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“Punishments and Dispute Settlement in Trade Agreement”

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Abstract: This paper interprets dispute settlement procedures and punishments as responses to the fact that trade agreements are incomplete contracts. I argue that this can explain prominent features and has implications for trade agreements. If no weight is given to the adjudication phase and if the degree of trade relatedness is known with certainty, the negotiated trade agreement will induce violation of the dispute settlement ruling and will deliver optimal liberalization and the optimal unilateral action. This suggests a central role, in multilateral trade liberalization, for an *implicit* agreement to allow countries to violate commitments if the violation implies no retreat from reciprocity. With the adjudication phase of concern the trade agreement will feature less liberalization. There is a presumption that the optimal trade agreement features commensurate punishment, or approximately commensurate punishment. The optimal trade agreement will likely induce abiding by the ruling when the negotiators attach more importance to the adjudication phase, and violating it when they attach less.

Keywords: incomplete contracts, reciprocal conflict, commensurate punishment, abidement property

JEL Classification Codes: F02, F13

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NEGOTIATED TRADE LIBERALIZATION under the auspices of the General Agreement on Tariffs and Trade (GATT) and the World Trade Organization (WTO) has been the big international economic story of the last sixty years. The GATT contained a dispute settlement procedure (DSP) which proved to be of only spasmodic significance. The Uruguay Round of multilateral trade negotiations, which established the WTO, significantly changed this procedure in the hopes of increasing its use. These hopes, at least, have not been frustrated.

But the recent vociferous (and sometimes violent) protests of environmentalists and social activists have been motivated to a significant (and perhaps dominant) degree by the decisions of the WTO DSP. This paper addresses, in such a context, the *economic* role of a system of punishments and dispute settlement.

I. Introduction

The GATT/WTO trade liberalization has had to deal with numerous trade disputes between individual countries, and the need to address these has produced a multilateral response. These disputes—within the GATT DSP, outside of it, or within the WTO DSP—and the response, can be summarized by the following stylized facts.

*I thank Arye Hillman and Henrik Horn for many useful exchanges.

- Punishments for alleged violations of past agreements have been *delayed*.

A decision to utilize the DSP is in practice a decision to delay punishment until that procedure has run its course. But, even when a DSP has not been utilized, countries convinced that their partners have violated trade agreements have consistently chosen to negotiate first rather than immediately to punish.

- Trade disputes are inherently *bilateral*, not multilateral.

The direct participants to trade disputes (whether two or several), and only they, initiate the disputes, force their timing, undertake negotiations to settle, and inflict any punishments. This is true even if the dispute is conducted within a multilaterally-established DSP.¹ Indeed, a major function of such a system is to help keep disputes bilateral by inducing aggrieved nations to go before a panel of experts rather than to seek allies among third countries. This is not necessarily a good thing: An insightful contribution by Maggi (1999) has shown that, in the presence of strategic complementarities across governments imposing tariffs on the same good, a multilateral DSP could enlarge aggregate punishment beyond that obtainable as a sum of bilateral punishments, allowing the negotiation of more multilateral liberalization.

- A formal DSP was created and continues to evolve.

The procedure was created years ago by the GATT, but the most important steps in this process were the Uruguay Round changes mentioned above, embodied in the Dispute Settlement Undertaking of that agreement.

- The DSP of the WTO has almost always decided in favor of the complainant (*C*) and, therefore, against the defendant (*D*).

Defendants clearly won only 2 of the first 44 decisions under the WTO system. Countries file complaints only when confident (usually rightly) that their complaints are justified, and not to acquire a “tough” reputation or to extract a nuisance value. This, too, has basically been the case when a DSP has not been utilized: Countries have provoked confrontations only when confident that concessions would result.

- Defendants have (much more often than not, at least since the institution of the WTO procedure) abided by the decisions of the DSP. But a number of important, highly

¹Third countries with a vital interest in a matter under dispute between two major countries sometimes sign on as participants (the banana war between the US and the EU being a notable example). This can be the easiest way for small countries to participate in the system.

visible, cases involving major countries, have resulted in prolonged violations of DSP decisions.

The decisions to abide have been widely viewed as evidence of the “success” of the WTO DSP (unwelcome success, in the opinion of many environmentalists and social activists), whereas the violations (notably the US–EU disputes on hormone-fed beef and bananas) have been viewed as “failures” that threaten the viability of a “rules-based” system.

- Punishments for alleged violations of past agreements have consistently been *commensurate with the violations* (i.e., tit-for-tat).

This has been true regardless of whether the punishments have been entirely unilateral or products of a dispute-settlement mechanism (such as that of the WTO).

These are very special properties. What is the role of such a system? The theoretical literature on trade policy commonly models implementation of a trade agreement as a repeated game. Each country weighs the short-term gain of deviating from its commitment against the longer-term loss implied by the future imposition of punishing trigger strategies by other countries. Thus the amount of liberalization obtainable is determined by the severity of credible punishments. It is natural to ask first whether the stylized facts described above can reasonably be thought of as corresponding to this theory.

There are difficulties with this. For one, negotiated tariff reductions do not in reality offer a country the opportunity to get a significant jump on its partners by acting first. In today’s world of instant communication and executive flexibility, it is not true that deviation today *must* be punished in the future: Deviation today *can* be punished today. Virtually no delay to retaliation means virtually no short-term gain from deviation, so any credible punishment becomes very powerful as a disincentive. (An inability to retaliate quickly was not always an unreasonable assumption: When James Madison introduced the first US tariff bill in Congress in April 1789, he hoped to have it apply to the spring imports shipped in ignorance of the tariff).

If, for whatever reason, retaliation is to be delayed, theory suggests that countries should embrace strong punishments to sustain the most desirable outcomes supportable by credible threats. But punishments for alleged violations of past agreements have consistently been commensurate with the violation. That countries choose to delay punishment when they don’t have to, and then, having so chosen, employ such anemic punishments doesn’t correspond well with the trigger strategy approach. The same is arguably also true of the conclusion that the pace of liberalization is determined by the severity of credible punishments. It appears to be determined instead by trade-offs between interests, within countries, affected differently by that liberalization.

This doesn't imply that the trigger strategy approach is irrelevant to reality, just that its domain of relevance does not include observed punishments and DSPs. Indeed, it suggests the following hypothesis: Post war liberalization has been sustained by the fear that the consequence of a break-down in international cooperation would be a repetition of the experience of the 1930s (Smoot-Hawley and all that), widely perceived as disastrous. This is certainly consistent with attitudes widely held in the 1940s and 1950s, and still lingering today. Under this interpretation, the world has for about six decades succeeded in following an equilibrium path supported by trigger strategies which, therefore, have never been observed. This presumes that all actual trade disputes, punishments, and defiances of DSP rulings have been just parts of the equilibrium path. It also suggests that the argument that actual liberalization seems to be determined by internal political conflicts rather than by the credibility of trigger strategies need not be an objection: The world has for six decades been gradually approaching a final static equilibrium. It is this equilibrium that will be supported by trigger strategies, rather than the speed of approach to it, determined by internal political trade-offs. Even those who regard such an explanation as far-fetched must concede that it cannot be contradicted by historical experience.

But even if this view is provisionally accepted, it still leaves open the following question. If observed DSPs and punishments are not real-world counterparts to the trigger strategy theory, what role do they play? Why are the stylized facts what they are? This paper proposes and investigates the following answer. Trade agreements are necessarily incomplete contracts; the DSP and weak punishments deal with that situation in a context in which individual countries sometimes will be tempted to implement a trade related policy and sometimes will have their trade influenced by a partner's implementation of such a policy.

I investigate this hypothesis in a context in which countries repeatedly conduct negotiations to lower trade barriers, each negotiation building on those that preceded it (i.e., the GATT rounds). I analyze a single round, presumably somewhere within the process. I am willing to accept the above argument for the practical relevance of the trigger strategy theory by tacitly supposing that the threat to retreat to a highly protectionist past (before the first round) is what supports the equilibrium that I describe. But my concern is to describe that equilibrium.

