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CENTER DISCUSSION PAPER NO. 717

LOBBYING AND INTERNATIONAL COOPERATION  
IN TARIFF SETTING

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# Lobbying and International Cooperation in Tariff Setting

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## Abstract

This paper develops a theory of tariff protection that incorporates cooperative behavior and interest-group lobbying. Governments are assumed to use import tariffs or subsidies to maximize a weighted sum of lobbying contributions and general welfare. It is assumed that governments do not use export taxes or subsidies and thus balance the interests of export and import-competing lobbies in setting tariff levels. In a symmetric model, governments interact in a stationary infinitely repeated game in which cooperation is sustained by threats of punishment in future periods. Unless governments place too much weight on the future, the result is a cooperative tariff; export lobbies succeed in lowering but not eliminating protection. If governments place too much weight on the future, the result is a reciprocal import subsidy.

KEY WORDS: Lobbying, Cooperation

## I. Introduction

Despite economists' long-standing recognition of the Pareto-optimality of free trade from a global viewpoint, governments continue to intervene in trade on a widespread basis.

This has led to inquiries into the political economy of protection. There is ample evidence that interest groups play an important role in shaping trade policy.<sup>1</sup> The conflict between these groups has been predominantly over the extent of protection from imports; export subsidies are rare and quantitatively much smaller.<sup>2</sup> While import-competing producers support protectionist measures, exporting producers oppose them. In the absence of export subsidies, exporters must rely on reciprocal trade liberalization as a trade policy instrument. Since the end of World War II, such reciprocal liberalization has taken place under the aegis of the General Agreement on Tariffs and Trade (GATT), a forum for international cooperation.

This paper presents a model that captures these facets of historical experience. Earlier research has developed models in which trade policy is the outcome of tradeoffs between the general welfare interest and lobbying.<sup>3</sup> The most rigorous of these is due to Grossman and Helpman (1992, 1993) who assume that some subset of the industries in a country are represented by lobbies. These lobbies submit contribution schedules to the government describing the contributions the lobby will pay for each potential level of the policy variables. There is inherent conflict between agents in the economy: each producer, as a net seller of his product, benefits from a higher price in his industry but prefers a lower price for every other good, for which he is a net consumer. Grossman and Helpman (1992) draw on the common agency analysis of Bernheim and Whinston (1986a, 1986b) to determine equilibrium lobbying contributions and government policies.

But the Grossman and Helpman models cannot explain why or to what effect export interests are pitted against import-competing interests; the two interact only as consumers of each others' products.<sup>4</sup> Nor can they explain why we almost universally

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<sup>1</sup>See Bhagwati (1988) and Krueger (1993).

<sup>2</sup>This has a basis in Article XVI of the GATT, which calls for contracting parties to seek to avoid export subsidies on primary products and to abolish export subsidies on all other goods. The principal exception to this prohibition has been in agriculture (Dam, 1970, Chapter 8).

<sup>3</sup>For a broad survey of the literature concerning the political economy of trade policy, see Hillman (1989).

<sup>4</sup>One might surmise that general equilibrium considerations cause governments to balance these interests. That would be one implication of Lerner's Symmetry Theorem, for example [see Lerner (1936), McKinnon (1966) and Corden (1984)]. However, this effect does not seem to be the one that motivates exporters to lobby for trade liberalization [Destler and Odell (1987), Milner (1988)]. Exporters seem more concerned with the policy of foreign governments than with the general equilibrium repercussions of domestic trade policy.

observe outcomes which, on net, aid import-competing producers (and not exporters).<sup>5</sup>

This paper shows that in a symmetric version of the Grossman and Helpman model, export subsidies exceed import tariffs in sectors with lobbies. If export subsidies are not used, then countries impose reciprocal import subsidies in the cooperative equilibrium. In the non-cooperative setting without export subsidies, however, import-competing lobbies win tariff protection. This suggests that the degree of sustainable cooperation is important.

Models of cooperation, as discussed in Dixit (1987) and applied in Bagwell and Staiger (1990, 1993), explain how trade policies can be set cooperatively and sustained through self-enforcing agreements. However, in such models policy is determined between unitary governments. They abstract away from the interplay of domestic forces.

In this paper, a model is developed in which governments are assumed to maximize a function containing lobbying contributions (producers' interests) and the general welfare (consumers' interests) as its arguments in the context of a repeated game. In the absence of export subsidies, governments set import policies so as to balance the conflicting interests of exporters and import-competing producers. Governments are constrained to reach cooperative agreements that are self-enforcing.

It is shown that the effectiveness of the mechanism to enforce international cooperation plays a vital part in determining the role of lobbying. This is summarized in the formal model by the government's discount factor. If the discount factor is below a critical level, protection rises as the weight placed by governments on lobbying contributions increases. Above that critical level, protection falls as the weight placed on contributions rises. This is because the absence of export subsidies implies that political forces for trade liberalization (exporters) can only have an impact when sufficient cooperation between trading partners is possible.

In the next section, the Grossman-Helpman structure is reviewed, since it forms the basis for the later sections. Section III considers the effects of limiting trade policy instruments and predictions of net trade promotion. Section IV introduces a linear version of the model and discusses the impact of a repeated-game setting. In Section V, a specific numerical example allows exploration of cases with multiple sectors and permits a comparison of results across different assumptions. Section VI concludes.

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<sup>5</sup>The question of why strong export industries cannot, in fact, fully prevail is closely related to the question of why Pareto-improving trade liberalization packages cannot garner electoral support. In an approach that differs from the one in this paper, Krueger (1990) and Fernandez and Rodrik (1991) argue that uncertainty over who gains from a trade reform prevents Pareto-improving policies from being adopted. Krueger calls the tendency to favor known losers over unknown winners an "identity bias" and argues that it favors established import-competing industries. Fernandez and Rodrik provide a model in which efficiency-enhancing reforms that would be approved in an ex-post ballot would not be approved ex-ante because of the uncertainty over who will lose.

## II. The Basic Setting

### A. Production, consumption and trade.

The setting for the analysis will be a world with two countries.<sup>6</sup> These countries will be assumed to be identical in their political structures, although they will differ in their autarky relative prices and may differ in the values of other parameters.

In each country, a wide range of traded products are produced with constant returns to scale technology. One of these, good  $z$ , is the numeraire good. This good uses only the mobile factor in production, labor, and units are chosen such that the price of a unit of  $z$  and the wage paid to labor are one.<sup>7</sup>

$$(2.1) \quad p_z = w = 1$$

The production processes in sectors 1 through  $n$ , however, will use both labor and a factor that is specific to each sector and in fixed supply. With the assumption that the return to labor is fixed, the profits of any firm are solely a function of the domestic price, so we may write  $\Pi_i = \Pi_i(p_i)$ . Hotelling's lemma provides supply as a function of price:

$$(2.2) \quad X_i = \Pi_i^{\Phi}(p_i)$$

In each country, these goods are consumed by the agents in the economy, of which there are  $L$  in the home country,  $L^*$  in the foreign country. These agents derive their income from the sale of their labor and perhaps share ownership of one of the specific factors.<sup>8</sup> They also receive a fraction of any net revenue the government earns through tariffs or export taxes. They consume to maximize identical utility functions of the following quasi-linear form:

$$(2.3) \quad U = c_z + \sum_{i=1}^n u_i(c_{x_i})$$

where  $c_z$  is consumption of the numeraire good and  $c_{x_i}$  denotes consumption of good  $i$ . The subutility functions  $u_i(\cdot)$  possess the standard properties of differentiability and strict concavity. This direct utility function leads to demand functions of the form:

$$(2.4) \quad c_{x_i} = d_i(p_i) = [u_i(p_i)]^{-1} \quad i=1, \dots, n$$

The indirect utility function, with income  $E$ , is:

$$(2.5) \quad v(p, E) = E + \left[ \sum_{i=1}^n u_i(d_i(p_i)) - \sum_{i=1}^n p_i d_i(p_i) \right]$$

<sup>6</sup>This general model (with full use of policy instruments) is that of Grossman and Helpman (1993), with only minor modifications. That paper and Grossman and Helpman (1992) provide a fuller description and development.

<sup>7</sup>It is assumed that some of the numeraire good is produced in each country.

<sup>8</sup>For simplicity, it will be assumed that agents own shares of at most one of the specific factors.

The bracketed term is the consumer surplus from goods other than the numeraire good. It will be useful to define that term as  $s(p)$ , where  $p$  is the entire vector of domestic prices.

