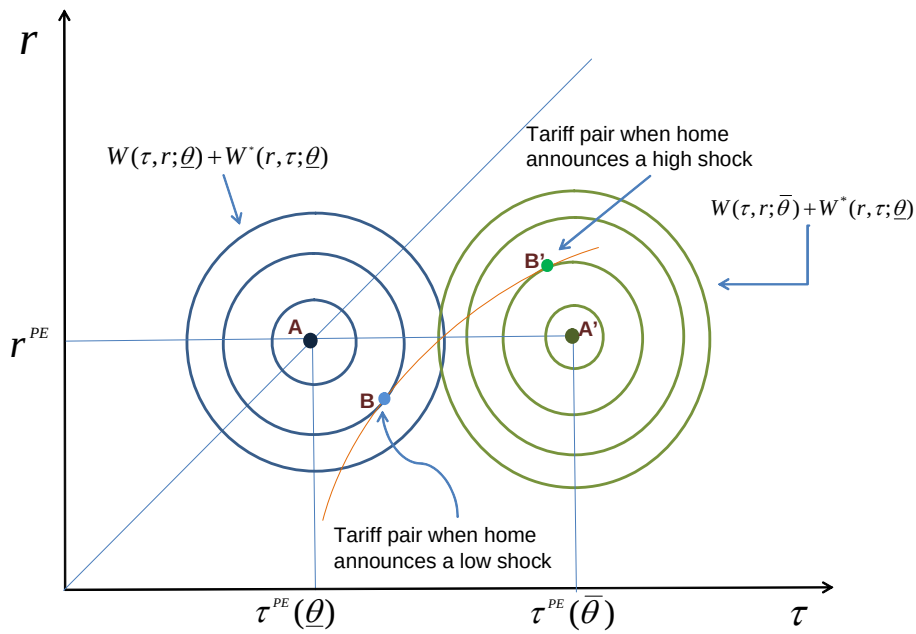

Figure 1: Equilibrium of the bargaining game (B and B') when there is no DSB.

4 Tariff Bargaining in the Presence of the WTO Court

The DSB can conduct an investigation and obtain a noisy signal about the state of the world in the home country. The signal obtained through investigation is correlated with the true state of the world. Formally, I assume that the signal observed by the DSB, θ_{DSB}, matches the true state of the world with probability γ, i.e.,

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

After the DSB's announcement regarding the state of the world, the two parties enter a bargaining game to renegotiate their tariffs. As before, I consider the problem of designing a direct revelation bargaining mechanism. The equilibrium of this game is summarized by two entries, namely, $\tau\left(\theta_d,\theta_{DSB}\right)$ and $r\left(\theta_d,\theta_{DSB}\right)$, where θ_d is the defending party's report of its political pressure and θ_{DSB} is the signal observed and announced by the DSB. Note that the DSB's announcement together with the defending party's announcement determine the equilibrium of the bargaining game. (The defending party is the home country in this setup).

There are four incentive compatibility constraints that must be satisfied. First, suppose that the home country is facing a high political pressure and the DSB has also observed a signal of high political pressure, i.e., $\theta_{DSB} = \overline{\theta}$. The home government will report its type truthfully if and only if:

$$W\left(\tau\left(\overline{\theta},\overline{\theta}\right), r\left(\overline{\theta},\overline{\theta}\right);\overline{\theta}\right) \geq W\left(\tau\left(\underline{\theta},\overline{\theta}\right), r\left(\underline{\theta},\overline{\theta}\right);\overline{\theta}\right). \tag{6}$$

If the true state of the world is $\theta = \underline{\theta}$, but the DSB's signal shows a high political pressure, the home government will have the incentive to report a low political pressure if and only if:

$$W\left(\tau\left(\underline{\theta},\overline{\theta}\right), r\left(\underline{\theta},\overline{\theta}\right);\underline{\theta}\right) \geq W\left(\tau\left(\overline{\theta},\overline{\theta}\right), r\left(\overline{\theta},\overline{\theta}\right);\underline{\theta}\right). \tag{7}$$

The remaining two incentive compatibility constraints are for situations where the DSB receives a signal of low political pressure. If this signal matches the true state of the world, then the incentive compatibility constraint is given by

$$W\left(\tau\left(\underline{\theta},\underline{\theta}\right), r\left(\underline{\theta},\underline{\theta}\right);\underline{\theta}\right) \geq W\left(\tau\left(\overline{\theta},\underline{\theta}\right), r\left(\overline{\theta},\underline{\theta}\right);\underline{\theta}\right). \tag{8}$$

