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TRADE WARS AND
TRADE TALKS

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ABSTRACT

Whether governments clash in trade disputes or negotiate over trade agreements, their actions in the international arena reflect political conditions back home. Previous studies of cooperative and noncooperative trade relations have focused on governments that are immune from political pressures and that act as benevolent servants of the public interest. Here we take a first step toward introducing domestic politics into the analysis of international economic relations. We study the interactions between national leaders who are concerned both with providing a high standard of living to the general electorate and collecting campaign contributions from special interest groups. The analysis reveals the determinants of the structure of protection in a noncooperative trade war and in a cooperative trade agreement.

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1. INTRODUCTION

Trade wars erupt when national governments fail to heed the impact of their policies on individuals and groups in other countries. When governments take unilateral trade actions they invite retaliation by trade partners that perceive themselves as harmed by those measures. But if governments recognize the joint losses that ensue when policies are set independently, they may be willing to enter into talks aimed at finding mutually preferred outcomes. Bargaining can lead to a trade agreement in which each country makes concessions in exchange for desired changes in the policies of its partners.

Both noncooperative and cooperative policy outcomes have been studied in the literature on tariff formation. Johnson (1953/54) was the first to consider retaliatory trade policies as giving rise to a noncooperative equilibrium in a static, tariff-setting game (see also Kuga [1973], Riezman [1982], and Kennan and Riezman [1984]). Mayer (1981), Riezman (1982), and others have viewed negotiated tariff agreements as the outgrowth of a bargaining process in which governments see the noncooperative, Johnson equilibrium as the status quo ante. But in all of these cases, governments have been viewed as benevolent servants of the national interest, seeking in their trade relations to maximize aggregate social welfare.¹ Such governments see potential improvements in the terms of trade as the sole motivation for departing from unilateral free trade. In their tariff wars they employ "optimum tariffs" to secure terms-of-trade improvements at the expense of their partners, accepting in the process some distortion

¹ Hillman and Moser (1992) is a recent paper that, like ours, views policy outcomes as the result of non-cooperative and cooperative interactions between politically motivated governments. They use reduced-form *political support functions* to describe the governments' objective functions, and then show the potential gains from mutual exchange of market access in a two-sector model of world trade. Our analysis goes beyond that in Hillman and Moser in explicitly modeling the behavior of special interest groups that determines the relationship between trade policies and the political support for the government. Also, we discuss the structure of protection in non-cooperative and cooperative equilibria with many sectors.

in local resource allocation. In their negotiations the governments reciprocally lower their trade barriers and thereby reduce the efficiency losses while keeping the external terms of trade roughly constant.

Few observers actually believe that governments set trade policy to maximize national welfare. Rather, it is now widely accepted that politicians, like other individuals, pursue their own personal objectives subject to perceived constraints. In the event, the outcomes of trade wars and trade talks reflect not only the implications of trade policies for overall efficiency and aggregate welfare, but also the political pressures that special interest groups can bring to bear on their national leaders. The analysis of international economic relations must be modified to reflect the domestic political forces that prevail in the various participating countries.

In this paper we study noncooperative and cooperative trade policy games in a setting where domestic politics determine international objectives. We take as our starting point the framework developed in Grossman and Helpman (1992) to describe the political interactions between an elected government, voters, and special interest groups. Our earlier paper focused on industry lobby groups that make campaign contributions to an incumbent government in order to influence trade policy. We studied the structure of protection that emerges in political equilibrium when many such interest groups simultaneously attempt to "buy" protection, but we did so in the context of a small country facing exogenously given world prices. Accordingly, there was no scope for interaction between several, politically-motivated governments. Here we relax the small-country assumption and study the political-economic equilibria that emerge when national trade policies are set separately or jointly.

The structure of our model is as follows. An incumbent government is in a position to set its nation's trade policies, either unilaterally or in conjunction with other governments through a process of international negotiations. The government can choose a schedule of trade taxes and subsidies on the various import and export goods.