World prices adjust to clear global markets. Specifically, the world price of good  $i$ ,  $p_i^w$  is the price such that domestic net exports of good  $i$  equal foreign net imports:

$$(2.6) \quad X_i(p_i^w) - \sum_L d_i(p_i^w) = \sum_{L^*} d_i^*(p_i^w) - X_i^*(p_i^w)$$

Production and consumption depend on the world price indirectly however. Central to this paper's discussion will be tariffs and subsidies. These will be denoted by  $\tau_i$  and  $\tau_i^*$ , where  $\tau_i < 1$  denotes an import subsidy or an export tax and  $\tau_i > 1$  denotes a tariff or an export subsidy.<sup>9</sup> Thus, domestic prices in the home country in sector  $i$  will be:

$$(2.7) \quad p_i = \tau_i p_i^w$$

Given the trade policy schedules  $\tau$  and  $\tau^*$ , the elements of  $p^w$  adjust so as to satisfy Equation 2.6 and clear world markets.

Given a trade policy vector, we can also determine net domestic government revenue as:

$$(2.8) \quad R(\tau, p^w) = \sum_{i=1}^n (\tau_i - 1) p_i^w \left[ \sum_{j \in L} d_{ij}(\tau_i p_i^w) - X_i(\tau_i p_i^w) \right]$$

where  $d_{ij}()$  is the demand of individual  $j$  for good  $i$  as a function of the domestic price. Each agent in the domestic economy receives  $R/L$  in a transfer from the government.  $R$  could be negative, in which case the government would collect  $R/L$  in payments from each agent. The foreign revenue is defined in parallel fashion and agents in the foreign economy receive  $R^*/L^*$ .

Next, the welfare of the populace can be defined. Summing Equation (2.5) over all agents in the economy and substituting the elements of every agent's income, the welfare of the populace is:

$$(2.9) \quad W(\tau, p^w) = L + \sum_{i=1}^n \Pi_i(\tau_i p_i^w) + R(\tau, p^w) + S(\tau, p^w)$$

This equation combines labor earnings, earnings from shares in profitable industries, net tariff revenue, and total consumer surplus from non-numeraire goods.  $W$  is the function that a government would work to maximize if it functioned solely in the public interest. However, this paper follows Grossman and Helpman (1992, 1993) in assuming that governments also benefit from political contributions. Only a subset of industries will be represented by lobbies and it is these lobbies that will make political contributions to

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<sup>9</sup>This is the convention used by Grossman and Helpman (1992, 1993) and is most useful for discussing their results. Later, the linear example will use a specific tariff.

maximize the welfare of those they represent.<sup>10</sup> In fact, behind the industries are shareholders, whose welfare depends on the profits of the industry in which they hold stock, on the prices of goods they consume and on their contributions. Therefore, a lobby  $i$  will pressure the government for higher prices for goods produced by the represented industry (higher  $\tau_i$ ) and lower prices for all other goods (lower  $\tau_j$  for all  $j \neq i$ ). Let  $L_i < L$  be the number of domestic agents represented by lobby  $i$ . We can define  $\alpha_i = (L_i / L)$  as the fraction of the population represented by lobby  $i$ . Further, let

$$(2.10) \quad \alpha = \sum_{i \in \Theta} \alpha_i$$

be the fraction of the population represented by any lobby, where  $\Theta$  is the set of all industries represented by a lobby.

### B. The lobbying framework.

Let  $W^i$  represent the sum of the welfare of all the shareholders represented by lobby  $i$ . We will assume that lobby  $i$  makes contributions to the government to maximize  $W^i$ . It does this by offering the government a contribution schedule,  $C_i(\tau, \tau^*)$ , contingent on both domestic and foreign trade policy. The schedules are shown by Grossman and Helpman in equilibrium to be truthful in the following specific sense:<sup>11</sup>

$$(2.11) \quad \frac{\partial C_i}{\partial \tau_j} = \frac{\partial W^i}{\partial \tau_j} \quad \text{and} \quad \frac{\partial C_i}{\partial \tau_j^*} = \frac{\partial W^i}{\partial \tau_j^*} \quad \text{for all } j.$$

Thus, the actual level of the contribution will be:

$$(2.12) \quad C_i(\tau, \tau^*) = W^i(\tau, \tau^*) - B_i$$

where  $B_i$  is a sector-specific positive constant that emerges from the bidding equilibrium. These schedules are only observable within a country.

The final element of this framework is the government welfare function. It will be assumed that the domestic government (and foreign government, in parallel fashion) maximizes a weighted sum of contributions and general welfare:

$$(2.13) \quad W^G(\tau, \tau^*) = aW(\tau, \tau^*) + \sum_{j \in \Theta} C_j(\tau, \tau^*)$$

through its choice of policy instruments,  $\tau$ , and through persuasion of the foreign government to alter  $\tau^*$ , if that is possible. The parameter  $a$  indexes the extent to which the government cares about the welfare of the populace, relative to contributions. By substituting Equation 2.12 into Equation 2.13, one can see that agents who are represented

<sup>10</sup>The issues of collective action and free ridership in contributing to lobbying efforts will not be addressed here. This paper takes the existence of contributing lobbies as exogenous.

<sup>11</sup>Grossman and Helpman (1992) draw on the work of Bernheim and Whinston (1986b) and show that rational behavior requires lobbies bids to meet this criterion in the neighborhood of equilibrium & local truthfulness. Both Grossman and Helpman and this paper also assume & global truthfulness, which can be shown to be among a lobby's set of best response strategies to any opponents' strategies.



by lobbies effectively have their welfare assigned a weight  $(1+a)$ , whereas those agents who are unrepresented receive the weight  $a$ .<sup>12</sup> Previous attempts at modeling political economy have started from the assumption that the government maximizes such an unevenly weighted objective function.<sup>13</sup> The merit of the Grossman-Helpman model lies in the foundation it provides for this weighting scheme.

### C. Large country solutions

With this model, Grossman and Helpman (1993) describe two trade policy equilibria. In the first, they restrict contribution schedules to be contingent solely on the domestic trade policy vector  $\tau$  and solve for the *non-cooperative Nash equilibrium*. The domestic government chooses  $\tau$  to maximize  $W^G$ , taking  $\tau^*$  as given. Similarly, the foreign government maximizes  $W^{G*}$ , taking  $\tau$  as given. Each of these operations defines a reaction function and the solution for a sector  $i$  is:

$$(2.14)^{14} \quad \tau_i - 1 = -\frac{I_{i0} - \alpha}{a + \alpha} \frac{X_i}{p_i^w M_i'} + \frac{1}{e_i^*}$$

where  $I_{i0}=1$  if sector  $i$  is represented by a lobby and 0 otherwise;  $M_i$  are net imports in sector  $i$ ; and  $e_i^* \equiv (\tau^* p_i^w M_i^*) / M_i^*$ , the foreign import demand or export supply elasticity. Note that  $M_i'$ , the change in net imports due to an increase in price, will be negative. Thus, the greater the weight placed on general welfare,  $a$ , the lower the production in sector  $i$ ,  $X_i$ , and the more elastic foreign import demand or export supply, the lower the equilibrium value of  $\tau_i$  (i.e., the greater the spur to trade in sector  $i$ ). Further, the greater the percentage of consumers represented by lobbies,  $\alpha$ , the lower the equilibrium value of  $\tau_i$ , to the point where if all consumers are represented and  $\alpha = 1$ , then the government will impose the classical optimal tariff or export tax.

Next we consider a *cooperative equilibrium*. Now contributions may be contingent on both  $\tau$  and  $\tau^*$ . We assume that transfers between countries are possible and that the solution maximizes joint welfare:<sup>15</sup>

$$(2.15) \quad P(\tau, \tau^*) \equiv a^* W^G(\tau, \tau^*) + a W^{G*}(\tau, \tau^*)$$

Because world prices,  $p^w$ , adjust to clear global markets, only the *relative* levels of  $\tau$  and  $\tau^*$  affect production, profits, and consumption in each country. In other words, if the exporting country imposes a subsidy on its export good and the importing country imposes

<sup>12</sup>There is also the industry-specific constant term, but this falls out with differentiation. Therefore, the weighting described in the text is equivalent.

<sup>13</sup>For example, Grossman and Helpman cite Hillman (1982) and Long and Voutsden (1991). See also Krugman (1993).

<sup>14</sup>This is Equation 17 from Grossman and Helpman (1993). The solution for the foreign country is analogous.

<sup>15</sup>Because of the linearity of welfare in this model, the weights in Equation 2.15 are necessary so as to equalize the welfare value of a transfer across countries.

a countervailing tariff, the world price would fall to leave the domestic prices in each country unchanged. Since production, profits and consumption depend only on these domestic prices, they too would be unchanged. The absolute levels of  $\tau$  and  $\tau^*$  only determine tariff revenue or subsidy cost and thus the amount of the transfer between countries. [For this reason, no transfers are actually necessary, since the same end can be achieved through adjusting the absolute levels of the trade policy instruments]. The cooperative equilibrium is thus:

$$(2.16)^{16} \quad \tau_i - \tau_i^* = \left[ -\frac{I_{i\Theta} - \alpha}{a + \alpha} \frac{X_i}{p_i^w M_i^*} \right] - \left[ -\frac{I_{i\Theta}^* - \alpha^*}{a^* + \alpha^*} \frac{X_i^*}{p_i^{*w} M_i^{*'}} \right]$$

This is very similar to Equation 2.14 with respect to the effects of the different variables on trade policy. The principal change is that terms of trade effects are omitted, since they are negative-sum.