Finally, if the DSB's signal of low political pressure differs from the true state of the world, the home government has the incentive to report its high political pressure truthfully if and only if

$$W\left(\tau\left(\overline{\theta},\underline{\theta}\right), r\left(\overline{\theta},\underline{\theta}\right);\overline{\theta}\right) \geq W\left(\tau\left(\underline{\theta},\underline{\theta}\right), r\left(\underline{\theta},\underline{\theta}\right);\overline{\theta}\right). \tag{9}$$

The expected joint welfare of the governments, which will be used as to measure the mechanism's performance, can be introduced as follows. First, consider a situation where the home country is under high political pressure. With probability γ, the DSB observes a signal of high political pressure and with probability $1-\gamma$, the DSB observes a low-pressure signal. Thus,

given high political pressure in the home country, the expected joint welfare is

$$\begin{aligned}&\gamma\left[W\left(\tau\left(\overline{\theta},\overline{\theta}\right),r\left(\overline{\theta},\overline{\theta}\right);\overline{\theta}\right)+W^{*}\left(r\left(\overline{\theta},\overline{\theta}\right),\tau\left(\overline{\theta},\overline{\theta}\right);\underline{\theta}\right)\right]\\&+(1-\gamma)\left[W\left(\tau\left(\overline{\theta},\underline{\theta}\right),r\left(\overline{\theta},\underline{\theta}\right);\overline{\theta}\right)+W^{*}\left(r\left(\overline{\theta},\underline{\theta}\right),\tau\left(\overline{\theta},\underline{\theta}\right);\underline{\theta}\right)\right].\end{aligned}$$

Now consider the case where the home government is facing low political pressure. The DSB's signal in this case will be a low political pressure with probability γ, and a high political pressure with probability $1-\gamma$. Therefore the expected joint welfare under low political pressure is

$$\begin{aligned}&\gamma\left[W\left(\tau\left(\underline{\theta},\underline{\theta}\right),r\left(\underline{\theta},\underline{\theta}\right);\underline{\theta}\right)+W^{*}\left(r\left(\underline{\theta},\underline{\theta}\right),\tau\left(\underline{\theta},\underline{\theta}\right);\underline{\theta}\right)\right]\\&+(1-\gamma)\left[W\left(\tau\left(\underline{\theta},\overline{\theta}\right),r\left(\underline{\theta},\overline{\theta}\right);\underline{\theta}\right)+W^{*}\left(r\left(\underline{\theta},\overline{\theta}\right),\tau\left(\underline{\theta},\overline{\theta}\right);\underline{\theta}\right)\right].\end{aligned}$$

The first case above, i.e., a high political pressure, is realized with probability ρ and the second case occurs with probability $1-\rho$. Thus, ex ante, that is, before the realization of the state of the world, the expected joint welfare of the governments is given by

$$\begin{aligned}&\rho\gamma\left[W\left(\tau\left(\overline{\theta},\overline{\theta}\right),r\left(\overline{\theta},\overline{\theta}\right);\overline{\theta}\right)+W^{*}\left(r\left(\overline{\theta},\overline{\theta}\right),\tau\left(\overline{\theta},\overline{\theta}\right);\underline{\theta}\right)\right]\\&+\rho(1-\gamma)\left[W\left(\tau\left(\overline{\theta},\underline{\theta}\right),r\left(\overline{\theta},\underline{\theta}\right);\overline{\theta}\right)+W^{*}\left(r\left(\overline{\theta},\underline{\theta}\right),\tau\left(\overline{\theta},\underline{\theta}\right);\underline{\theta}\right)\right]\\&+(1-\rho)(1-\gamma)\left[W\left(\tau\left(\underline{\theta},\overline{\theta}\right),r\left(\underline{\theta},\overline{\theta}\right);\underline{\theta}\right)+W^{*}\left(r\left(\underline{\theta},\overline{\theta}\right),\tau\left(\underline{\theta},\overline{\theta}\right);\underline{\theta}\right)\right]\\&+(1-\rho)\gamma\left[W\left(\tau\left(\underline{\theta},\underline{\theta}\right),r\left(\underline{\theta},\underline{\theta}\right);\underline{\theta}\right)+W^{*}\left(r\left(\underline{\theta},\underline{\theta}\right),\tau\left(\underline{\theta},\underline{\theta}\right);\underline{\theta}\right)\right].\end{aligned}\tag{10}$$

The problem of designing a direct revelation bargaining mechanism will be to maximize (10) subject to incentive compatibility constraints $(6-9)$. The equilibrium of this bargaining game can be demonstrated by four tariff pairs, namely, C, C', D, and D', depicted in Figure (2). The curves going through C-C' and D-D' are two welfare contours of the home country under low political pressure.