It seeks to maximize its own utility, which we take to be a function of aggregate welfare and the total amount of political contributions that it collects. We include aggregate welfare in the government's objective function, because we believe that an incumbent's chances of being re-elected depend to some extent on the level of well-being of the general electorate. However, contributions also enter the government's utility function, because campaign funds can be used for political advertising, and because the contributions sometimes augment the candidates' personal fortunes or provide other political benefits (see the discussion of this point in Grossman and Helpman [1992]).

We assume that the various factor owners with stakes in certain industries have established lobby groups to represent their collective interests in the political process. Each organized lobby confronts the incumbent government with a schedule relating its campaign contributions to the various policy actions that the government might take. The contribution schedules are set to maximize the aggregate welfare of the lobby group's members, taking as given the schedules offered by the other organized groups. Then, faced with these various contribution schedules as well as their (perhaps limited) concern for the general electorate, the governments enter the international arena. In the event of a "trade war" they set their policies noncooperatively, ignoring any effect of their own actions on the well-being of foreign interest groups and voters. In the event that the governments endeavor to cooperate, they negotiate over their various tariff structures according to some specified bargaining process. The outcome in either case is an equilibrium schedule of trade taxes and subsidies for each country as well as a set of political contributions by each lobby in each country that supports the political-economic equilibrium.

In the next section we lay out more fully and formally our assumptions about the various agents' objectives and behavior and specify the nature of the political process. Section 3 characterizes the Nash equilibrium of a policy game between two non-cooperating governments. In section 4 we describe the outcome of international trade

negotiations, first assuming only that bargaining leads to policies that are jointly efficient from the point of view of the two negotiating parties, and then imposing the additional structure of a particular (Rubinstein [1982]) bargaining process. The final section contains a summary of our findings.

2. THE FRAMEWORK

We consider the trade relations between two countries, "home" and "foreign." The countries have similar political and economic systems, although their tastes, endowments, and political sensitivities may differ. We describe the political and economic structure of the home country. Equations that relate to the foreign country are similar, except that the relevant variables, parameters, and functions will be distinguished by asterisks.

Residents of the home country share identical additively separable preferences. Each individual maximizes a utility function of the form

$$(1) \quad u = c_Z + \sum_{i=1}^n u_i(c_{X_i}),$$

where c_Z is consumption of good Z and c_{X_i} is consumption of good X_i , $i = 1, 2, \dots, n$. The sub-utility functions $u_i(\cdot)$ are differentiable, increasing, and strictly concave. Good Z serves as numeraire, with a world and domestic price equal to one. We denote by p_i the (domestic) price of good X_i in the home country, while π_i represents its offshore price.² With these preferences, each resident of the home country demands $d_i(p_i)$ units of good X_i , $i = 1, 2, \dots, n$, where $d_i(\cdot)$ is the inverse of $u_i'(\cdot)$. The consumer devotes the remainder of his total spending of E to the numeraire good, thereby

² The offshore price need not be the same as the price prevailing in the foreign country, because the foreign country may impose trade taxes or subsidies of its own. We use p_i^* to denote the internal price in the foreign country.

attaining the utility level

$$(2) \quad v(p, E) = E - \alpha(p),$$

where $p = (p_1, p_2, \dots, p_n)$ is the vector of home prices of the non-numeraire goods and

$$(3) \quad \alpha(p) \equiv \sum_i p_i d_i(p_i) - \sum_i u_i[d_i(p_i)].$$

The numeraire good Z can be produced from labor alone, with constant returns to scale. We assume that the aggregate labor supply, ℓ , is sufficiently large to ensure a positive output of this good. Then we can choose units so that the competitive wage rate equals one. Each of the other goods is manufactured from labor and a sector-specific input, also with constant returns to scale. The various specific inputs are available in inelastic supply and each earns a quasi-rent that depends only on the domestic price of the good that it is used to produce (given that the wage rate is fixed at one). We denote the aggregate rent of the specific factor used in producing good X_i by $\Pi_i(p_i)$, and note that the slope of this function gives the supply curve for good X_i ; i.e.,