### III. Static Setting

This section will attempt to characterize and interpret these equilibria both as they are presented above and with a restriction disallowing export subsidies. A first important aspect to note about the tariff equilibria in the previous section is that they are determined only by aggregate variables and by the characteristics of the sector in question. If a home export industry  $i$  is large and stands to profit a great deal from a price increase, it lobbies for an export subsidy or a reduction in the foreign tariff in sector  $i$ . In the non-cooperative case, described by Equation 2.14, it will receive the subsidy if terms-of-trade concerns are relatively unimportant. In the cooperative case, described by Equation 2.16, the relative strength of the export industry  $i$  at home and the import-competing sector  $i$  abroad will determine whether there is net trade promotion or impedance in sector  $i$  (see below for a symmetric reference case). In neither case does the lobby for industry  $i$  press for liberalization in home sector  $j$  in exchange for foreign liberalization. This is because the government is assumed to have sufficient instruments at its disposal to satisfy each sector independently of the others.

This section will consider the equilibrium outcomes of the model in a benchmark symmetric setting in which countries and sectors are identical in all respects except for their supply schedules. In an export sector, an industry supplies more at a given price than its foreign counterpart industry. In an import sector, the reverse holds.<sup>17</sup> Of the many sectors in the economy, we initially posit that there are two represented sectors, 1 and 2, in each country. We assume that:

<sup>16</sup>This is Equation 26 from Grossman and Helpman (1993).

<sup>17</sup>This could be due to differences in technology or in endowments of the sector-specific factor.

$$(3.1) \quad X_1(p) = X_2^*(p) > X_2(p) = X_1^*(p) \quad \forall p$$

so the home country exports good 1 and imports good 2.

There are four variations to consider: Equilibria with or without export subsidies and with or without cooperation.

### A. With full instruments

#### i. Non-cooperative

In this case, the solution is given by Equation 2.14. We are interested only in the net effect of policy interventions on trade in each sector,  $(\tau_1^* - \tau_1)$  or  $(\tau_2 - \tau_2^*)$ . If these terms are positive, then there is net trade protection. Let us consider good 2, where the home country is an importer.<sup>18</sup> If we assume that the two countries have equal weights placed on general welfare, ( $a=a^*$ ); equal percentages of agents represented by lobbies, ( $\alpha=\alpha^*$ ); and equal import demand or export supply slopes, ( $M_1' = M_1'^*$ ),<sup>19</sup> the difference in tariffs will be given by:

$$(3.2) \quad \tau_2 - \tau_2^* = \left[ -\frac{1-\alpha}{(a+\alpha)p_2^w M_2'} \right] (X_2 - X_2^*) + \frac{1}{e_2^*} - \frac{1}{e_2}$$

The bracketed term is positive, since  $0 < \alpha < 1$  and  $M_2' < 0$ .

To interpret this result, we can look at two extremes. First, if we assume for a moment that there is no lobbying for consumer interests ( $\alpha \approx 0$ )<sup>20</sup> and that a very high weight is placed on contributions relative to general welfare ( $\cong a$  near zero), then the first term of Equation 3.2 will dominate the elasticity terms. By assumption,  $X_2^* > X_2$  since the foreign country is the exporter so  $\tau_2 - \tau_2^*$  would be negative. In other words, the export subsidy in the foreign country on good 2 would exceed the domestic tariff on good 2, so the net effect of trade intervention across the two countries is to promote trade.

On the other hand, if we assume that political contributions played a very small role in government welfare relative to the welfare of the general populace ( $\cong a$  would be very large), then the first term becomes insignificant and the two elasticity terms predominate. The first of these terms contains the foreign export supply elasticity, which is positive. The second contains the domestic import demand elasticity, which is negative. These terms

<sup>18</sup>Because of symmetry, home country (importer) solutions for good 2 are identical to foreign country (importer) solutions for good 1. Equally, foreign country (exporter) solutions for good 2 are identical to home country (exporter) solutions for good 1. Therefore, only good 2 will be discussed.

<sup>19</sup>The changes in net imports with respect to the domestic price need not be equal across countries, particularly because domestic prices will differ between countries if  $\tau \neq 1$ . However, the assumption is plausible and it is easy to see how the equilibrium would change with deviations from this assumption. These symmetry conditions will be used from this point on in the paper.

<sup>20</sup>This would happen if the percentage of all consumers represented by lobbies (through their ownership of shares in politically-represented industries) were trivially small.

represent the classical terms of trade considerations in tariff setting and each works for net trade impedance.

Thus, in the symmetric non-cooperative setting with both export and import policies available to governments, the standard efficiency argument for import tariffs or export taxes encourages net trade protection whereas lobbying encourages net trade promotion. Which effect predominates will depend on the weight the government places on general welfare relative to lobbying contributions, but the fact remains that introducing political economy considerations promotes rather than restricts trade.

## ii. Cooperative

If we apply the same symmetry assumptions to Equation 2.16, the net trade policy will be:

$$(3.3) \quad \tau_2 - \tau_2^* = \left[ -\frac{1 - \alpha}{(a + \alpha)p_2^w M_2'} \right] (X_2 - X_2^*)$$

This solution is identical to that in Equation 3.2, only it is missing the elasticity terms. This is because the costs of tariffs or export taxes imposed to alter the terms-of-trade exceed the benefits when both countries' welfare is taken into account; i.e., the terms-of-trade effects of trade restrictions are &beggar-thy-neighbor policies and cooperation ensures they will not be used.

As discussed above, the right-hand side of Equation 3.3 is negative as long as  $X_2^* > X_2$ . Thus, in the symmetric cooperative case, lobbying is clearly a force for net trade promotion. One might still observe a tariff in the home (importing) country; it would just be exceeded by a foreign export subsidy. Whether a tariff is countered by an export subsidy, or an import subsidy exceeds an export tax, depends on the absolute levels of  $\tau_2$  and  $\tau_2^*$ . These are set so as to effect a transfer between the countries (the higher the level of  $\tau_2$  and  $\tau_2^*$ , holding their difference constant, the greater the transfer to the importing country). If, as is assumed here, there are two such sectors so that the transfer in one will exactly offset the transfer in the other, then the absolute levels will be indeterminate.

## **B. Limiting export instruments**

For reasons given earlier, we now modify the model to assume that governments cannot apply export taxes or subsidies ( $\tau_1 = \tau_2^* = 1$ ). Since the relationship between net protection and profits is unchanged for both import-competing and exporting industries, the lobbying schedules will offer the same contributions per level of net protection. Again, we examine non-cooperative and cooperative solutions.

### i. Non-cooperative

In the non-cooperative setting, neither government can do anything to affect the profits (or contributions) of their export industries, since the only relevant policy variable for the export industry is the foreign tariff. Therefore, each government sets its tariff so as to balance general welfare and consumer lobbying against contributions from the import-competing sector. The resulting net protection is:

$$(3.4) \quad \tau_2 - 1 = \left[ -\frac{1 - \alpha}{a + \alpha} \frac{X_2}{p_2^w M_2'} \right] + \frac{1}{e_2^*}$$

where  $e_2^* > 0$  since the foreign country is assumed to export good 2. The right-hand side is unambiguously positive. Here both the first term, which represents the effects of lobbying, and the second, which represents the terms-of-trade effects, are positive. This is the only case of the four permutations in which there is unambiguous net trade protection and in which political economy serves to heighten levels of protection.

#### ii. Cooperative - reciprocal import subsidies

Under the cooperative solution without export subsidies, the same net trade protection is achieved as with export subsidies:

$$(3.5) \quad \tau_2 - 1 = \left[ -\frac{1 - \alpha}{(a + \alpha)p_2^w M_2'} \right] (X_2 - X_2^*)$$

This is the constrained version of Equation 3.3. The indeterminacy in the absolute levels of the policy variables is now removed, however, and  $\tau_2 = \tau_1^* < 1$  so long as the exporting country produces more than the importing country for each product. In other words, each nation applies an import subsidy under full cooperation.