Incomplete-contract problems arise because the subsequent state of the world is not known when negotiations take place. Any agreement must reflect this. The most straightforward way to deal with it is to negotiate *state-contingent* agreements. But state-contingent agreements have severe limitations: The negotiation of state-invariant changes in recognized policy instruments has become enormously complicated and time consuming. So, negotiated trade agreements necessarily remain, by their very nature, incomplete contracts. This is implicitly acknowledged in the GATT itself, where Articles XXII and XXIII allow response to a "nullification or impairment" of concessions not necessarily the result of an explicit repudiation of a trade agreement.

This suggests the following difficulty. Trade agreements address a limited number of policy instruments that pertain directly to trade, but governments care about economic outcomes, not about the instruments that can be negotiated. And trade is one aspect of the general equilibrium that depends upon *all* economic instruments. So, *ex post*, governments will be doing things that influence trade and that have not been explicitly addressed by trade agreements: a recipe for disagreement about the constraints implied by those agreements.

Each country is aware, *ex ante*, that it may find itself, *ex post*, harmed by a policy that some trading partner wishes to make. So the former will want a recognized punishment procedure as a deterrent. But that country will also be aware, *ex ante*, that it might find, *ex post*, itself in a position where it would be costly not to take some policy action that would harm a partner. This is the *reciprocal-conflict problem*: Each country knows that it might turn out to be either the accuser or the accused. Thus it is in no country's interest, *ex ante*, to agree that, *ex post*, either the accuser should be unconstrained in its ability to punish or the accused should be unconstrained in its ability to proceed without punishment. This generates a role for a dispute settlement mechanism.

But the use of such a mechanism cannot be costless. It implies that punishments *must* be delayed, because the implementation of a controversial policy by some country cannot be required to wait until the dispute settlement mechanism renders its verdict. The reason the mechanism exists in the first place is that no one knows in advance what will come into dispute: Trade agreements are incomplete contracts. So the only way to delay implementation is to require that this be automatically required for any policy action that is disputed, and this would in effect give each country a temporary veto over every economic policy action of every other country, hardly acceptable to anyone.

Much of the theoretical literature on dispute-settlement procedures² proceeds from the assumption that the trade policies of partners are imperfectly observable. But actual trade disputes generally proceed *from* the observation and focus on the acceptability—in terms of existing trade agreements—of clearly observed policies.³ So I ignore informational asymmetries and exploit instead the fact that trade agreements are incomplete contracts.

The above argument can motivate the use of either an explicit dispute-settlement mechanism (as under the WTO) or an implicit agreement by countries not to punish without first attempting to negotiate a solution and also spelling out in advance what punishments

²This literature includes Hungerford (1991), Ludema (1990), Kovenock and Thursby (1992), Maggi (1999), Furusawa (1999), Büttler and Hauser (2000), and Rosendorff (2000). Staiger (1995) contains an insightful survey. Related issues arise in Bagwell and Staiger (2001).

³Recall the most prominent trade disputes over the last 40 years: the “chicken war” between the U.S. and the EC, the U.S.-EC dispute over EC policy toward oilseed production, U.S.-EU disputes about U.S. hormone-fed beef and genetically modified foods, the “banana war” between the U.S. and the E.U., complaints about U.S. policies toward Venezuelan oil and toward tuna caught in “dolphin-unfriendly” ways. In all these cases the policies of the accused were common knowledge: It was their acceptability that was under dispute.

will be used (as with the U.S. Section 301, and as when trade disputes under the GATT were not submitted to GATT procedures). In what follows there is no need to distinguish between these two, and so for simplicity I simply assume the use of a formal dispute settlement mechanism.

II. An Abstract Framework

I first provide a simple abstract framework for what follows.

The background

Assume two goods, A and B , and two factors of production. In light of the stylized fact that trade disputes are not inherently multilateral, I also assume 2 countries. One has a comparative advantage in A and the other in B ; otherwise they are identical. Technology is neoclassical. Assume a succession of periods. Both factors are mobile between sectors across periods, but immobile within each period. All consumers spend equally on both goods.

Initially, each country has an historically given tariff t on all imports. This comes from a highly protectionist past: I shall not investigate why the present is less protectionist. For simplicity I suppose that this initial tariff is common to both countries. Also, factors in each country are initially allocated between the two sectors. Governments negotiate changes in initial tariffs; I shall not model the negotiations. The inter-sectoral immobility of factors during the period ensures that one interest group prefers more protection and one prefers less protection. When the governments negotiate changes in their tariffs they do not know the exact state of the world that will pertain when those changes subsequently come into effect.

These two features—the tug of divergent special interests and the fact that agreements must be reached before the environment to which they will apply is fully known—have always been of paramount concern to trade negotiators. They must be addressed in any useful model of negotiated liberalization.

At the close of any negotiations, the state of the world is revealed, governments implement tariff changes, and trade takes place. Once the period ends, factors become free to move between sectors, and, once they have done so, history repeats itself, with the initial tariffs for the new period equal to the final tariffs from the preceding period and with a new generation of policymakers, taking history as given, ready to consider further tariff changes.

Government objectives

Following Bagwell and Staiger (1999, 2001), I assume a government objective function sensitive both to domestic relative prices and to the terms of trade. But I specify the functional form in several ways. For one, I suppose that domestic relative prices matter because they influence the distribution of income between factors specific to the export sector and those specific to the import sector, given the terms of trade, and I specify this distributional concern. Also, I allow the possibility that a government may be confronted with the need to decide upon a trade related policy: a policy that directly impacts its objective function but also influences trade.

Specifically, I use the following objective function.

$$\tilde{\phi}(s, a) = \left[\beta \frac{\Delta R_x(s, a)}{R_x} - \left(-\frac{\Delta R_m(s, a)}{R_m} \right)^{1+\gamma} \right] + \tilde{\mu} \Delta MA(s, a) + \tilde{\lambda}(s, a),$$

where the three terms on the right reflect the implications, respectively, of distributional concerns, the terms of trade, and a possible trade-related policy action. R_x and R_m denote the real returns earned by factors specific to the export sector and to the import-competing sector respectively. With trade liberalizations, $\Delta R_x > 0$, $\Delta R_m < 0$. The parameter β denotes the weight the government attaches to R_x relative to R_m (presumably greater than unity if the export sector is larger than the import-competing sector, as it will be here). The parameter $\gamma > 0$ captures the idea behind Corden's (1997, pp 74-76) description of a *conservative* social welfare function: Governments avoid policies that would cause a serious reduction in the income of any interest group.⁴ I accordingly refer to γ as the *Corden sensitivity*. Here $\Delta MA = (\Delta X_D - \Delta M_D)/X$, the excess, at initial world prices, of the direct amount by which the tariff reduction would raise foreign demand for home exports over the direct amount it would raise home demand for imports (in terms of exportables), as a proportion of the initial trade volume. This can be called the net exchange of market access. The parameter μ , called the *terms-of-trade sensitivity*, reflects the impact ΔMA will produce on the terms of trade (the inverse of the familiar Marshall-Lerner term) multiplied by the importance the government attaches to this. The parameter s indexes the (currently unknown) state of the world that will

⁴For $\gamma > 0$ appropriately to reflect a conservative social welfare function I need to choose units so that $-\Delta R_m/R_m > 1$ for the policy change being considered. This observation was prompted by a comment from Rob Feenstra. Hillman (1982) shows how Corden's concerns can be generated by a plausible political support function, and applications of Corden's ideas to trade policy are found in Deardorff (1987), Brander and Spencer (1994), and Ethier (1998a, b).

exist when the new tariff levels are in effect, and a denotes a policy variable determined after s is revealed (more on this later).