$$(4) \quad X_i(p_i) = \Pi_i'(p_i).$$

We assume that the government has a limited set of policy instruments at its disposal. We allow it to tax or subsidize trade in any of the non-numeraire goods and to collect revenues or distribute tax receipts using a (neutral) head tax or subsidy. In other words, we restrict the government to the use of trade policies in effecting any redistribution of income between groups in the economy. It appears to be difficult in reality for governments to transfer income using very direct and transparent instruments, such as targeted income taxes or subsidies. Instead, governments resort to

less direct tools such as trade policies to benefit groups that curry their favor. Since the politics of trade policy seem largely to be battles over income distribution, we have constructed an environment where special interest groups will seek income transfers by this indirect means.

The ad-valorem trade taxes or subsidies levied by the home government drive a wedge between domestic and offshore prices. We represent these policies by the parameters τ_i such that $p_i = \tau_i \pi_i$. Then $\tau_i > 1$ represents one plus the rate of tariff on an import good or one plus the rate of export subsidy on an export good. Similarly, $\tau_i < 1$ represents an import subsidy or an export tax. The vector of trade policies $\tau = (\tau_1, \tau_2, \dots, \tau_n)$ generates per capita government revenue of

$$(5) \quad r(\tau, \pi) = \sum_i (\tau_i - 1) p_i \left[d_i(\tau_i \pi_i) - \frac{1}{N} X_i(\tau_i \pi_i) \right]$$

where $\pi = (\pi_1, \pi_2, \dots, \pi_n)$ and N measures the total (voting) population, henceforth normalized to equal one. The government redistributes this revenue uniformly to the public at large.

Individuals collect income from several sources. Most earn wages as workers and all receive the same transfer (possibly negative) from the government. In addition, some individuals own claims to part of the stock of one of the specific inputs. We may think of these assets as being indivisible and nontradable (as, for example, with claims to sector-specific human capital), so that individuals cannot hold more than one type. Clearly, those who own some of the specific input used in industry i see their income tied to the domestic price of good X_i . These individuals have a direct stake in the trade policy τ_i that goes beyond their general interest as consumers in all policies that affect domestic prices.

The owners of the specific input used in sector i , with their common desire for protection (or export subsidies) for their industry, may choose to join forces to convey

their policy wishes to the incumbent government. We assume that the various owners of some (or perhaps all) of the specific inputs have formed political action groups, while the owners of the remaining specific inputs (if any) have failed to organize politically. In this paper we take the set of organized industries to be exogenous. The organized groups enjoy a political advantage relative to individual factor owners inasmuch as the groups control substantially greater resources than most individuals. With these vast resources at their disposal the lobbyists can gain access to the politicians to communicate their political demands. As in Grossman and Helpman (1992) we assume that the lobbies express their demands in the form of *contribution schedules*; that is, they offer to contribute to the campaign funds of the incumbent politicians an amount that depends upon the particular policies implemented by the government.³ While the unorganized individuals (including those individuals who own none of the specific inputs) might also wish to "bid" for trade policies in this way, we assume that the politicians will not take the time to hear their offers, which are likely to be small in view of the limited income of an individual factor owner and the limited stake that any one person has in the policy outcome. In short, we assume that politically unorganized have no means to influence policy with their campaign contributions; they enter the political process only as voters.