This represents the effect of export-interest lobbying on trade liberalization. In the cooperative equilibrium, the countries not only remove their tariff barriers but subsidize imports solely in order to win the same treatment abroad for their represented export industry. The export interests do not explicitly press for a reduction in their country's tariffs; their contributions are still contingent on the foreign tariff or subsidy that they face. However, the only means for achieving a drop in foreign barriers is a reciprocal drop in domestic barriers.<sup>21</sup>

The absence of export subsidies forces each government to weigh the interests of its represented exporters against those of its represented import-competing industry. Because

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<sup>21</sup>No variables characterizing the strength of the home country's export interests appear explicitly in Equation 3.5 because of the symmetry of the model. In a sense, they do appear since the foreign export interests are identical to the domestic export interests. In an asymmetric model, one would need a different solution concept, such as the Nash Bargaining Solution, in order to determine the allocation of the benefits of cooperation between countries.

exporters are larger and have more to gain from a price change than import-competing firms have to lose, they prevail and governments provide reciprocal trade subsidies.

### C. Unrepresented sectors

Curiously, if we examine cooperative equilibria in which the domestic and foreign producers in the sector in question are politically unrepresented (i.e., are unable to lobby), the results reverse themselves. One can easily derive the following value of the equilibrium cooperative tariff without export subsidies from Equation 2.16:

$$(3.6) \quad \tau_2 - 1 = \left[ \frac{\alpha}{(a + \alpha)p_2^w M_2'} \right] (X_2 - X_2^*)$$

The sign is now reversed from Equation 3.5, so the two countries apply a reciprocal positive tariff. If export policies were permitted, there would be net protection, although the actual levels of the policies would depend on the transfer between countries:

$$(3.7) \quad \tau_2 - \tau_2^* = \left[ \frac{\alpha}{(a + \alpha)p_2^w M_2'} \right] (X_2 - X_2^*)$$

Thus, symmetrically unrepresented sectors win protection while symmetrically politically represented sectors do not.<sup>22</sup>

The explanation for this paradoxical result is that in both of these cooperative equilibria, the unrepresented producers are losing  $\Delta$  to represented interests who gain from tariff revenue and from lower prices for the country's export good. When both exporting producers and import-competing producers are represented, the pressure for net trade promotion by the exporters exceeds the pressures for protection. When neither is represented, consumer interests in each country prevail and gain lower prices for the export goods as well as tariff revenue.

Finally, when export taxes and subsidies are available, with the counterpart to Equation 3.2 one can see that the non-cooperative solution for unrepresented industries will unambiguously entail net trade protection:

$$(3.8) \quad \tau_2 - \tau_2^* = \left[ \frac{\alpha}{(a + \alpha)p_2^w M_2'} \right] (X_2 - X_2^*) + \frac{1}{e_2^*} - \frac{1}{e_2}$$

Each term of the right-hand side is now positive.

Without export taxes or subsidies, the non-cooperative policy on imports will be a tariff or a subsidy, depending on whether terms-of-trade or political-economy concerns prevail:

<sup>22</sup>The conditions for this to hold are the same symmetry conditions described earlier. Note also that if no lobbies pursued their clients' consumer interests, then  $\alpha = 0$  and there is free trade in unrepresented sectors.

$$(3.9) \quad \tau_2 - 1 = \left[ \frac{\alpha}{a + \alpha} \frac{X_2}{p_2^w M_2'} \right] + \frac{1}{e_2^*}$$

The first term is negative (since  $M_2' < 0$ ) and the second term is positive.

#### D. Restoring net trade protection

It is possible to observe net protection as a result of lobbying in the original Grossman-Helpman model. It was shown in the symmetric case above that in the *non-cooperative* equilibria without export instruments, net trade protection would result.

However, since there has clearly been a history of cooperation in lowering international trade barriers, this is not a wholly satisfactory explanation. There are also two principal deviations from the symmetric case described above that could lead to positive tariffs.

First, one could relax the assumption that exporters produced more than import-competing producers. If  $X_2 > X_2^*$  in Equations 3.2, 3.3 or 3.5, other things equal, then the effects of lobbying will be reversed. The new assumption, under which exporters would produce less than import-competing industries, could be justified by an asymmetry in preferences; each country would need to have a greater demand than the other for its own import good.

Second, one could introduce other asymmetries into Equations 3.2, 3.3 or 3.5. These could include a greater emphasis on general welfare in one country ( $a > a^*$ , e.g.) or different degrees of political representation ( $\alpha > \alpha^*$ ). These changes would make one country more likely to impose protection in all sectors, however. To the extent that the predicted policies for one country became more plausible, the predicted policies for the other country would become less plausible.

None of these modifications is particularly satisfactory as a general explanation of protection. While disallowing export subsidies does compel governments to balance export interests against import-competing interests, the net result is implausible: In symmetric cooperative settings in which the larger producer exports, political economy emerges as a force for trade promotion.

### IV. Infinitely Repeated Game — Algebraic Results

The implausible levels of trade promotion that can emerge from the Grossman and Helpman model represent the extreme of full cooperation. The previous section also discussed the alternate extreme of no cooperation, which does entail positive tariffs when export subsidies are disallowed. With a linear version of the model in which export taxes and subsidies are not available, this section will describe the cases in between when only limited cooperation is supportable in a repeated game.

### A. Modifications in assumptions

We retain the assumption of two countries with two symmetric represented sectors. For tractability, we now assume that the supply function,  $X(p)$ , takes one of two linear forms. For exporters:

$$(4.1) \quad X(p) = \frac{p - \beta_L}{\phi}$$

For import-competing firms:

$$(4.2) \quad X(p) = \frac{p - \beta_H}{\phi}$$

where  $p$  is the price faced by the agent in question,  $\phi$ ,  $\beta_L$  and  $\beta_H$  are positive constants, and  $\beta_L < \beta_H$ .

The linear demand functions will be identical across sectors and countries:

$$(4.3) \quad D(p) = \frac{\chi - p}{\gamma}$$

where  $\chi$  and  $\gamma$  are positive constants.

Without loss of generality, we now assume that tariffs or import subsidies are specific, rather than ad valorem. Therefore  $p + \tau$  will be the price in the importing country (provided  $\tau$  is non-prohibitive) and  $p$  the price in the exporting country. However,  $p$  will be a function of  $\tau$  since both countries are large. In equilibrium, the exporting country faces the market-clearing world price:

$$(4.4) \quad p = \frac{2\phi\chi + \gamma(\beta_L + \beta_H)}{2(\phi + \gamma)} - \frac{\tau}{2}$$

while the importing country consumers and producers face price  $p + \tau$ . We will impose the restriction on the parameters that both the import-competing industry and the exporting industry will produce under free trade (see Appendix).

The welfare of the populace,  $W(\tau, \tau^*)$  is the sum of consumer surplus, producer surplus (profits), and tariff revenue. The government maximizes a weighted sum of this and political contributions as in Equation 2.13.

### B. Nature of the Game

To ascertain the limits of cooperation, we assume that there is no external enforcement mechanism, so any cooperative agreement must be self-enforcing. There is a unique non-cooperative Nash equilibrium in this tariff-setting game. In this non-cooperative equilibrium each country adopts a positive tariff as described by Equation



3.4.<sup>23</sup> However, if countries engage in repeated play, the possibility arises that some cooperation can be sustained. The governments would wish for an agreement that went beyond free trade to reciprocal import subsidies, as in Equation 3.5. Whether such an agreement would be self-enforcing would depend on the governments' discount factors and punishment strategies. We explore this issue in an infinitely repeated game in which the threat of punishments in future periods induces countries to adopt cooperative tariff levels.<sup>24</sup>

We assume that the setting is stationary. Lobbies base their contribution schedules on current-period policy variables. The contributions of the export industry are contingent on the current period foreign tariff while the contributions of the import industry are contingent on the current period domestic tariff.<sup>25</sup> Neither country can observe the other's contribution schedules.

After lobbies have submitted their contribution schedules each period, governments determine the tariff levels they will apply. Governments are aware of the stationarity of the environment in which they operate and are thus able to calculate the discounted present value of their welfare (contributions and general welfare) under cooperative or non-cooperative play. We restrict our consideration of government strategies here to symmetric stationary subgame-perfect solutions. We focus in particular on the strategy in which each country applies a cooperative tariff,  $\tau_C$  (lower than the Nash non-cooperative tariff,  $\tau_N$ ) unless either government applies a different tariff, after which point both countries would apply  $\tau_N$  for every period thereafter.<sup>26</sup>

Infinite reversion to  $\tau_N$  by both players would imply a relative welfare loss in all future periods. A country would only incur such a loss if it were exceeded by the immediate gain from defecting to its optimal tariff ( $\tau_N$ ) when the other country imposes the cooperative tariff. So long as the cooperative tariff is different from  $\tau_N$ , each country could gain (gross of punishment) from imposing  $\tau_N$ . Out of the set of cooperative tariffs for

<sup>23</sup>A convenient feature of the model is that this tariff is the optimal non-cooperative solution independent of the other country's actions.