If $\theta_{DSB}=\overline{\theta}$, then the equilibrium tariff pair is either C or C', depending on the home country's true state of the world. Under low political pressure, the home country will be indifferent between C and C', and I assume that it will choose C to maximize the joint welfare of the governments.

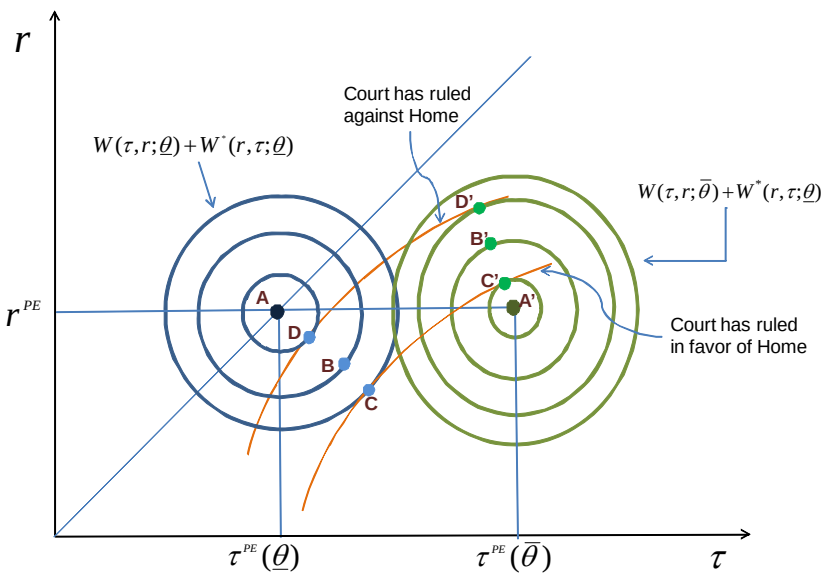

Figure 2: Equilibrium of the DSB-assisted bargaining game (C, C', D, and D').

Under high pressure, however, the home country will be strictly better off at C' than C, so it will announce a high political pressure and C' will be the outcome of the bargaining game.

If the DSB observes a low pressure signal, i.e., $\theta_{DSB} = \underline{\theta}$, then the equilibrium tariff pair is either D or D'. Similar to the previous case, the home country is indifferent between D and D' when it faces low political pressure and I assume it will choose D so that the joint welfare is maximized. Moreover, if the home country faces high pressure, it will be strictly better off by announcing a high pressure that results in adopting tariff pair D'.

Note that the DSB's announcement has the effect of 'framing the renegotiations'. If the DSB rules in favor of the home country by stating that the home country is facing high political pressure, the subsequent bargaining game between the governments is to mutually agree on either C or C'. In contrast, if the DSB announces a low political pressure in the home country, the governments bargain over D and D'. Loosely speaking, the defending party (here the home country) will have the upper hand in renegotiations if the DSB issues an opinion favorable to the defendant. Similarly, if the DSB's opinion is against the defending party, the complaining party will be in a better bargaining position.

To understand the source of welfare gain from introducing the DSB, compare the equilibrium

outcomes when there is no DSB, given by B and B', and the equilibrium outcomes under the DSB, given by C, C', D, and D'. First, consider a situation where the home country is facing a high political pressure. In this case, bargaining without the help of the DSB results in tariff pair B'. But in the presence of the DSB, there is a high chance (i.e., $\gamma > 1/2$) that C' will be chosen by parties, which is associated with a higher joint welfare. The downside of the bargaining under the DSB is that with a low probability $(1-\gamma)$, the DSB may make a wrong judgment that results in the less efficient tariff pair D'. But the expected joint welfare will be higher under the DSB as long as the DSB's signal is informative (i.e., $\gamma > 1/2$). The same story is true when the home country is facing a low political pressure. In that case, in absence of the DSB, the bargaining outcome is given by B, while in the presence of the DSB the bargaining outcome may be at D with probability $\gamma > 1/2$.