The organized input owners coordinate their political activities so as to maximize their joint welfare. The lobbyist representing industry i submits to the politicians the contribution schedule $\Lambda_i(\tau, \cdot)$ that maximizes

$$(6) \quad v^i = \bar{\Omega}_i(\tau, \pi) - \Lambda_i(\tau, \cdot),$$

³ The contributions made by lobbies might also be made to depend on the concessions that the politicians manage to extract from the foreign government in any trade negotiations that take place.

where

$$(7) \quad \bar{\Omega}_i(\tau, \pi) \equiv \ell_i + \Pi_i(\tau_i \pi_i) + \alpha_i [r(\tau, \pi) - \delta(\tau \pi)],$$

α_i is the fraction of the population that owns the specific input used in sector i (also their measure, given that $N = 1$), and ℓ_i is the joint labor endowment of these factor owners.⁴ Equation (7) gives the total gross-of-contributions welfare of the α_i members of lobby group i , which they derive from their wages, the rents to their specific input, their share of total government transfers, and their surplus from consuming the non-numeraire goods (see [2]). Notice that we have omitted all but one argument of the contribution schedule. This allows us to distinguish the case of a trade war, where the contribution schedule depends only on the actions of the home government, from that of trade talks, where the contributions may also depend upon actions taken by the foreign government in the negotiated agreement. In either case, the various members contribute to the association whatever is needed to pay the stipulated campaign contribution; an unspecified burden-sharing scheme allows them to share in the benefits of their collective action.

Facing the contributions schedules offered by the various lobbies, the incumbent government sets trade policy — either unilaterally or through a process of international bargaining — so as to maximize its own political well being. We assume that the politicians care about the accumulation of campaign contributions and perhaps also about voter welfare. As we discussed in the introduction, the politicians value contributions as potential funding for campaign advertisements and possibly for other reasons. Their concern for aggregate welfare, if it exists, arises because the prospects for re-election may depend upon the overall level of prosperity. We posit a linear form for

⁴ In (7) we have used the notation $\tau \pi$ in the argument of $\delta(\cdot)$ to represent the vector $(\tau_1 \pi_1, \tau_2 \pi_2, \dots, \tau_n \pi_n)$. Thus, $\tau \pi = p$ is the vector of home country prices.

the government's objective function, namely

$$(8) \quad v^G = \sum_{i \in L} \Lambda_i(\tau, \cdot) + a \tilde{\Omega}_A(\tau, \pi), \quad a \geq 0,$$

where L is the set of organized industries and

$$(9) \quad \tilde{\Omega}_A(\tau, \pi) \equiv \ell + \sum_i \Pi_i(\tau_i, \pi_i) + \tau(\tau, \pi) - \delta(\tau \pi)$$

measures gross aggregate welfare. The parameter a in (8) represents the government's weighting of a dollar of social welfare compared to its weighting of a dollar of campaign contributions, considering both the perceived political value of the funding and the indirect cost associated with the contributor's loss of welfare.

As we mentioned at the beginning of this section, the foreign country has a similar political and economic structure. We allow the foreign subutility functions $u_i^*(\cdot)$, the foreign profit functions $\Pi_i^*(\cdot)$, the set of organized industries in the foreign country L^* , the number α_i^* of foreign voters with claims to the specific input used in sector i , and the weight a^* that the foreign government places on aggregate welfare relative to contributions to differ from those in the home country (where the analogous functions and parameters have no asterisks). Equations analogous to (1) through (8) apply to the foreign country, where trade policies are $\tau^* = (\tau_1^*, \tau_2^*, \dots, \tau_n^*)$, internal prices are $p^* = (p_1^*, p_2^*, \dots, p_n^*)$, output in sector i is X_i^* , etc.

Having specified the production and demand sides of each economy we turn now to the international equilibrium. Net imports of good i in the home country are given by $M_i(p_i) = d_i(p_i) - X_i(p_i)$, while those in the foreign country are given by $M_i^*(p_i^*) = d_i^*(p_i^*) - X_i^*(p_i^*)$. Recall that $p_i = \tau_i \pi_i$ and $p_i^* = \tau_i^* \pi_i^*$. Then world product markets clear when

$$(10) \quad M_i(\tau_i, \pi_i) + M_i^*(\tau_i^*, \pi_i^*) = 0, \quad i = 1, 2, \dots, n.$$

This equation allows us to solve for the world market clearing price of good X_i as a function of the industry trade taxes or subsidies imposed by the two countries. We denote this functional relationship by $\pi_i(\tau_i, \tau_i^*)$. It follows from (10) that the functions $\pi_i(\cdot)$ are homogeneous of degree minus one; i.e., if the home country were to increase its tariff on imports of some good while the foreign country increased its export subsidy by the same percentage amount, then the world price would fall so as to leave the domestic prices in each country unchanged.