<sup>24</sup>The difficulty with a finitely repeated game is that cooperation will be untenable in the last period, so there will be no punishment for deviations in the next-to-last period and cooperation will be untenable. This reasoning can be repeated until cooperation is seen to be untenable in the first period. If there were multiple Nash equilibria (e.g., if autarky were a Nash equilibrium) then cooperation may be sustainable in a finitely repeated game [see Dixit (1987) and Benoit and Krishna (1985)], but that is not the case here.

<sup>25</sup>For simplicity, we set  $\alpha = \alpha^* = 0$ , so that lobbies do not press for price reductions as consumers. This means that lobbies can only represent shareholders' business interests and not their consumption interests. An inspection of Equations 2.14 and 2.16 reveals that this will have little qualitative effect on the outcome in a symmetric case. Note also that consumer interests are still represented in government welfare, they just receive weight  $\alpha$  rather than  $(1+\alpha)$ .

<sup>26</sup>There do exist more severe punishment strategies which could support greater cooperation. The effect of adopting such a strategy in lieu of the strategy in the text would be to allow a lower discount factor for any given level of cooperation (or greater cooperation for a given discount factor).

which each country's immediate payoff to imposing  $\tau_N$  is less than or equal to its loss in all future periods from playing  $\tau_N$  rather than the cooperative tariff, we define  $\tau_C$  as the tariff closest to the jointly optimal level.<sup>27</sup>

To formalize this, we return to the notation of Section II where  $W^G(\tau, \tau^*)$  represents the home government's welfare in a period as a function of its own and the foreign tariff.<sup>28</sup> Symmetry implies that the cooperative and non-cooperative solutions for each country will be identical, so we omit the asterisks. From the definitions above, we derive the following ordering:

$$(4.5) \quad W^G(\tau_N, \tau_C) > W^G(\tau_C, \tau_C) > W^G(\tau_N, \tau_N) > W^G(\tau_C, \tau_N)$$

for any cooperative tariff  $\tau_C < \tau_N$ .

The one-time gain for a country from defecting and imposing its optimal tariff,  $\tau_N$ , is:

$$(4.6) \quad \Omega(\tau_C) \equiv W^G(\tau_N, \tau_C) - W^G(\tau_C, \tau_C)$$

Since  $W^G$  is strictly increasing in the domestic tariff for  $\tau < \tau_N$ ,  $\Omega$  increases as  $\tau_C$  falls.

The payoff to cooperation is  $W^G(\tau_C, \tau_C) - W^G(\tau_N, \tau_N)$  in every ensuing period. Let  $\delta$  represent the government's discount factor.<sup>29</sup> Then the benefit of not defecting and maintaining cooperation in future periods is:

$$(4.7) \quad \omega(\tau_C) \equiv \frac{\delta}{1 - \delta} [W^G(\tau_C, \tau_C) - W^G(\tau_N, \tau_N)]$$

It can also be shown that  $\omega$  is increasing as  $\tau_C$  falls.

Clearly, when  $\tau_C = \tau_N$ , then  $\omega = \Omega$ . It will be shown below that if cooperation is sustainable, there exists a second, lower value of  $\tau_C$  for which  $\omega = \Omega$ . That value will be the lowest supportable tariff,  $\tau_C$ .

### C. Solutions

<sup>27</sup>We will generally assume that the government discount factor is such that there is no slack in the incentive constraint, in which case  $\tau_C$  is the lowest supportable tariff.

<sup>28</sup>This discussion will deal with home country welfare, although it applies equally to the welfare of the foreign country because of the assumed symmetry.

<sup>29</sup>We assume  $0 < \delta < 1$ . Note that since this is a government's discount factor, it need bear no relation to any interest rate. To the extent one believes that governments are more concerned with the short run than the average economic agent, one would expect  $\delta$  to be lower than the standard discount factor. Dixit (1987, p.340) writes: 'There is much evidence that governments, especially democratic ones, have very short time horizons and correspondingly high discount rates.'

Given truthful lobbying and linearity, government welfare takes the form:

$$(4.8) \quad W^G(\tau, \tau^*) = (1+a) \frac{(p + \tau - \beta_H)^2}{2\phi} + a \frac{(\chi - p - \tau)^2}{2\gamma} + a\tau \left( \frac{(\chi - p - \tau)}{\gamma} - \frac{(p + \tau - \beta_H)}{\phi} \right) \\ + (1+a) \frac{(p^* - \beta_L)^2}{2\phi} + a \frac{(\chi - p^*)^2}{2\gamma}$$

where  $p$  is the price of the Home import good defined in Equation 4.4, and  $p^*$  is the price of the Home export good, similarly defined but dependent on  $\tau^*$ .

Holding the foreign tariff constant, we can solve for the non-cooperative tariff:

$$(4.9) \quad \tau_N = \begin{cases} \gamma \frac{(\beta_H - \beta_L)(a\phi - \gamma + a\gamma) + 2\phi(\chi - \beta_H)}{(\phi + \gamma)(3a\phi - \gamma + 3a\gamma)} & \text{for } a \in [\bar{a}, \infty) \\ \frac{\gamma(\beta_H - \beta_L)}{(\phi + \gamma)} & \text{for } a \in [0, \bar{a}] \end{cases}$$

The first term is the unconstrained value and is decreasing in  $\bar{a}$  (see Appendix). The second term is the prohibitive tariff, which we can call  $\tau_N$ . We define  $\bar{a}$  as the level of  $\bar{a}$  such that the first term equals the second. As in Section III, in a non-cooperative setting both import-competing interests and standard optimal-tariff motives argue for a positive tariff.

The fully cooperative tariff is:

$$(4.10) \quad \tau_C^f = \frac{(\beta_H - \beta_L)\gamma}{\gamma - a(\phi + \gamma)}$$

Fulfillment of the second-order condition ensures that this will be an import subsidy (see Appendix).

To solve for the lowest supportable tariff,  $\tau_C$ , we set  $\omega(\tau_C) = \Omega(\tau_C)$ . This yields a quadratic equation in  $\tau_C$ , for which one of the two solutions is  $\tau_C = \tau_N$ . The other solution is:<sup>30</sup>

$$(4.11) \quad \tau_C = \frac{\begin{bmatrix} 4\phi\beta_H\gamma - 4\phi\chi\gamma + 4\phi\beta_H\Delta\gamma - 4\phi\beta_L\Delta\gamma + 2\beta_H\gamma^2 - 2\beta_L\gamma^2 \\ + 4\beta_H\Delta\gamma^2 - 4\beta_L\Delta\gamma^2 + \tau_N(-\phi\gamma - 2\phi\Delta\gamma - \gamma^2 - 2\Delta\gamma^2) \\ + a(-2\phi\beta_H\gamma + 2\phi\beta_L\gamma - 2\beta_H\gamma^2 + 2\beta_L\gamma^2) \\ + a\tau_N(3\phi^2 + 2\phi^2\Delta - 6\phi\gamma + 4\phi\gamma\Delta + 3\gamma^2 + 2\gamma^2\Delta) \end{bmatrix}}{(\phi + \gamma)(3a\phi + 2a\phi\Delta - \gamma + 3a\gamma - 2\Delta\gamma + 2a\Delta\gamma)}$$

<sup>30</sup>For sufficiently low  $\bar{a}$  and  $\Delta$  no cooperation will be supportable and  $\tau_C$  will be equal to  $\tau_N$ . See Section V and Figure 5.3 for a numerical example.

where  $\Delta = \frac{\delta}{1-\delta}$  and  $\tau_N$  is substituted for  $\tau_N$  when  $a < \bar{a}$ . Whether this  $\tau_C = \tau_C$  is a tariff or subsidy cannot be determined without further assumptions about the parameters. However, one can state the following:

**Proposition:** For any  $\bar{a}$ , there exists a critical discount factor  $\Delta(\bar{a})$  below which the cooperative tariff falls with the weight placed on general welfare and above which the cooperative tariff rises with the weight on general welfare.

**Proof:** We consider two cases.

Case I:  $a > \bar{a}$ . At  $\Delta=0$ , it can be shown from Equation 4.11 that the cooperative solution is identical to the non-cooperative solution. From Equation 4.9, the non-cooperative solution  $\tau_N$  falls as  $\bar{a}$  rises over this range of  $\bar{a}$ . Since  $\tau_C = \tau_N$  at  $\Delta=0$  then  $\frac{\partial \tau_C}{\partial a} < 0$ .