4.1 Comparative Statics

As the DSB's signal becomes more accurate, that is when γ becomes closer to 1, C-C' will shift to the right and down and D-D' shifts to the left and up. That is because as the DSB becomes more accurate in observing the true state of the world, the cost of making a wrong judgment becomes less of a concern and the DSB can be more aggressive in its rulings in favor or against the home country. In the extreme case of $\gamma = 1$, D will coincide with A, while C' will coincide with A', meaning that bargaining results in the first-best outcome.

For a given value of γ, an increase in ρ moves both C-C' and D-D' to the right and down. The shift of D-D' to the right and down reflects the fact that when a high pressure is more likely, the DSB wants to reduce the cost of wrong rulings when the true pressure is high. Moreover, C-C' shifts in the same direction because the probability of low pressure is now smaller and the expected cost of a wrong judgment when a high pressure signal is observed is reduced. When $\rho = 1$, there will be no asymmetric information and A', C', and D' will coincide.

5 Implementation of the Optimal Mechanism

The previous section laid out a 'direct' revelation mechanism in which the bargaining outcome is uniquely determined based on the defending party's announcement of its private type. As is well-known in the mechanism design literature, the outcome of a direct revelation mechanism may be obtained through other institutional designs. My objective in this section is to offer an institutional design that resembles the actual dispute settlement process of the WTO while replicating the same outcome as the direct mechanism found above.

Under the direct mechanism of Section 4, the defending country has to choose one of the two tariff pairs that are recommended by the DSB. However, due to lack of enforcement power on behalf of the DSB, the defending party can choose any tariff that it deems necessary and the DSB can only determine the maximum level of retaliation by the complaining party. It turns out that despite its lack of enforcement power, the dispute settlement process can be designed in a way that induces the defending country to choose, voluntarily, the second best outcome calculated in Section 4.

Consider two countries that have agreed on a pair of tariff bindings given by point D in Figure 3, which is a reproduction of Figure 2. For simplicity, suppose that when a country violates the tariff binding it sets a tariff rate equal to the politically efficient tariff under high political pressure, i.e., $\tau^{PE}\left(\overline{\theta}\right)$. In case of violation of tariff bindings, the DSB investigates the state of the world and recommends an adjustment in the defending country's trade policy. In particular, if the DSB receives a low-pressure signal, it will recommend the defending party to respect the negotiated tariff bindings and reduce its tariff from $\tau^{PE}\left(\overline{\theta}\right)$ to τ_L. If the defendant insists on the necessity of increased protection, then the complaining party will be authorized to retaliate according to Menu L. Menu L is the upper envelope of the home iso-welfare contours under low and high political pressures that go through point $D\prime$. Under this retaliation scheme, the home government would respect the recommendation of the DSB if it faces a low political pressure and will choose point $D\prime$ if it faces a high political pressure. Note that under Menu L the home government is indifferent between choosing the tariff rate associated with $D\prime$ or higher