As Bagwell and Staiger (1999, 2001) aptly note, the first term on the right in my objective function, corresponding to internal distributional concerns, can be controlled unilaterally whereas manipulating the second term involves international spillovers: Our terms of trade is also our partner's terms of trade. Thus it is only the second consideration—a terms of trade externality—that can motivate trade agreements. I have two comments. First, the third term of my objective function also corresponds to an international externality, but the point of departure of this paper is that it is not possible to negotiate directly about it. Second, an earlier paper, Ethier (1998b) used an objective function that incorporated the second term on the right above but that based it on *political* externalities between countries rather than on *terms of trade* externalities. Unlike the earlier paper, for the issues addressed in the two country model of this paper, it doesn't matter at all whether the negotiable externality between the two governments is political or terms-of-trade in origin: The reader can take whichever interpretation he or she finds more congenial.⁵

Unilateralism and reciprocity

Ignore the trade-related action for the moment, and consider a unilateral reduction

$\tau_i = (-i/(1+i))$ in its tariff by a single country i . At unchanged world prices, the home relative price of imports falls by the amount of the tariff decrease, so that $\Delta R_x > 0$, $\Delta R_m < 0$, and $\Delta MA = -\epsilon \tau_i M_i < 0$, where ϵ denotes the home price elasticity of import demand and M_i the initial volume of imports. Define a liberalization as *reciprocal* if accompanied by foreign liberalizations that imply $\Delta MA = 0$. Thus the second term of the governmental objective function vanishes. The following is immediate.

Proposition 1 *A government will never liberalize unilaterally, with a large enough Corden sensitivity γ and terms of trade sensitivity $\tilde{\mu}$. However, it will always accept a sufficiently small reciprocal liberalization that implies $\Delta R_x/R_x + \Delta R_m/R_m > 0$. It will never accept a move to free trade, provided that the Corden sensitivity γ is sufficiently large.*

Reciprocity neutralizes concern about market access, rendering the magnitude of $\tilde{\mu}$ irrelevant. In what follows I assume that the above conditions are fulfilled: Governments will

⁵I conjecture that the political externality is far more relevant to reality but that the terms-of-trade externality is more “politically correct” among trade theorists. So take your choice.

not unilaterally liberalize, but they wish to negotiate reciprocal liberalizations that do not go all the way to free trade. It is easy to specify bargaining rules that imply equal gains and difficult to specify plausible rules that imply unequal gains: I assume all agreements feature reciprocal liberalization. I also assume that, because of pre-existing countervailing-duty laws, trade cannot be subsidized: Tariffs are constrained to be nonnegative.

The optimal reciprocal rate of liberalization

Consider next the rate of reciprocal liberalization that both governments would, in the absence of trade related actions, regard as optimal: the optimal reciprocal rate of liberalization. To this end, rewrite the objective function as follows.

$$\tilde{\phi} = \left[\beta \frac{\Delta R_x}{R_x} - \left(-\frac{\Delta R_m}{R_m} \right)^{1+\gamma} \right] + \tilde{\mu} \Delta MA$$

Under present assumptions, a liberalization at the rate τ implies the following.

$$\frac{\Delta R_x}{R_x} = \frac{\tau}{2} \quad \frac{\Delta R_m}{R_m} = -\frac{\tau}{2} \quad \Delta MA = \frac{\varepsilon X \tau^* - \varepsilon M \tau}{X}$$

where τ^* denotes the partner country's liberalization. Substituting these terms into the political support function and defining the transformation $\phi = 2^{1+\gamma} \tilde{\phi}$, $\mu = 2^{1+\gamma} \tilde{\mu}$ gives the following.

$$\phi = \left[r^\gamma \tau - \tau^{1+\gamma} \right] + \mu \Delta MA \quad (1)$$

where $r = 2\beta^{1/\gamma}$. The value of $\tau = \tau^*$ that maximizes ϕ , the optimal reciprocal rate of liberalization, is therefore:

$$\tau_{ORL} = r \left(\frac{1}{1+\gamma} \right)^{\frac{1}{\gamma}}. \quad (2)$$

The optimal rate of liberalization can be interpreted as that rate which would be optimal for all governments were trade agreements complete contracts.

III. A Model of A Dispute Settlement Procedure

I now present a model of a DSP motivated by the above considerations. First, I must modify the sequence of events within each period to reflect the incomplete-contract nature of trade agreements and to include the operation of a DSP.

Trade related actions

Suppose that, *ex post*, some country may determine an action, a , which directly influences that government's level of political support and also affects that country's willingness to import. I am especially concerned with three types of uncertainty to which such an action would be subject *ex ante*.

- 1 Uncertainty about what actual policy situation (environmental issues, health or safety concerns, etc., etc.) might give rise to such a potential action.
- 2 Uncertainty about the identity of the country in which the situation might emerge.
- 3 Uncertainty about the extent to which the potential action might be trade-related. To focus sharply on these concerns, I shall assume away all other sources of uncertainty.

The first aspect is incorporated in the requirement that the trade agreement be an incomplete contract. Next, I suppose that exactly one issue will arise and that it will confer an opportunity for a trade related action on one country or the other, with an equal probability ($\frac{1}{2}$) of either outcome.

In general, a trade-related action by some country may or may not be welcomed by its partners. But this paper concerns trade *disputes*. Consequently, I assume that such actions are always unwelcome: They cause the country undertaking the action to display more protection rather than less.

Specifically, I assume that implementing an action at the level a (≥ 0) affects the country's demand for imports in the same way as would an increase in its tariff in the proportion αa . Thus the trade-related action in effect reduces the country's liberalization from the negotiated rate τ to the rate $\tau - \alpha a$. The parameter α is a measure of how trade-related the action is: *higher* values of α correspond to more trade-relatedness. Furthermore, independently of its

effect on the country's trade, the action has a net direct effect on the government's political support in the amount $\lambda(a)$. When a trade agreement is being negotiated, the value of α is not yet known but has an expected value of unity.

I assume, for simplicity, that the form of the function λ is known at the time of negotiations. In particular, $\lambda(0) = 0$ and λ is strictly convex, increasing at a decreasing rate with $\lambda''' \geq 0$, reaching a maximum at $a = a^\circ$. Interpret a° as the *optimal unilateral action*: the action the government would take in the absence of trade consequences.

The sequence of events

Each period now consists of the following sequence of events.

- 1 Countries negotiate and then implement a reciprocal rate of liberalization τ , and they also determine a DSP.
- 2 One country is then presented with the opportunity to make a trade related action a not explicitly covered by the trade agreement, and this country (the potential *defendant*) determines a .
- 3 The trading partner (the potential *complainant*) then utilizes the DSP.
- 4 A fixed adjudication time is required for the DSP to reach a determination. During this time, the defendants continue with their action and no punishment is implemented.
- 5 When the DSP renders a decision, the defendant must decide whether to cease the action or to defy the decision. If it decides to cease, it sets $a = 0$, the sequence comes to an end, and the period runs its course.
- 6 If the defendant decides to violate the DSP decision, the complainant retaliates with trade restrictions proportional to the trade effects of the action a . The degree of proportionality is fixed by the trade agreement. The sequence now comes to an end and the period runs its course.

Possible outcomes

The objective functions of the governments of the potential defendant (D) and the potential complainant (C) are as follows.

$$\begin{aligned}\phi^D &= \left[r^\gamma (\tau - \alpha a) - (\tau - \alpha a)^{1+\gamma} \right] + \lambda(a) + \mu \varepsilon \alpha a \\ \phi^C &= \left[r^\gamma \tau - \tau^{1+\gamma} \right] - \mu \varepsilon \alpha a\end{aligned}\tag{3}$$

Here, τ is negotiated before it is known which country will be D and which will be C , and before the magnitude of α is known. After these are revealed, D chooses a . These expressions are valid before the DSP decision is reached.