Let  $\Delta^f(a)$  denote the lowest value of  $\Delta$  sufficient to support  $\tau_c^f$ . From Equation 4.10,  $\tau_c^f$  rises towards 0 as  $\bar{a}$  rises, so for  $\Delta \neq \Delta^f$  we have  $\frac{\partial \tau_C}{\partial a} > 0$ . The derivative  $\frac{\partial \tau_C}{\partial a}$  is continuous in  $\Delta$ , the denominator of  $\frac{\partial \tau_C}{\partial a}$  is positive for all  $\Delta$ , and the numerator of  $\frac{\partial \tau_C}{\partial a}$  is a quadratic in  $\Delta$ . However, since  $\frac{\partial \tau_C}{\partial a}$  changes sign between  $\Delta=0$  and  $\Delta=\Delta^f(a)$ , given a value of  $\bar{a}$ , there is one and only one  $\Delta$  for which  $\frac{\partial \tau_C}{\partial a} = 0$ , and this  $\Delta$  lies in  $(0, \Delta^f(a))$ . Below this  $\Delta$ ,  $\frac{\partial \tau_C}{\partial a} < 0$  and above  $\Delta$ ,  $\frac{\partial \tau_C}{\partial a} > 0$ .  $\Delta$  is a function of  $\bar{a}$  because  $\tau_N$  is a function of  $\bar{a}$ .<sup>31</sup>

Case II:  $a < \bar{a}$ . In this case  $\tau_N$  is prohibitive. We limit the range to  $\bar{a}$  and  $\Delta$  sufficiently large that some cooperation is sustainable (see footnote 48).  $\frac{\partial \tau_C}{\partial a}$  is continuous in  $\Delta$  over this range, the denominator is positive in this range and the numerator is a quadratic in  $\Delta$ , as in the previous case. At the boundary point of  $\bar{a}$  and  $\Delta$  where cooperation just becomes sustainable, the one-sided derivative  $\frac{\partial \tau_C}{\partial a} < 0$  (since if it were positive when  $\tau_C = \tau_N$ , it would not be a boundary point). As before, when  $\Delta \neq \Delta^f$ ,  $\frac{\partial \tau_C}{\partial a} >$

<sup>31</sup>See Section V for a numerical example.

0. Therefore, there exists a single  $\bar{\Delta}$  such that  $\frac{\partial \tau_C}{\partial a} = 0$ . Since  $\tau_N$  is not a function of  $\bar{a}$  in this range, linearity ensures that the value of  $\bar{\Delta}$  is independent of  $\bar{a}$ . Q.E.D.

This proposition is equivalent to saying that for  $\Delta < \bar{\Delta}$ , political economy is a force for trade protection while above  $\bar{\Delta}$  it is a force for trade promotion, since  $\bar{a}$  is an inverse measure of the importance of lobbying contributions. While  $\bar{\Delta}$  divides  $\{a, \Delta\}$  space into two parts, one cannot say that for a given  $\Delta$ , increases in  $\bar{a}$  uniformly raise or lower protection (since  $\bar{\Delta}$  depends on  $\bar{a}$ ).

To understand the result, recall that export interests are &more powerful $\Delta$  than import-competing interests, but, unlike import-competing interests, they are dependent on international cooperation to achieve their ends (in the absence of direct export measures). If the governments put sufficiently low weight on future periods, little cooperation is possible and the power of export interests is diminished.

These results will be illustrated through a numerical example in the next section.

## V. Infinitely Repeated Game — Numerical Example and Sectoral Interaction

To this point, the discussion concerning the repeated game between countries has considered only the two represented sectors in the two countries and ignored the other sectors in the economy. This is a legitimate approach in the following three cases:

- a) If the other, unrepresented sectors (aside from the numeraire good) produce non-traded goods;
- b) If the other, unrepresented sectors produce traded goods, but no trade between the two countries in question occurs in these products;
- c) If the two countries in question trade the products from the unrepresented sectors, but if cooperative agreements in those sectors are separable from the cooperative agreement in the represented sectors.

If these conditions do not apply, then we must consider the interaction of represented and unrepresented sectors. In the unrepresented sectors, barring any lobbying on behalf of consumers, the non-cooperative tariff is the standard optimal tariff of the trade literature. The fully cooperative tariff would be zero. As with the represented sectors, a cooperative tariff could be supported by the threat of permanent reversion to the non-cooperative tariff in case of a defection.

However, if the three conditions listed above are unmet, then governments can support more cooperation in one sector by requiring less in another. Consider sectors in pairs, since the benefits to cooperation come in an export sector and the costs in an importing sector. If we index each pair by  $i$ , the new condition for lowest supportable tariffs is:

$$(5.1) \quad \sum_i \omega_i(\tau_{Ci}) = \sum_i \Omega_i(\tau_{Ci})$$

This describes the tradeoff between the lowest supportable tariffs across sectoral pairs. All these cooperative tariffs will be supported by the threat that if a country defects, its trading partner will revert to non-cooperative tariffs in *all* sectors.

While the algebra for solving Equation 5.1 in the general case is complex, the concept is simple and readily illustrated through a numerical example. We assume that every sector is identical, except for the intercept of the supply curve, which takes the value  $\beta_L$  or  $\beta_H$ , thus determining whether the industry exports or competes against imports.

Table 5.1 gives the values of parameters under which the model was solved.

**Table 5.1**

Variable	Assumed Value
$\phi$	0.3
$\gamma$	1
$\chi$	200
$\beta_H$	30
$\beta_L$	10

We will begin with the case in which there is not any further linkage between sectors: a single pair of *represented* sectors, the case described in the previous section. The world price, which will obtain in the exporting country is:

$$(5.2) \quad p = 61.539 - \frac{\tau}{2}$$

To determine tariffs, we need a further assumption about the weight the government places on general welfare,  $\equiv a$ . If we assume  $a=3$  and  $\Delta=0.5$  (implying a discount factor,  $\delta = \frac{1}{3}$ ),

the non-cooperative tariff will be:

$$(5.3) \quad \tau_N = 11.503 \underline{\hspace{1cm}}$$

This is below the prohibitive tariff of  $\tau_N = 15.385$ .

The fully cooperative tariff which maximizes joint welfare will be an import subsidy:

$$(5.4) \quad \tau_c^f = -6.897$$

However, the lowest sustainable cooperative tariff will be:

$$(5.5) \quad \tau_c = 3.656$$

Thus, the fully cooperative solution involves a reciprocal import subsidy, whereas without full cooperation, the effect of export interest lobbying is a significant lowering of the tariff, but not to the point of a subsidy.

To demonstrate how  $\tau_c$  depends on the assumed weights on government welfare and on the discount factor, Figure 5.1 depicts  $\tau_c$  as a function of  $\alpha$ , holding  $\Delta = 0.5$ . Figure 5.2 depicts  $\tau_c$  as a function of  $\Delta$ , holding  $\alpha = 3$ .

**Figure 5.1**

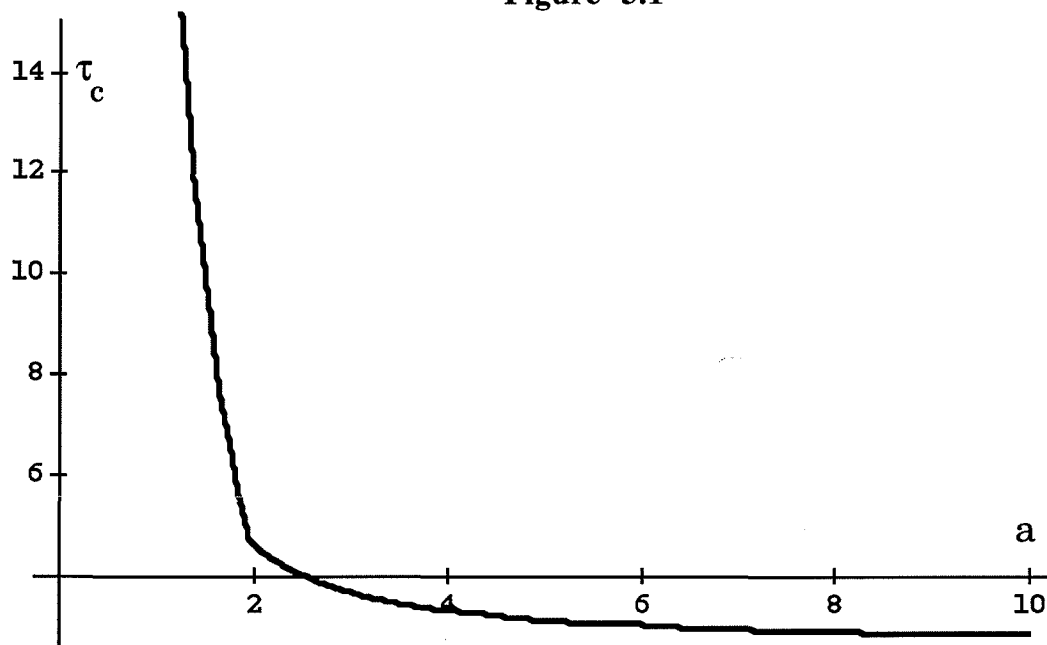


Figure 5.1 depicts the lowest supportable cooperative tariff as a function of the weight the government places on general welfare,  $\alpha$ . The graph is based on  $\Delta = 0.5$  and the parameters in Table 5.1. For  $\alpha < 1.96$ , the non-cooperative tariff solution is the prohibitive tariff.