Using (10) it is possible to express the (gross-of-contributions) welfare levels of the organized interests groups and of the general electorate in each country as functions of the trade-policy vectors τ and τ^* . For example, the expression in (7) for the gross welfare of home-country owners of the specific factor used in industry i becomes $\Omega_i(\tau, \tau^*) \equiv \tilde{\Omega}_i[\tau, \pi(\tau, \tau^*)]$. Similarly, the aggregate welfare of home-country voters (see [9]) can be written as $\Omega_A(\tau, \tau^*) \equiv \tilde{\Omega}_A[\tau, \pi(\tau, \tau^*)]$. Inserting these functions into (6) and (8) and their foreign analogs gives the objectives of the lobbies and politicians as functions of the trade policy vectors in each country.

We describe finally the sequence of actions by the various agents in our two-country model. The lobbies in each country move first, setting contributions schedules that specify their bids for the various possible policy outcomes. The lobbies act simultaneously (and noncooperatively) at this stage, each taking the schedules of all other lobbies in the same and the other country as given. In the second stage, the two governments set their national trade policies. In section 3, where we study trade wars, these policies are set in a noncooperative, simultaneous-move game. In section 4, which deals with international negotiations, the policies emerge from the specified bargaining game. In both cases we assume that the implicit contracts between the politicians and interest groups in one country (i.e., the contribution schedules that have been

communicated by the lobbyists to the government) are not observable to the government in the other. The importance of this assumption will become clear as we go along.

3. TRADE WARS

We begin our analysis of the international economic relations between politically motivated governments with the case of a trade war. Here, the governments behave unilaterally, ignoring the impacts of their actions on political and economic agents in the opposite country. While purely noncooperative outcomes are unlikely to emerge in a world with repeated interactions and many established forums for international discussions, the extreme case of noncooperation sheds light on the political forces that shape trade policies during the frequent departures from harmony and cooperation in the trading realm.

Let us define an *equilibrium response* by each country to an arbitrary policy choice of the other. We use the home country to illustrate, although a similar definition applies to the foreign country.

Definition 1: Let τ^* be an arbitrary trade policy vector of the foreign country. Then a set of feasible contribution functions $\{\Lambda_i^o\}_{i \in L}$ and a home trade policy vector τ^o are an equilibrium response to τ^* if :

- (a) $\tau^o = \arg \max_{\tau} \sum_{i \in L} \Lambda_i^o(\tau, \tau^*) + a\Omega_A(\tau, \tau^*)$; and
- (b) for every organized interest group $i \in L$ there does not exist a feasible contribution function $\Lambda_i(\tau, \tau^*)$ and a trade policy vector τ^i such that:
 - (i) $\tau^i = \arg \max_{\tau} \Lambda_i(\tau, \tau^*) + \sum_{j \neq i, j \in L} \Lambda_j^o(\tau, \tau^*) + a\Omega_A(\tau, \tau^*)$; and
 - (ii) $\Omega_i(\tau^i, \tau^*) - \Lambda_i(\tau^i, \tau^*) > \Omega_i(\tau^o, \tau^*) - \Lambda_i^o(\tau^o, \tau^*)$.