If D complies with the DSP decision, a becomes equal to zero in the above expressions. If D refuses to comply and C punishes, the expressions become:

$$\begin{aligned}\phi^D &= \left[r^\gamma (\tau - \rho \alpha a) - (\tau - \rho \alpha a)^{1+\gamma} \right] - \mu \varepsilon (\rho - 1) \alpha a + \lambda(a) \\ \phi^C &= \left[r^\gamma (\tau - \rho \alpha a) - (\tau - \rho \alpha a)^{1+\gamma} \right] + \mu \varepsilon (\rho - 1) \alpha a\end{aligned}\tag{4}$$

where ρ denotes the degree of proportionality for punishment allowed by the DSP.

For the period as a whole, the total value of each government's objective function is a weighted average of its value when the DSP is proceeding and its value after that procedure has run its course. Let δ ($1 \geq \delta \geq 0$) denote the weight given to the former and $1 - \delta$ that given to the latter. δ is determined by the discount factor (which I assume exogenous and fixed) and by the amount of time allowed the DSP to do its business.

I can now describe the values of the objective functions of the two governments over the period as a whole. i If the DSP is not invoked or finds in favor of D they are given by (3) above. ii If the DSP finds for C and D abides they are as follows.

$$\begin{aligned}\phi^D &= \delta \left\{ \left[r^\gamma (\tau - \alpha a_j) - (\tau - \alpha a_j)^{1+\gamma} \right] + \mu \varepsilon \alpha a_j + \lambda(a_j) \right\} + (1 - \delta) \left[r^\gamma \tau - (\tau)^{1+\gamma} \right] \\ \phi^C &= \delta \left\{ \left[r^\gamma \tau - \tau^{1+\gamma} \right] - \mu \varepsilon \alpha a_j \right\} + (1 - \delta) \left[r^\gamma \tau - (\tau)^{1+\gamma} \right]\end{aligned}\tag{5}$$

Here a_j denotes the action D takes during the adjudication phase.

iii If the DSP finds for C , D refuses to comply and continues to violate, and C implements a punishment strategy we have:

$$\begin{aligned}\phi^D &= \delta \left\{ \left[r^\gamma (\tau - \alpha a_j) - (\tau - \alpha a_j)^{1+\gamma} \right] + \mu \varepsilon \alpha a_j + \lambda(a_j) \right\} \\ &\quad + (1 - \delta) \left\{ \left[r^\gamma (\tau - \alpha a) - (\tau - \alpha a)^{1+\gamma} \right] - \mu \varepsilon (\rho - 1) \alpha a + \lambda(a) \right\} \\ \phi^C &= \delta \left\{ \left[r^\gamma \tau - \tau^{1+\gamma} \right] - \mu \varepsilon \alpha a_j \right\} \\ &\quad + (1 - \delta) \left\{ \left[r^\gamma (\tau - \rho \alpha a) - (\tau - \rho \alpha a)^{1+\gamma} \right] + \mu \varepsilon (\rho - 1) \alpha a \right\}\end{aligned}\tag{6}$$

In light of one of the stylized facts (“The DSP of the WTO has almost always decided in favor of the complainant and, therefore, against the defendant”), I shall assume away case i, that is, the DSP will always find for C . As mentioned above, use of the DSP implies that punishments will be delayed.⁶ Goals of the subsequent analysis include delineating when D will abide by or violate the DSP ruling and explaining why punishments are tit-for-tat.

IV. The Base Case

The basic ideas of this paper are best illustrated by a special base case, which arises with two further assumptions, to be subsequently relaxed. i The DSP is fast enough so that governments give little weight to what happens before a decision is reached: $\delta = 0$. ii The degree of trade-relatedness is known beforehand: $\alpha = 1$.

Under these circumstances, if D refuses to abide by the DSP ruling, the government objective functions reduce to:

⁶That C invokes the DSP rather than punishing immediately can be thought of as a feature of the equilibrium path tacitly supported by trigger strategies.

$$\phi^D(a, \tau, \rho) = \left[r^\gamma (\tau - a) - (\tau - a)^{1+\gamma} \right] - \mu \varepsilon (\rho - 1) a + \lambda(a)$$

$$\phi^C(a, \tau, \rho) = \left[r^\gamma (\tau - \rho a) - (\tau - \rho a)^{1+\gamma} \right] + \mu \varepsilon (\rho - 1) a$$

Consider first D 's choice of a , given τ and ρ . This is determined by the first order condition $\partial \phi^D / \partial a = 0$, which reduces to

$$\tau - a = \left[\frac{r^\gamma + \mu \varepsilon (\rho - 1) - \lambda'}{1 + \gamma} \right]^{\frac{1}{\gamma}} \quad (7)$$

If λ' does not exceed a critical positive value, this expression can be solved for $a(\tau, \rho)$ possessing the following properties.

$$\tau > a \quad 1 > \frac{\partial a}{\partial \tau} > 0 \quad \frac{\partial a}{\partial \rho} < 0$$

Now turn to the negotiation stage. Assume each government wants to maximize the expected value of its objective function. Since each government has equal probability of turning out to be D or C , both governments share a common *ex ante* objective equivalent to maximizing the sum $\phi^D + \phi^C$. The first order conditions are:

$$\begin{aligned} \frac{d\phi^D}{d\tau} + \frac{d\phi^C}{d\tau} &= \phi_\tau^D + \phi_a^D \frac{\partial a}{\partial \tau} + \phi_\tau^C + \phi_a^C \frac{\partial a}{\partial \tau} = 0 \\ \frac{d\phi^D}{d\rho} + \frac{d\phi^C}{d\rho} &= \phi_\rho^D + \phi_a^D \frac{\partial a}{\partial \rho} + \phi_\rho^C + \phi_a^C \frac{\partial a}{\partial \rho} = 0 \end{aligned} \quad (8)$$

Substituting, and setting $\phi_a^D = 0$ because D will subsequently choose a optimally,

$$\begin{aligned}
& (1+\gamma)\left[(\tau-\rho a)^\gamma - (\tau-a)^\gamma\right] + \\
& \left(2-\rho\frac{\partial a}{\partial \tau}\right)\left[r^\gamma - (1+\gamma)(\tau-a)^\gamma\right] + \frac{\partial a}{\partial \tau}\mu\varepsilon(\rho-1) = 0 \\
& \frac{\partial a}{\partial \rho}\mu\varepsilon(\rho-1) - \left(a+\rho\frac{\partial a}{\partial \rho}\right)\left[r^\gamma - (1+\gamma)(\tau-\rho a)^\gamma\right] = 0.
\end{aligned}$$

These are solved by $\rho = 1$ and $\tau = a^\circ + \left[\frac{1}{1+\gamma}\right]^{\frac{1}{\gamma}} r$, for which the optimal subsequent choice of a requires that $\gamma'(a) = 0$, that is, that $a = a^\circ$. Thus the solution of the negotiation phase plus D 's choice of a is given by the following.

$$\tau = a^\circ + \left[\frac{1}{1+\gamma}\right]^{\frac{1}{\gamma}} r, \quad \rho = 1, \quad a = a^\circ.$$

So, commensurate punishment ($\rho = 1$) emerges endogenously. This can be regarded as a response to the reciprocal-conflict problem, as suggested above. But it does more than that. It ensures that the ultimate implications of D 's actions on protection are reciprocal, which in turn allows the governments to negotiate an agreement that will allow the country that turns out to be D to implement the optimal unilateral action and both governments to experience the optimal reciprocal liberalization.

Note, also, that this trade agreement ensures that D will in fact take the action a° rather than no action at all: the latter would cause D to experience more liberalization than desired in addition to forgoing the direct net benefit of acting. In other words, the two countries will reach a trade agreement that guarantees that the country that turns out to be D will in fact defy a negative ruling by the DSP.