Figure 5.2

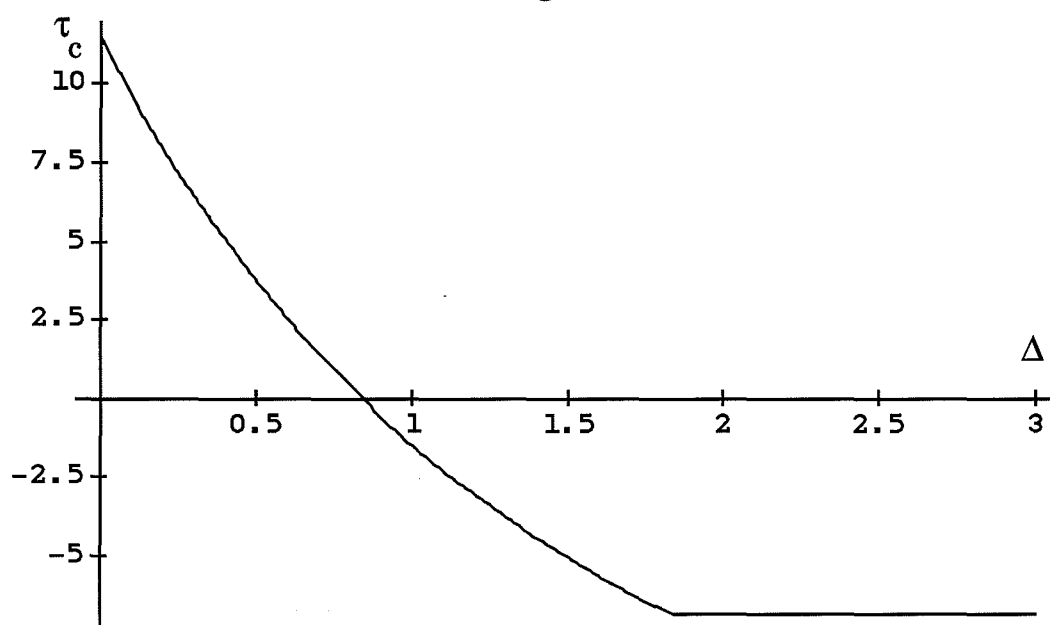


Figure 5.2 shows the lowest supportable cooperative tariff as a function of  $\Delta$ , a measure of the weight the government places on welfare in future periods. The graph is based on  $a=3$  and the parameters in Table 5.1. For  $\Delta=1.84$ , the fully cooperative tariff,  $-6.9$ , is supportable. For  $\Delta > 1.84$  there is slack in the government's incentive constraint. For  $\Delta = 0$ ,  $\tau_c = 11.503$ , the non-cooperative level.

Also in the previous section, the solutions were conditional on  $\alpha$  being sufficiently large. Figure 5.3 demonstrates the extent of this restriction. If  $\alpha < 1.96$ , then one must recalculate the cooperative tariff for  $\tau_N = 15.385$ , the prohibitive level (this is done for Figure 5.1). For any given  $\alpha < 1.96$  there exists a  $\Delta > 0$  such that the lowest sustainable cooperative tariff will be  $\tau = 15.385$  so there can be no trade. This  $\Delta$  falls as  $\alpha$  rises.



Figure 5.3

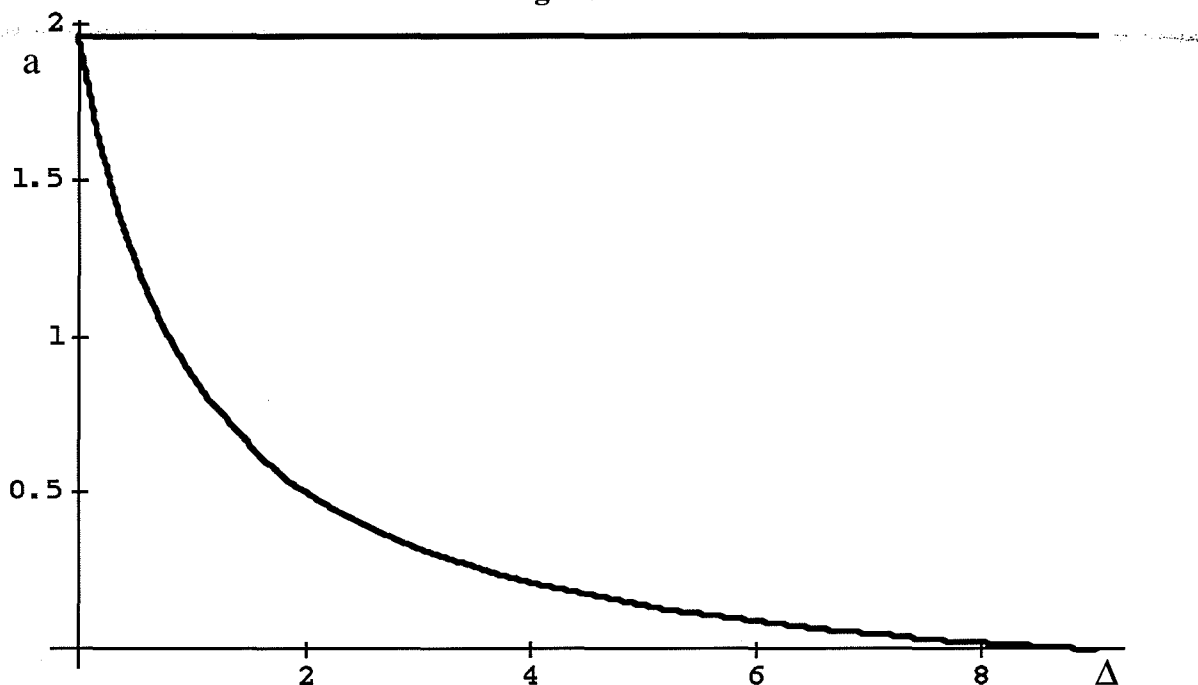


Figure 5.3 shows the ranges of the parameters  $\cong a$  and  $\Delta$  for which corner solutions are a concern. Between the axes and the lower line, no cooperation is sustainable, so both the cooperative and non-cooperative tariffs are at the prohibitive level. Between the two lines, the non-cooperative tariff is prohibitive, but there is trade under cooperation. Above the upper line, for  $a > 1.96$ , the non-cooperative tariff is also low enough to allow trade.

For the area in which  $\tau_N$  is prohibitive, the critical  $\Delta$  described in the previous section is:

$$(5.6) \quad \Delta = 1.847$$

When  $\tau_N$  is not prohibitive ( $a > 1.96$ ),  $\Delta$  is as portrayed in Figure 5.4. Note that at  $a = 1.96$  there is a discontinuity in  $\Delta$ . The difference between at 1.96 and  $a > 1.96$  is due to the linearity of the model and the fact that, for lower  $\cong a$ , changes in  $\cong a$  have no effect on  $\tau_N$  whereas for higher  $\cong a$  they do.

Figure 5.4

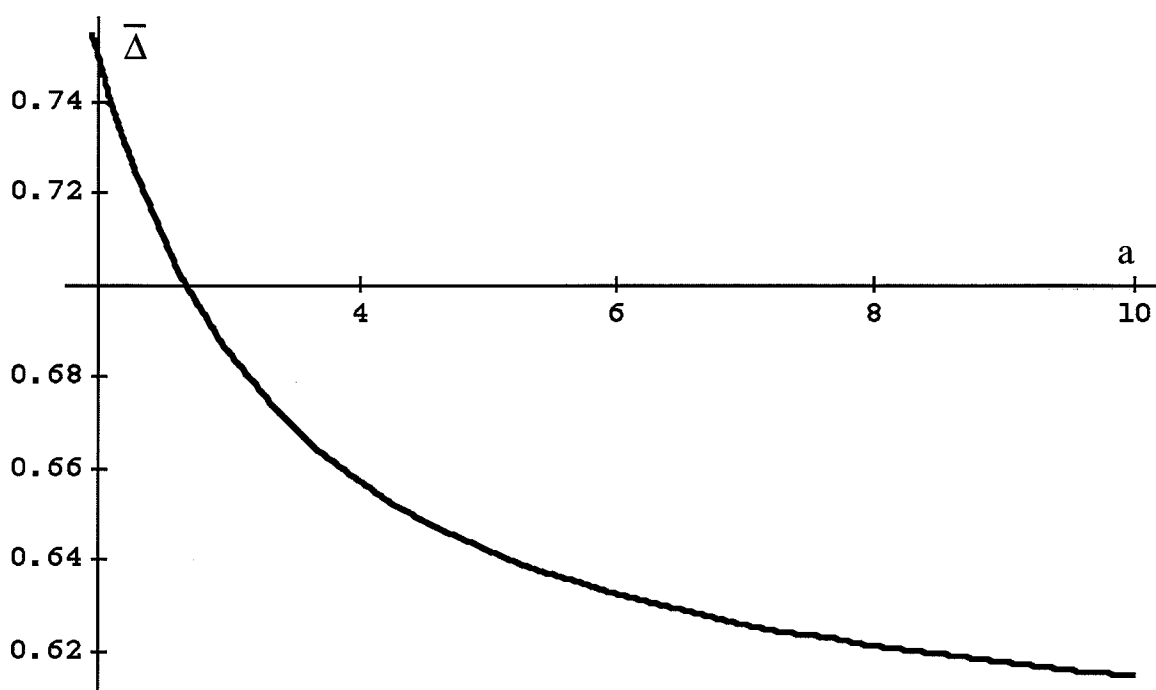


Figure 5.4 shows  $\bar{\Delta}$  as a function of  $\cong a$  for  $a > 1.96$ . In this range, the non-cooperative tariff solution is below the prohibitive level and is influenced by changes in  $\cong a$ . Note that the vertical axis intercepts the horizontal axis at  $a=2$ .