The definition says that an equilibrium response comprises both a set of feasible contribution schedules, one for each organized interest group in the country, and a policy vector. Each contribution schedule prescribes a political payment for each trade policy vector τ that the home government might select. Feasible schedules are those that promise only non-negative offers that do not exceed the aggregate income of the group's members. Condition (a) of the definition stipulates that the home politicians choose the policy vector that best serves their own interests, given the policy of the foreign government and given the contribution schedules offered by the domestic lobbies. Condition (b) states that, given the set of contribution schedules selected by all lobbies other than itself, no individual lobby i can improve its lot by setting a contribution schedule $\Lambda_i(\cdot)$ different from $\Lambda_i^0(\cdot)$, thereby inducing the home government to choose the policy vector τ^i .

Several aspects of this definition bear further discussion. First, our definition supposes that the lobbies do not cooperate with one another. While it is occasionally the case that several lobbies in a country will coordinate their activities to pursue a common goal, and even that lobbies in different countries will join forces, the norm is certainly for the various industry representatives to take independent political action. One explanation for this observation might be that pressure groups cannot write binding contracts to specify all aspects of their behavior including the contributions they would make to the government in the event of certain policy outcomes. In the absence of such contracts, it would be difficult for the different lobby groups to enforce any cooperative agreement among themselves. Also, in our model, the scope for cooperation between lobbies in any one country is limited, because the interests of different producers are largely in opposition to one another. Lobbies representing the same industry in different countries also have opposing views about desirable policy interventions, as we shall see.

Our definition also presumes that the lobbies condition their political efforts on the expected policy choice of the other country's government. In other words, the lobbies

take the other country's policy choice as given, even though these lobbies make their decisions before the governments make theirs. The lobbies certainly would wish to influence the choices of the other government if it were possible to do so. But here is where our assumption that a lobby's offers to its own government cannot be observed by the other government comes into play. If the home lobbies could make their promises observable to the foreign politicians and if they could commit to their contribution schedules immutably, then the lobbies would set their compensation schedules strategically in order to induce a favorable policy response by the foreign government. The situation would be similar to that analyzed by Fershtman and Judd (1987), who showed that the owners of a firm generally will want to set a compensation schedule that gives the firm's managers an incentive to act aggressively in the oligopolistic competition against other firms. But, as Katz (1991) later argued, the strategic design of an agent's compensation schedule can only bear fruit in a delegation game (i.e., where agents play a game on behalf of principals) if the contracts between principal and agent can be observed by the opposing players. Otherwise, the opposing players will not be influenced by (unobserved) manipulation of the principal-agent contract, and so there can be no gain to the principals (in our case, the home lobbies) from such manipulation.

It is natural for us to assume that contribution schedules cannot be observed abroad, for at least two reasons. First, it might be problematic for special interest groups to be open and explicit about their willingness to pay the government for favorable treatment. Second, even if the interest groups were to announce their intention to vary their support according to the positions taken by the politicians, these promises would not be legally binding and policy makers abroad would not know whether there were further details or subsequent agreements besides those that had been made public. In cases where multiple agreements or renegotiation are possible, a lobby's announcement of its contribution schedule carries little commitment value (see Katz [1991]). Accordingly, we feel justified in studying an equilibrium in which the industry

groups condition their lobbying strategies on what they expect will be the other government's policy choice, but do not see themselves as able to influence those policies by their own choice of contribution schedule.

To find the equilibrium responses for each country we proceed as in Grossman and Helpman (1992). There we characterized the equilibrium policy choices for a small country that takes foreign trade policies and world market prices as given. We noted the applicability of the theory of common agency developed by Bernheim and Whinston (1986), wherein a single actor acts simultaneously as the agent for several different principals. In the present context, once we take the foreign policy vector as given, we have a situation where the home government acts as an agent for the various special interests groups in the home country. We have already derived the payoffs to the principals and the agent for every action open to the latter, so we can proceed to apply the Bernheim–Whinston results to characterize the equilibrium responses. It should be noted, however, that unlike in Grossman and Helpman (1992), lobbies and the government will see their welfare affected by policy-induced changes in the international terms of trade. They will of course take these effects into account in making their political decisions.