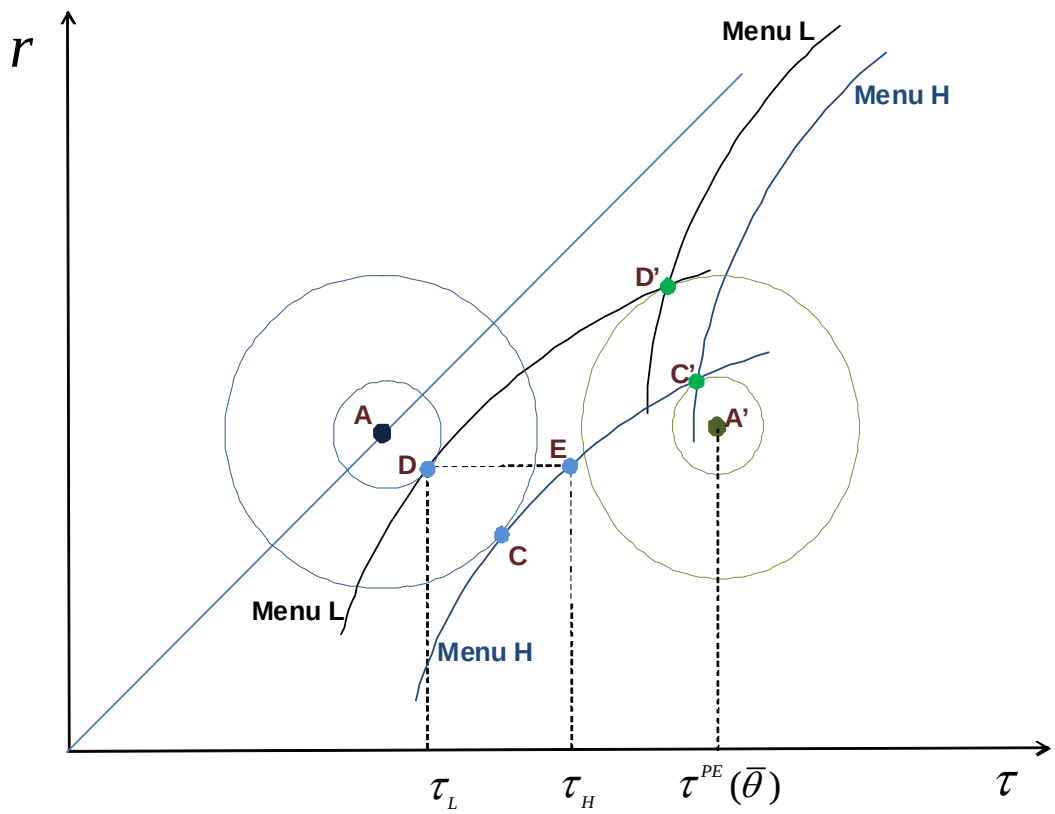

Figure 3: Tariff pair D (tariff pair E) is the reference point determined by the DSB when a low-pressure (high-pressure) signal is observed. Moreover, the renegotiation rule is given by the punishment menu L (menu H).

tariffs if it is under high pressure.

If the DSB observes a high political pressure, it will recommend the defending party to reduce its tariff from $\tau^{PE}\left(\overline{\theta}\right)$ to τ_H, where $\tau_L < \tau_H < \tau^{PE}\left(\overline{\theta}\right)$. In this case if the defending party wants to impose a tariff higher than τ_H, the complaining party will be authorized to retaliate using the retaliation menu H. As shown on Figure 3, Menu H is the upper envelope of the home iso-welfare contours under low and high political pressures that go through point $C\prime$. Moreover, Menu H provides a basis for the complaining party to offer a reduction in its own tariffs to induce the defending party to choose point C. The defendant will accept such an offer only if it is facing a low political pressure.

5.1 The DSB's Biased Ruling Pattern

An interesting feature of the optimal ruling decision presented above is that it always recommends the defending party to cut its tariff rate. In other words, according to this optimal ruling, the DSB should always rule against the defending party. Nevertheless, the extent of the recommended tariff cut depends on the assessment of the DSB from the state of the world.

The data on the official rulings of the DSB reveals a high disparity between the success rates of the complaining and defending parties. As reported by Colares (2009), the DSB rules against the defending party in more than 88 percent of cases where the subject of dispute is related to trade remedies.[5] In some categories of disputes this disparity is even more dramatic. For example, in litigations regarding the safeguard measures adopted to protect domestic industries against potentially harmful surge in imports, the DSB has always ruled against the defending party (Sykes 2003).

Some observers have interpreted this pro-trade ruling pattern as unsatisfactory. For example, Sykes (2003) and Grossman and Sykes (2007) argue that the DSB's interpretation of the WTO Agreement has made it increasingly difficult for the governments to resort to the escape clause, which frustrates the purpose of the WTO Agreement on Safeguards. Colares (2009) attributes the DSB's bias to the normative views of the individuals who are involved in the DSB and argues that the asymmetrical pattern of the DSB's ruling is "the result of a process of authoritative normative evolution (i.e., rule development) that has expressed itself with a tilt favoring complainants."

The results of this paper, however, suggest that the seemingly biased rulings of the DSB may be part of an optimal dispute settlement mechanism. In particular, if the DSB finds some evidence in favor of the defending party, it would be optimal to advise a tariff level that is lower than the disputed tariff but higher than the original bindings. Therefore, even in the case of a finding in favor of the defendant the DSB's ruling will seem anti-defendant as it recommends a cut in the level of protection afforded. Nevertheless, even a ruling that sanctions only a modest increase in protection helps the defending party to adopt a higher level of protection more cheaply. That is

[5] In non-trade remedy cases this rate is 83.33%.

because the DSB's verdict influences the final outcome by framing the subsequent negotiations in favor of the party who is more likely to have a legitimate claim. [[[Note to myself: look at cases where the DSB issued mixed rulings and see how the defendants took advantage of the positive part of the ruling in the subsequent negotiations]]]

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