If we now consider an identical pair of sectors which are politically unrepresented, the free trade price will be the same. The non-cooperative tariff in this unrepresented sector (with  $\Delta=0.5$ ) will be:

$$(5.7) \quad \tau_N^u = 5.128$$

The fully cooperative tariff which maximizes joint welfare will be free trade:

$$(5.8) \quad \tau_c^f = 0$$

However, the lowest sustainable cooperative tariff will be:

$$(5.9) \quad \tau_c^u = 2.564$$

Finally we assume that there are a number of identical *unrepresented* sector pairs (10) and one *represented* sector pair.<sup>32</sup> Equation 5.1 implicitly defines a tradeoff between  $\tau_c^u$  and  $\tau_c$ . This tradeoff is depicted in Figure 5.5. Given this tradeoff and symmetry, we can depict  $W^G(\tau_c^u)$ , as is done in Figure 5.6. The new solution that maximizes  $W^G$  (and therefore  $W^{G*}$ ) is:

<sup>32</sup>These numbers only affect the magnitude of the tradeoff between supportable tariff levels. The critical simplifying assumption is that demands and supplies in each of the sectors are identical.

$$(5.10) \quad \tau_c^u = 2.621 \quad \text{and}$$

$$(5.11) \quad \tau_c' = 3.453$$

**Figure 5.5**

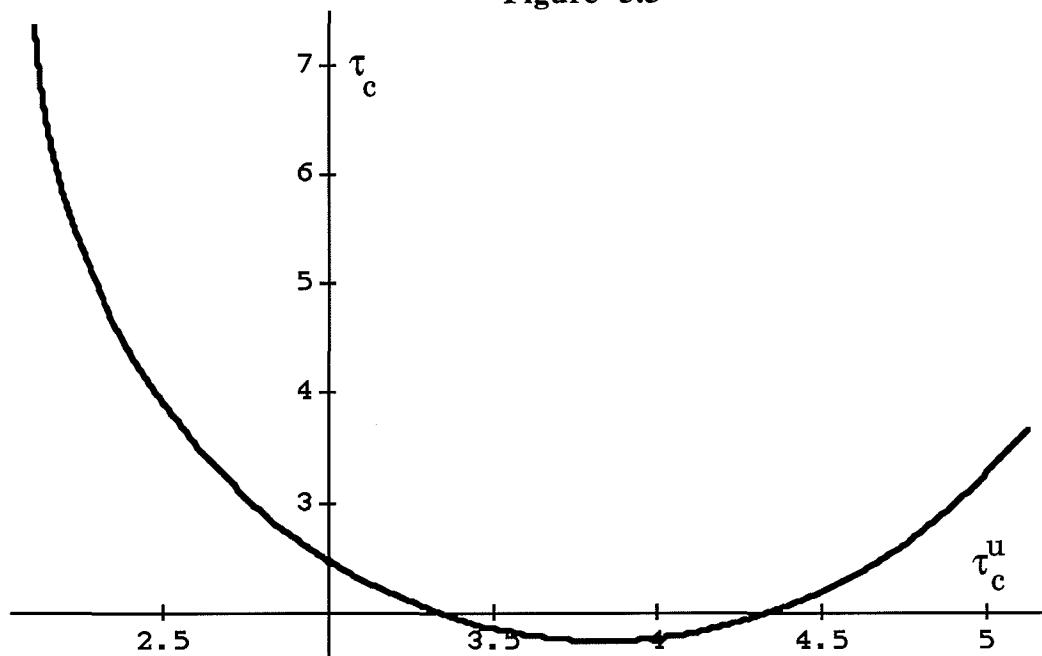


Figure 5.5 depicts the tradeoff between tariffs in represented and unrepresented sectoral pairs implicitly defined by Equation 5.1. The case shown assumes one represented and 10 unrepresented sectoral pairs.

In this case, when there is a linkage between sectors, the governments will choose to raise the tariff slightly in the ten unrepresented import-competing sectors in order to allow a lower tariff in the pair of represented sectors.

Figure 5.6

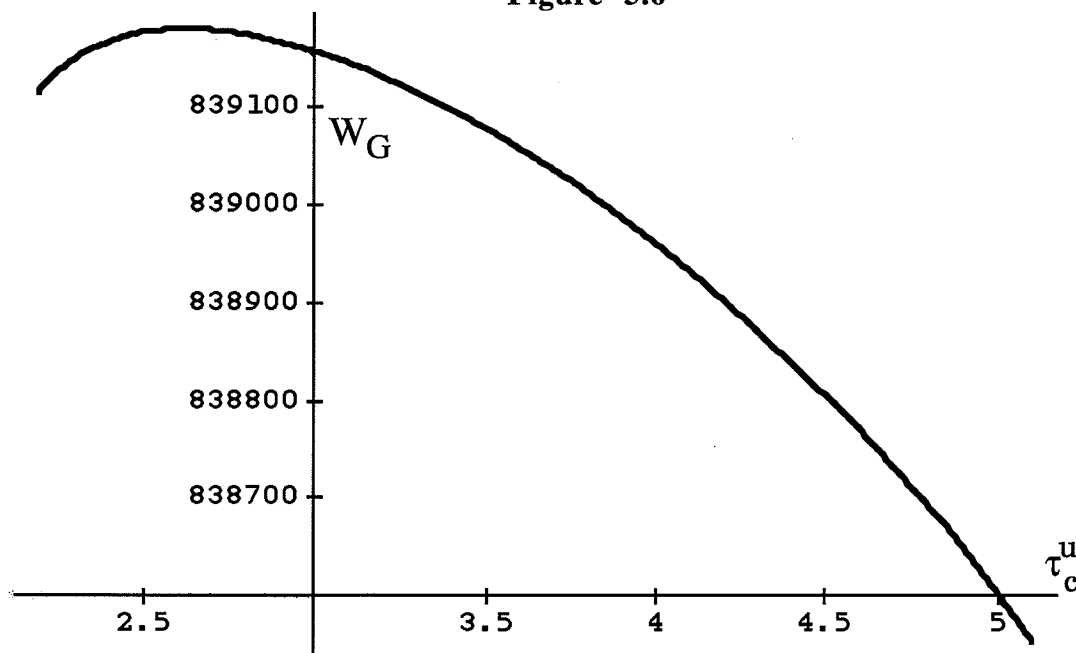


Figure 5.6 shows government welfare as a function of the tariff in an unrepresented import-competing sector, given the constraint depicted in Figure 5.5.

## VI. Conclusion

This paper has provided a model in which export lobbies succeed in reducing tariffs to low but positive levels. Central to the result was the assumption that governments are not as free to subsidize exports as they are to tax or subsidize imports. It was this assumption which pitted the export lobbies against lobbies for import-competing industries. Although the export lobbies are stronger than the import-competing lobbies which oppose them, this advantage is offset somewhat by the necessity for governments to cooperate to satisfy their export lobbies. Particularly if governments have short time horizons, this limits the tariff liberalization that can be sustained.

Dam (1970, p. 132) asks whether the antipathy toward export subsidies in the GATT is justified. He discusses several distortions an export subsidy might remedy. The results of this paper suggest another justification: The absence of export subsidies harnesses the lobbying efforts of export-oriented industries toward trade liberalization.

There are several extensions of this work that suggest themselves immediately. First, it would be useful to examine asymmetric cases to understand what effects country size might have on liberalization results. Second, a richer dynamic model would allow for the possibility that profits in one period are not independent of profits in a previous period.

Finally, this paper may allow a better understanding of the effects of such policy experiments as the pursuit of free trade agreements. To understand how a free trade agreement or customs union might affect a nation's trade relations with the outside world, it is first necessary to understand on what basis those trade relations were originally formed. It is to be hoped that this paper is useful in that regard.

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