We know from Lemma 2 in Bernheim and Whinston (1986) (or Proposition B–W in Grossman and Helpman [1992]) that the equilibrium policy response to τ^* satisfies, in addition to condition (a) of Definition 1, the following requirement that is implied by condition (b):⁵

$$(11) \quad \tau^0 = \arg \max_{\tau} \Omega_i(\tau, \tau^*) - \Lambda_i^0(\tau, \tau^*) + \sum_{j \in L} \Lambda_j^0(\tau, \tau^*) + a\Omega_A(\tau, \tau^*)$$

for every $i \in L$.

⁵ This is a necessary condition for an equilibrium. The complete set of necessary and sufficient conditions are given in Proposition B–W of Grossman and Helpman (1992).

This condition has a simple interpretation: the equilibrium trade policy vector must maximize the joint welfare of each lobby i and the government, when the contribution schedules of all lobbies other than i are taken as given. If this were not the case, lobby i could reformulate its schedule to induce the government to choose the jointly optimal policy vector instead of the alternative, and it could do so in such a way as to share in the surplus from the switch in policy. In equilibrium there can exist no such possibilities for a lobby to improve its welfare unilaterally. Of course, the same holds true for the foreign lobbies, so that an equation analogous to (11) applies to τ^{*o} .

Let us assume now that the lobbies set contribution schedules that are *differentiable*, at least around the equilibrium point.⁶ We have argued in Grossman and Helpman (1992) that there are compelling reasons for focusing on contributions schedules that have this property. For example, differentiable schedules may be robust to small calculation errors. With differentiability, a trade policy vector that satisfies (11) also satisfies the first-order condition

$$(12) \quad \nabla_{\tau} \Lambda_i^o(\tau^o; \tau^*) - \nabla_{\tau} \Omega_i(\tau^o, \tau^*) + \sum_{j \in L} \nabla_{\tau} \Lambda_j^o(\tau^o; \tau^*) + a \nabla_{\tau} \Omega_A(\tau^o, \tau^*) = 0,$$

for all $i \in L$.

The home politicians' utility maximization ensures, by condition (a) of Definition 1, that

$$(13) \quad \sum_{j \in L} \nabla_{\tau} \Lambda_j^o(\tau^o; \tau^*) + a \nabla_{\tau} \Omega_A(\tau^o, \tau^*) = 0.$$

⁶ Typically, the contribution schedules would not be differentiable where the constraint that payments must be non-negative becomes binding; i.e., where $\Lambda_i(\cdot) = 0$. However, this is not a problem for our arguments, as we will assume differentiability only around equilibria where $\Lambda_i^o(\tau^o; \tau^{*o}) > 0$ for all i .

Taken together, (12) and (13) imply

$$(14) \quad \nabla_{\tau} \Lambda_i^{\circ}(\tau^{\circ}; \tau^*) = \nabla_{\tau} \Omega_i(\tau^{\circ}, \tau^*) \quad \text{for all } i \in L;$$

i.e., the contribution schedules are set so that the marginal change in the donation for a small change in home policy (taking the foreign policy as given) matches the effect of the policy change on the lobby's gross welfare. In Grossman and Helpman (1992) we referred to this property of the equilibrium contribution schedules as *local truthfulness*.

We sum equation (14) over all i and substitute the result into (13) to derive

$$(15) \quad \sum_{i \in L} \nabla_{\tau} \Omega_i(\tau^{\circ}, \tau^*) + a \left[\nabla_{\tau} \Omega_A(\tau^{\circ}, \tau^*) \right] = 0.$$

This equation allows us to compute directly the equilibrium home policy response to an arbitrary foreign policy vector τ^* . Similarly, we have

$$(15^*) \quad \sum_{i \in L} \nabla_{\tau^*} \Omega_i^*(\tau^{*\circ}, \tau) + a^* \left[\nabla_{\tau^*} \Omega_A^*(\tau^{*\circ}, \tau) \right] = 0,$$

which gives the foreign equilibrium response to an arbitrary home policy vector.