Proposition 2 *If no weight is given to the adjudication phase and if the degree of trade relatedness is known with certainty, the negotiated trade agreement will induce D to violate the DSP and will deliver, ex post, both the optimal degree of liberalization and the optimal unilateral action for D .*

Consider in this light the hormone-fed beef case, widely regarded as a "failure" of the WTO system and as a threat to a "rules-based" international order for trade policy. An

alternative interpretation might go as follows. "If governments thought that trade agreements would prevent them from responding to unforeseen deep political pressures of this sort (from the EU viewpoint), they would never sign on to those agreements in the first place. If they thought that such pressures would allow their trade partners to depart from reciprocity, they also would never sign on to such agreements in the first place. Under these circumstances, the experience of the hormone-fed beef case is probably the best feasible outcome, from the viewpoint of long term trade liberalization." Rosendorff (2000) offers a related analysis in which a DSP allows a country to "purchase" a release from its trade commitments, inducing it to agree to more liberalization than it would do in the absence of such a release. Perdakis, Kerr and Hobbs (2001) observe (p. 381), "It has always been recognized that for the WTO to be politically acceptable there have to be provisions which allow governments to ignore their WTO commitments when domestic pressure for protection becomes politically unmanageable." In other words, violation of DSP decisions can be thought of as an *extra-legal* counterpart, applying to a residual of unforeseen circumstances, to various GATT provisions (e.g., Articles XXII and XXIII) allowing the *legal* withdrawal of concessions.

Proposition 2 is, of course, consistent with this interpretation. But it also goes much further, suggesting the possibility of *optimality* properties of current arrangements.

Though the base case solution involves commensurate punishment, one can enquire how much added deterrence stronger punishments would provide. Define the *elasticity of deterrence* as

$$\sigma \equiv -\frac{\rho}{a} \frac{\partial a}{\partial \rho},$$

where D chooses a optimally, that is, to satisfy (7). Deterrence can be said to be strong, uniform, or weak according as σ exceeds, equals, or falls short of unity. Strong deterrence means that a higher *ex ante* punishment proportionality ρ will result, at unchanged τ , in less *ex post* punishment ρa , and so forth.

At the base case solution, (7) implies that

$$\sigma = -\frac{\mu \varepsilon / a^{\circ}}{\lambda'' - \gamma r^y / \tau_{ORL}}. \quad (9)$$

Thus deterrence elasticity is enhanced by a high terms of trade sensitivity ($\mu\epsilon$) or optimal rate of reciprocal liberalization (τ_{ORL}) and by a low willingness to protect (γ), optimal unilateral action (a^o), or low curvature ($-\lambda''$) of the payoff from unilateral action.

V. Beyond the Base Case: A Significant Adjudication Phase

The base case gives strong results, but at the cost of suppressing essential aspects of the problem: the adjudication phase and the possibility of different degrees of trade relatedness α . I now consider the implications of these features, proceeding one step at a time. I start by allowing a significant adjudication phase: $\delta > 0$.

The adjudication phase

During the adjudication phase, C cannot punish D , so the respective objective functions, during that period, are as follows.

$$\begin{aligned}\phi_J^D &= \left[r^\gamma (\tau - a_J) - (\tau - a_J)^{1+\gamma} \right] + \mu\epsilon a_J + \lambda(a_J) \\ \phi_J^C &= \left[r^\gamma \tau - \tau^{1+\gamma} \right] - \mu\epsilon a_J\end{aligned}\tag{10}$$

During the adjudication phase, the optimal action $a_J(\tau)$ corresponding to each negotiated liberalization is implicitly defined by D 's first order condition

$$(1 + \gamma)(\tau - a_J)^\gamma - r^\gamma + \mu\epsilon + \lambda'(a_J) = 0.\tag{11}$$

This in turn implies that

$$1 > \frac{da_j}{d\tau} > 0 \quad \frac{\partial a_j}{\partial \mu} > 0.$$

Consider, initially, the trade agreement of the base case: $\tau = \tau_{ORL} + a^\circ$ and $\rho = 1$. Then, with $\mu\epsilon > 0$, the first order condition requires that $a_j > a^\circ$. This reveals three influences of the adjudication phase on the objective functions of the two governments.

First, by taking the trade related action without punishment, D 's objective function increases by $\mu\epsilon a_j$ while C 's falls a like amount. This departure from reciprocity might well induce *ex post* apoplectic outrage from C , but it has no direct *ex ante* effect since it does not change the joint welfare of the two governments. It has an indirect effect, however, because it induces D to set a_j higher than it otherwise would: $a_j > a^\circ$ implies that $\tau - a_j < \tau_{ORL}$ and $\lambda(a_j) < \lambda(a^\circ)$. Thus D experiences less effective liberalization than it would otherwise like, and an excessive level of the action a , and this does reduce the joint welfare of the two governments. This is also true of the third effect: because C cannot retaliate during the adjudication phase, it experiences "excessive" liberalization at the negotiated rate. (Another way of saying this is that the DSP causes the C government to behave during the adjudication phase as though it had a lower willingness to protect (γ) than it actually does—aggregate national welfare rises with the actual rate of liberalization).

The trade agreement

Next, take a step back to enquire whether setting $\delta > 0$ would induce the two governments to reach a trade agreement different from that of the base case. The effect of a change in τ on the joint objective function during the adjudication phase, taking into account D 's response in taking its optimal action $a_j(\tau)$, is as follows.

$$\frac{d\phi_j^D}{d\tau} + \frac{d\phi_j^C}{d\tau} = \left[r^\gamma - (1 + \gamma)(\tau - a_j)^\gamma \right] + \left[r^\gamma - (1 + \gamma)\tau^\gamma \right] - \mu\epsilon \frac{da_j}{d\tau} \quad (12)$$

With τ close to $\tau_{ORL} + a^\circ$, the first term on the right-hand side will be positive and the remaining two terms negative. For small values of $\mu\epsilon$, a_j will not be much greater than a° , so that the first term on the right will be dominated by the second, and the entire expression is thus negative. An increase in $\mu\epsilon$ will produce an increase in a_j , but it will magnify the third term more than the first (see the Appendix), so the entire expression will remain negative.

With the right-hand side negative, a small decrease in τ below $\tau_{ORL} + a^\circ$ will increase the joint welfare of the two governments during the adjudication phase. This will have no first-

order effect on their joint welfare during the post-adjudication phase, where $\tau_{ORL} + a^\circ$ is first-best. Thus it generates a net overall benefit.

Proposition 3 *If the adjudication phase becomes of concern to the two governments (i.e., if δ becomes positive) they will negotiate a trade agreement with less liberalization than that of the base case.*

Intuitively, if τ is reduced, D will lower a_j . This affects D in two ways: a_j falls back toward a° , increasing the non-trade benefits of the action; a_j falls less than the reduction in τ itself so that $\tau - a_j$ falls, further worsening the deficient realized liberalization experienced by D . Thus, the reduction in the negotiated rate of liberalization induces D to give *more* weight to the non-trade implications of the action, and less weight to the trade aspects, during the adjudication phase. Finally, the reduction in τ directly reduces the “excessive” liberalization experienced by C during the adjudication phase, a clear benefit to the C government at least.

Next turn to the implications of $\delta > 0$ for the negotiated punishment factor ρ . The size of ρ is irrelevant to the adjudication phase, but the fact that $\delta > 0$ causes τ to deviate from its post-adjudication first-best value suggests that ρ may also deviate from its post-adjudication first-best value (unity). The second equation in (8) above is the condition that ρ be set optimally, from the *ex ante* point of view of each government. Using this expression to find the implicit derivative of ρ with respect to τ , assuming that D sets a optimally *ex post*, and evaluating the result at the base case trade agreement ($\tau = \tau_{ORL} + a^\circ$, $\rho = 1$) gives the following:

$$a \frac{d\rho}{d\tau} = \frac{(\sigma - 1)}{(\sigma - 1) - \sigma \frac{\mu\varepsilon/a^\circ}{\gamma r^\gamma / \tau_{ORL}}}$$

Thus uniform deterrence ($\sigma = 1$) implies that $d\rho/d\tau = 0$: Commensurate punishment will still

be negotiated. Weak deterrence ($\sigma < 1$) implies $1 > a \frac{d\rho}{d\tau} > 0$. The reduction in τ reduces

punishment, but in a dampened way: $a\rho$ falls by less than τ . From (9), $\frac{\mu\varepsilon/a^\circ}{\gamma r^\gamma / \tau_{ORL}} > \sigma$. This in

turn implies that strong deterrence gives $-1 < a \frac{d\rho}{d\tau} < 0$; punishment increases, but, again, in a dampened way.

The introduction of an adjudication phase results, during the post adjudication phase, in deficient *ex post* liberalization $\tau < a$ and in an excessive action a . Raising ρ above unity worsens the former problem, since it causes C to liberalize less *ex post*, but improves the latter problem. Weak deterrence implies that the first effect will be predominant, so that ρ should be reduced; strong deterrence implies the reverse.

The result, though, is an emphasis on commensurate punishment. This is preserved with uniform deterrence. Strong or weak deterrence produces deviations in the punishment factor ρ , but they are dampened in the sense that punishments $a\rho$ change less than τ itself.

The argument thus far in this section assumes that D will violate the DSP ruling and that C will punish. This is necessarily so in the base case, where the two countries will negotiate a trade agreement that guarantees violation. If the adjudication phase is not too important to the two governments relative to the post-adjudication phase (*i.e.*, if δ is small enough), the trade agreement will be close enough to that of the base case still to guarantee violation. But large values of δ require that the possibility of D abiding by the DSP ruling be considered. I turn to this next. To summarize results thus far.

Proposition 4 *For sufficiently small positive δ , the two governments will negotiate a trade agreement in which $\tau < \tau_{ORL} + a^\circ$ and ρ approximates unity. This will induce D to violate the DSP ruling.*

Raising δ above zero causes D to set $a_j > a^\circ > a$, and it also causes C to experience “excessive” liberalization during the adjudication phase and deficient liberalization during the post-adjudication phase. The trade agreement induces D to adjust its action closer to a° in each phase, enhancing the non-trade effects of the action, and it smooths out the variation of liberalization experienced by C .

The pure adjudication case

Consider now what the negotiated trade agreement would be if the negotiators gave no weight at all to the post-adjudication phase, that is, if $\delta = 1$. This can be thought of as the polar opposite to the base case, where $\delta = 0$. With $\delta = 1$, the magnitude of the punishment coefficient ρ is immaterial, so nothing is lost by setting it equal to unity.

The joint welfare of C and D equals

$$W_J = \left[r^\gamma (\tau - a_J) - (\tau - a_J)^{1+\gamma} \right] + \left[r^\gamma \tau - \tau^{1+\gamma} \right] + \lambda(a_J). \quad (13)$$

The first-order *ex ante* optimality condition that τ be chosen to maximize W_J , taking into account that D will subsequently choose a_J optimally, reduces to

$$\frac{dW_J}{d\tau} = (1 + \gamma) \left\{ \left[\tau_{ORL}^\gamma - (\tau - a_J)^\gamma \right] + \left[\tau_{ORL}^\gamma - \tau^\gamma \right] \right\} - \mu\epsilon \frac{da_J}{d\tau} = 0.$$

If $\mu\epsilon$ is sufficiently small, this condition implies that $\tau > \tau_{ORL} > \tau - a_J$. This in turn implies that $(1 + \gamma)(\tau - a_J)^\gamma < r^\gamma$, which, for sufficiently small $\mu\epsilon$, requires $\lambda'(a_J) > 0$, so that $a_J < a^\circ$. Conversely, if $\mu\epsilon$ is sufficiently large, the first-order condition implies that $\tau_{ORL} > \tau > \tau - a_J$, whence $a_J > a^\circ$ for $\mu\epsilon$ sufficiently large.

Proposition 5 *Suppose the two countries negotiate a pure-adjudication-case trade agreement. If terms of trade effects are sufficiently unimportant to the negotiators, the agreement will result in D experiencing deficient liberalization and C excessive liberalization and in D choosing a level of the trade related action below the optimal unilateral level a° . Sufficiently important terms of trade effects result in both countries experiencing deficient liberalization and in D choosing a level of the trade related action above the optimal unilateral level a° .*

Abide or violate?

Consider now the choice that D must make at the end of the adjudication phase: whether to abide (A) by the finding and set $a = 0$ or to violate (V) the finding and set a equal to some positive value, knowing that this will induce punishment by C . The choice between the A and V strategies is independent of what D did during the adjudication process, now past history.

Define $V(\tau, \rho)$ as follows.

$$V(\tau, \rho) = \left[r^\gamma (\tau - a) - (\tau - a)^{1+\gamma} \right] + \mu\epsilon(1 - \rho)a + \lambda(a) - \left[r^\gamma \tau - \tau^{1+\gamma} \right] \quad (14)$$

where

$$(1 + \gamma)(\tau - a)^\gamma - r^\gamma + \mu\epsilon(1 - \rho) + \lambda'(a) = 0.$$

D will violate or abide by the ruling according as V is positive or negative, and

$$V(\tau_{ORL} + a_0, 1) > 0.$$

Define $W(\tau, \rho)$ as:

$$\begin{aligned} W(\tau, \rho) = & \frac{1}{2} \left[r^\gamma (\tau - a) - (\tau - a)^{1+\gamma} \right] + \frac{1}{2} \left[r^\gamma (\tau - \rho a) - (\tau - \rho a)^{1+\gamma} \right] \\ & + \frac{1}{2} \lambda(a) - \left[r^\gamma \tau - \tau^{1+\gamma} \right]. \end{aligned} \quad (15)$$

It will be optimal *ex ante* that whichever country turns out to be D violate or abide by the ruling according as W is positive or negative. Also, $W(\tau_{ORL} + a_0, 1) > 0$ and

$$V(\tau, 1) = W(\tau, 1) + \frac{1}{2} \lambda(a).$$

The above discussion of the pure adjudication case implied that, unless $\mu\epsilon$ is small enough to prevent it, $\tau_j - a_j$ will be further enough from τ_{ORL} than will τ_j to ensure that

$$\left[r^\gamma (\tau_j - a_j) - (\tau_j - a_j)^{1+\gamma} \right] < \left[r^\gamma \tau_j - \tau_j^{1+\gamma} \right].$$

This in turn implies that $V(\tau_j, 1) < 0$ unless $\lambda(a_j)$ is large enough to prevent it. That is, unless trade related action is important enough to governments relative to trade concerns—as measured by $\mu\epsilon$ —governments would prefer to abide by a negative determination, when the degree of liberalization is that of the pure adjudication case, rather than to violate it and experience the rollback of liberalization implied by violation *cum* commensurate punishment. I refer to this circumstance as the *abidement property*.

Abidement property $\mu\epsilon$ is large enough relative to $\lambda(a_j)$ so that $V(\tau_j, 1) < 0$.

The definition of $V(\tau, \rho)$ implies that, when $\rho = 1$, $V_\tau = (1 + \gamma) \left[\tau^\gamma - (\tau - a)^\gamma \right] > 0$ and

$$V_\rho = -\mu\epsilon a < 0 \text{ so that}$$

$$\left. \frac{d\rho}{d\tau} \right|_{V=0, \rho=1} = \frac{(1+\gamma) \left[\tau^\gamma - (\tau-a)^\gamma \right]}{\mu \varepsilon a} > 0.$$

Also, at $\rho = 1$, $W_\tau = V_\tau + \lambda' \frac{da}{d\tau}$, which is positive with $\lambda' \geq 0$, and

$W_\rho = -\frac{a}{2} \left[r^\gamma - (1+\gamma)(\tau-a)^\gamma \right]$, which is negative with $\lambda' > 0$. Accordingly,

$$\left. \frac{d\rho}{d\tau} \right|_{W=0, \rho=1} = \frac{V_\tau + \lambda' \frac{da}{d\tau}}{\frac{a}{2} \left[r^\gamma - (1+\gamma)(\tau-a)^\gamma \right]} > 0.$$

Figure 1 depicts the plane of possible trade agreements (τ, ρ) . The locus $V=0$ bisects the plane between those agreements that will induce the country that turns out to be D to abide by or to violate the DSP ruling. The $W=0$ locus does the same on the basis of whether it is *ex ante* optimal that D abide or violate. Point **B** denotes the base case agreement and must be in the violate zone. Point **J** denotes the pure adjudication agreement with $\rho=1$, and, if the abidement property holds, will be in the violate zone as depicted in the figure.

The *ex ante* optimal trade agreement is **B** if $\delta=0$ and **J** if $\delta=1$. Intermediate values of δ imply other agreements, possibilities illustrated by the bold line in figure 1. Small values of δ yield agreements that will induce D to violate the DSP ruling. As discussed above, these agreements will feature commensurate punishment if deterrence is uniform, or dampened departures from commensurate punishment otherwise. If the abidement property holds, large values of δ yield agreements that will induce D to abide by the ruling, and commensurate punishment suffices to ensure this.

Yet another possibility is for some range of intermediate values of δ to imply agreements between the $V=0$ and $W=0$ schedules. In such cases, an optimal agreement requires D to abide by the DSP ruling, but commensurate punishment would induce D to violate. See Figure 1. Thus punishment must be more severe than this, with ρ at least large enough to correspond to points on the $V=0$ schedule.

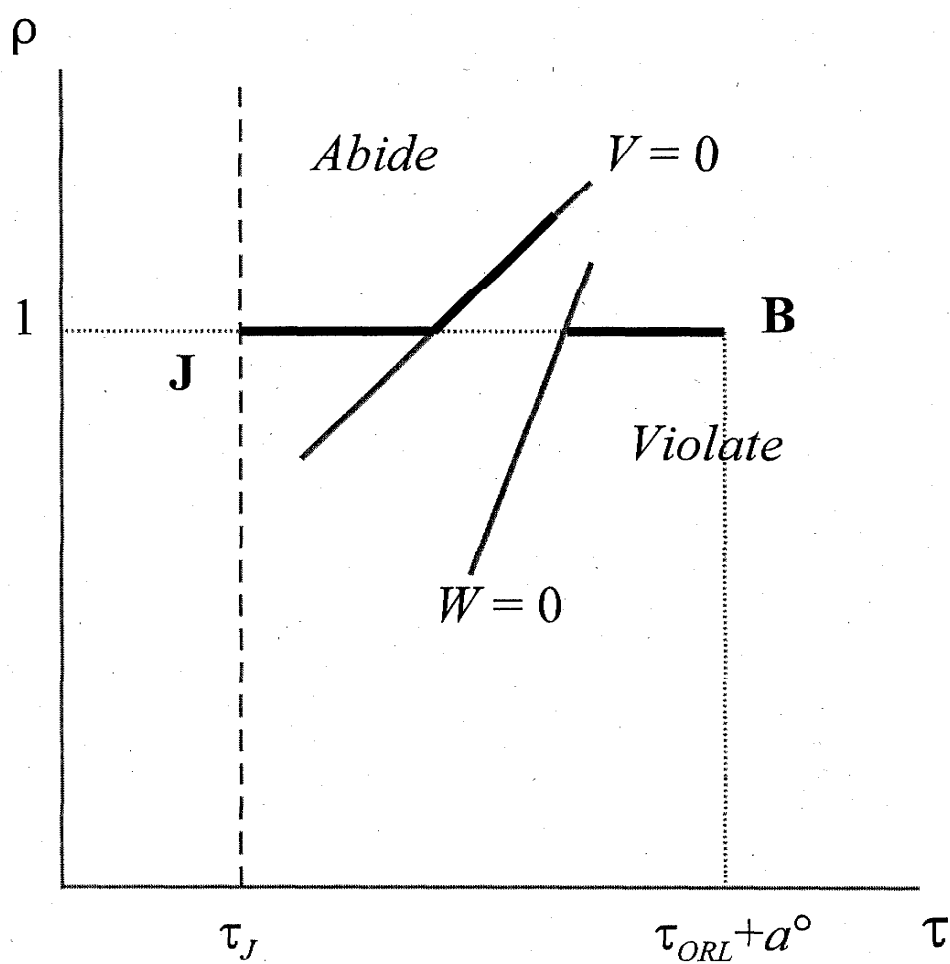


Figure 1 The Trade Agreement Plane

The abidement property, however, tends to minimize the importance of such deviations from commensurate punishment. First, low values of $\lambda(a)$ reduce the distance between the two schedules when $\rho = 1$, limiting the scope for such outcomes. Second, high values of $\mu\epsilon$ flatten the $V = 0$ schedule, limiting the required deviation above $\rho = 1$.

Proposition 6 *If the abidement property holds, there is a presumption that the optimal trade agreement will feature commensurate punishment, or approximately commensurate punishment.*

With low values of δ the abidement property is irrelevant for commensurate punishment, or a dampened departure from it, as we saw above. High values of δ render the property important. Commensurate punishment is one of the two key results of this section. The second is the delineation of the circumstances under which D will abide by or violate the DSP ruling.

Proposition 7 *If the abidement property holds, the optimal trade agreement will induce D to abide by the DSP ruling when the negotiators attach more importance to the adjudication phase (large δ), and to violate it when they attach less importance (low δ).*

Why low values of δ induce violation is clear from the earlier discussion of the base case. When δ is large, so the adjudication phase is important, the negotiators, knowing that they have no way of preventing D from implementing a during that phase, will negotiate less liberalization to reduce the incentive for D to set a large a . But when the post adjudication phase commences, this lower negotiated liberalization will increase the damage of further backsliding with violation *cum* commensurate punishment. Thus the agreement should induce D to abide.

Thus abiding by the DSP during the post adjudication phase is associated with *more* (not less) emphasis on the adjudication phase, during which D is free to violate without punishment. This should not be interpreted to mean that high values of δ are desirable because they limit international conflict. Indeed, since the base case is first-best, there is a presumption that the negotiators would prefer lower values of δ and therefore would try to design the adjudication process so that δ is as small as consistent with the integrity and credibility of that process. Attempting to do just this was a main objective of the revision of the GATT DSP undertaken during the Uruguay Round.

VI. Beyond the Base Case: The Degree of Trade Relatedness

Thus far I have assumed that the negotiators know beforehand what the degree of trade relatedness will be, that is, that α assumes its expected value (unity) with certainty. Now this will be relaxed. It will be convenient to assume that the negotiators are risk neutral with respect to such uncertainty, and proceed on the basis of the expected value of α , reaching the agreement described above. The problem, then, is to determine how, given this agreement, *ex post* behavior will depend upon the realization of α .

The timing is as follows. First, the governments negotiate a trade agreement (τ, ρ) . Next, the identity of D and the magnitude of α are revealed. Then, as above, D chooses a , the DSP rules against D , and D decides whether to abide by or to violate the ruling. The interesting question is how this decision is influenced by the realization of the degree of trade relatedness.

Abide or violate redux

When α can deviate from unity, the terms critical for the decision whether to abide or to violate, and for whether either decision is desirable, become

$$V(\tau, \rho) = \left[r^\gamma (\tau - \alpha a) - (\tau - \alpha a)^{1+\gamma} \right] + \mu \varepsilon (1 - \rho) \alpha a + \lambda(a) - \left[r^\gamma \tau - \tau^{1+\gamma} \right] \quad (16)$$

where

$$\alpha(1 + \gamma)(\tau - \alpha a)^\gamma - \alpha r^\gamma + \mu \varepsilon \alpha(1 - \rho) + \lambda'(a) = 0,$$

and

$$\begin{aligned} W(\tau, \rho) = & \frac{1}{2} \left[r^\gamma (\tau - \alpha a) - (\tau - \alpha a)^{1+\gamma} \right] + \frac{1}{2} \left[r^\gamma (\tau - \rho \alpha a) - (\tau - \rho \alpha a)^{1+\gamma} \right] \\ & + \frac{1}{2} \lambda(a) - \left[r^\gamma \tau - \tau^{1+\gamma} \right]. \end{aligned} \quad (17)$$

These expressions imply, if $\rho = 1$ and $\alpha = 1$ initially,

$$\frac{dV}{d\alpha} = -a\lambda'(a) < 0$$

and

$$\frac{\partial \alpha}{\partial \alpha} = \frac{\lambda' + \gamma(1 + \gamma)a(\tau - a)^{\gamma-1}}{\lambda'' - \gamma(1 + \gamma)(\tau - a)^{\gamma-1}} < 0.$$

and

$$\frac{dW}{d\alpha} = a[(1 + \gamma)(\tau - a) - r'] + \frac{1}{2}\lambda'(a)\frac{\partial \alpha}{\partial \alpha} < 0.$$

When $\rho = 1$, $V_\tau > 0$ and $W_\tau > 0$, as shown above. Thus:

$$\left. \frac{d\tau}{d\alpha} \right|_{V=0, \rho=1} > 0, \quad \left. \frac{d\tau}{d\alpha} \right|_{W=0, \rho=1} > 0.$$

An increase in α above unity will shift the $V = 0$ and $W = 0$ schedules to the right, causing some trade agreements that would have caused D to violate the DSP ruling (with $\alpha = 1$) to instead cause D to abide by the ruling. A reduction of α below unity does the reverse.

Proposition 8 *A realization of high trade relatedness ($\alpha > 1$) increases the set of trade agreements inducing the country that turns out to be D to abide by the DSP ruling. A realization of low trade relatedness ($\alpha < 1$) reduces the size of that set.*

When D decides whether to abide or violate, it weighs the favorable direct effect of violation against the unfavorable reduction in liberalization implied by violation *cum* punishment. A high degree of trade relatedness enhances the second, negative, consideration. This can be enough to transform a decision to violate into one to abide for agreements close to $V = 0$, where the two effects balance out.

Commensurate punishment redux

Negotiators, aware of the possible effects consequent upon the *ex post* realization of α , might possibly negotiate a different punishment proportion ρ as a result. Suppose, for example, that the negotiators settle on an agreement to the left of the $V = 0$ schedule, which will therefore induce D to abide by the DSP ruling if α attains its expected value of unity. Consider the effect of altering this agreement by raising ρ above unity.

This alteration will be of no consequence whenever the degree of trade relatedness is equal to or above its expected value, because D will still abide. If the degree of trade relatedness turns out below its expected value it could cause the agreement, with $\rho = 1$, to lie between the $V = 0$ and $W = 0$ schedules, so that D would choose to violate the DSP ruling even though that would lower the joint welfare of the two governments. If, instead, ρ had been set above unity by enough, that could induce D to abide by the ruling, a social benefit. Even if D still violates, the higher ρ would induce a lower α . A final possibility is that the realized degree of trade relatedness is enough below average so that the trade agreement, with its higher value of ρ , ends up below the $W = 0$ schedule. In this case, having raised ρ above unity causes it to be even further from its optimal *ex post* value if deterrence is uniform or weak, and this must lower joint welfare. With strong deterrence, the increase in ρ might have moved it either towards or away from its optimal value.

Now suppose instead that the negotiators settle on an agreement to the right of the $W = 0$ schedule, which will therefore induce D to violate the DSP ruling if α attains its expected value of unity. In this case, altering the agreement by raising ρ above the level that is optimal when $\alpha = 1$ must lower joint welfare *ex post* whenever the realized degree of trade relatedness is equal to or below its expected value. If α ends up above unity by enough to leave the agreement between the $V = 0$ and $W = 0$ schedules an increase in the negotiated ρ could either raise or lower *ex post* joint welfare, and it would have no effect should the realized degree of trade relatedness be sufficient to put the agreement to the left of $V = 0$.

Note that the abidement property tends to work against the possibility that uncertainty about α could induce the negotiators to increase ρ when the optimal *ex ante* agreement lies above the $V = 0$ schedule. By reducing the difference between the $V = 0$ and $W = 0$ schedules it lowers, other things equal, the chances that the realization of α will leave the trade agreement between those two schedules. By flattening the $V = 0$ schedule it lowers the amount by which increasing ρ could conceivably be beneficial.

All in all, it seems quite unlikely that uncertainty about the degree of trade relatedness would induce negotiators to increase ρ significantly. But it is possible to construct examples where this would happen—for example, a magnitude of δ implying (when $\alpha = 1$) a trade agreement somewhat to the left of the $V = 0$ schedule combined with a subjective probability distribution over α giving no likelihood to the realization of low enough degrees of trade relatedness to leave the negotiated agreement to the right of the $W = 0$ schedule.

VII. Concluding Remarks

This paper explores the idea that observed dispute settlement procedures and punishments are responses to the fact that trade agreements are necessarily incomplete contracts. I argue that this perspective can explain prominent features of these procedures and punishments and also has implications for the trade agreements themselves. The argument can be summarized as follows.

- Trade agreements are of necessity incomplete contracts because trade can be affected by all sorts of potential policies that countries can either not foresee or not be willing to negotiate about.
- If no weight is given to the adjudication phase and if the degree of trade relatedness is known with certainty, the negotiated trade agreement will induce the defendant to violate the DSP and will deliver, *ex post*, both the optimal degree of liberalization and the optimal unilateral action for the defendant.
- This suggests a central role, in the process of multilateral trade liberalization, for an *implicit* agreement to allow countries to violate agreed commitments if the violation implies no retreat from reciprocity.
- If the adjudication phase is of concern to the two governments they will negotiate a trade agreement with less liberalization.
- The *abidement* property—that trade matters sufficiently to governments relative to trade related action—implies a presumption that the optimal trade agreement will feature commensurate punishment, or approximately commensurate punishment.
- If the *abidement* property holds, the optimal trade agreement will induce the defendant to abide by the DSP ruling when the negotiators attach more importance to the adjudication phase, and to violate it when they attach less importance.
- A realization of high trade relatedness increases the set of trade agreements inducing the country that turns out to be *D* to abide by the DSP ruling. A realization of low trade relatedness reduces the size of that set.

A question for future research suggested by the above is: What are the implications of uncertainty about the direct magnitude on governments' objective functions of the trade related actions? The important role of the abidement property (essentially that the trade consequences of such actions be sufficiently important relative to the direct consequences) suggests that this is an important question.

This paper has, for concreteness, proceeded with respect to the dispute settlement procedures of the WTO. But the basic stylized facts motivating this analysis have characterized the entire GATT-WTO period of history. This suggests that the issues raised here are central to the process of multilateral trade liberalization. It also raises another question for future research. With the WTO, essential stylized facts of the DSP are enshrined in trade agreements. Before that they were still present but apparently as elements of an "implicit" contract. Does such "implicitness" matter? Or, put another way, does it matter that such stylized facts are now enshrined in the WTO?

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Appendix: Implications of the Adjudication Phase for the Trade Agreement

The rate of liberalization

The condition (11) that a_J be optimally chosen implies that

$$1 > \frac{\partial a_J}{\partial \tau} > 0 \quad \text{and} \quad \frac{\partial a_J}{\partial \tau} = \gamma(1+\gamma)(\tau - a_J)^{\gamma-1} \frac{\partial a_J}{\partial(\mu\epsilon)} > 0.$$

Now for small values of $\mu\epsilon$ the right-hand side of (12) is necessarily negative. The response of this right-hand side to a change in $\mu\epsilon$, in light of (17), is just

$$-\mu\epsilon \frac{\partial^2 a_J}{\partial \tau \partial(\mu\epsilon)} = -\left(\frac{\partial a_J}{\partial(\mu\epsilon)}\right)^2 \left\{ -\gamma(1-\gamma)(1+\gamma)(\tau - a_J)^{\gamma-2} \left[1 - \frac{\partial a_J}{\partial \tau} \right] - \lambda''' \frac{\partial a_J}{\partial \tau} \right\} > 0.$$

Thus the right-hand side of (12) is necessarily negative for all values of $\mu\epsilon$.