At last we are ready to define a full equilibrium in the trade war. At the time when policies are set each government makes an equilibrium response to what it expects will be the other's policy action. It is natural then to invoke the concept of a Nash equilibrium as follows:

Definition 2: A noncooperative trade policy equilibrium consists of sets of political contribution functions $\{\Lambda_i^{\circ}\}_{i \in L}$ and $\{\Lambda_i^{*\circ}\}_{i \in L^*}$ and a pair of trade policy vectors τ° and $\tau^{*\circ}$ such that $\{[\Lambda_i^{\circ}]_{i \in L}, \tau^{\circ}\}$ is an equilibrium response to $\tau^{*\circ}$ and $\{[\Lambda_i^{*\circ}]_{i \in L^*}, \tau^{*\circ}\}$ is an equilibrium response to τ° .

We can proceed to characterize the equilibrium trade policy vectors by substituting τ^{*0} for τ^* in (15), and τ^0 for τ in (15*) and then treating these as a system of simultaneous equations. We calculate the derivatives in (15) using (3), (5), (7), (9), and the definitions of the import functions $M_i(\cdot)$ and the gross benefit functions $\Omega_i(\cdot)$ and $\Omega_A(\cdot)$. This gives

$$(16) \quad (I_{iL} - \alpha_L)(\pi_i + \tau_j^0 \pi_{i1})X_i + (a + \alpha_L)[(\tau_i - 1)\pi_i(\pi_i + \tau_i^0 \pi_{i1})M_i' - \pi_{i1}M_i] = 0,$$

where I_{iL} is an indicator variable that equals one if industry i is politically organized and zero otherwise, and $\alpha_L \equiv \sum_{j \in L} \alpha_j$ denotes the fraction of the voting population that is represented by a lobby. From (10) we find the partials of the world price functions, $\pi_i(\cdot)$.⁷ Substituting these into (16) yields an expression for the home country's equilibrium trade policy, namely

$$(17) \quad \tau_i^0 - 1 = -\frac{I_{iL} - \alpha_L}{a + \alpha_L} \frac{X_i}{\pi_i M_i'} + \frac{1}{e_i^*}, \quad \text{for } i = 1, 2, \dots, n,$$

where $e_i^* \equiv \tau_i^* \pi_i M_i^{*'} / M_i^*$ is the elasticity of foreign import demand or export supply (depending upon whether M_i^* is positive or negative). An analogous equation describes the equilibrium foreign policy:

$$(17^*) \quad \tau_i^{*0} - 1 = -\frac{I_{iL}^* - \alpha_L^*}{a^* + \alpha_L^*} \frac{X_i^*}{\pi_i^* M_i^{*'}} + \frac{1}{e_i^*}, \quad \text{for } i = 1, 2, \dots, n,$$

⁷ We have $\pi_{i1}/\pi_i = -M_i' / (\tau_i M_i' + \tau^* M_i^{*'})$ and $\pi_{i2}/\pi_i = -M_i^{*'} / (\tau_i M_i' + \tau_i^* M_i^{*'})$.

where $e_i \equiv \tau_i \pi_i M_i' / M_i$ is the home country's import demand or export supply elasticity.

Equations (17) and (17*) express the ad valorem trade tax and subsidy rates in each country as sums of two components. These components represent, respectively, the *political support* and *terms-of-trade* motives for trade intervention. The first component has exactly the same form as the expression in Grossman and Helpman (1992) for the equilibrium trade policy in a small country facing fixed world prices. It reflects a balancing of the deadweight loss associated with trade policies (given the terms of trade) and the income gains that special interest groups can capture via such policies. The second component represents the familiar "optimum tariff" (or export tax) that applies in a large country with a benevolent dictator. Given the balancing of special and general interests implicit in the first term, this second term enters the political calculus as an added reason why noncooperating governments will wish to tax international trade.

It is apparent from (17) and (17*) that an organized import-competing industry emerges from a trade war with a protective tariff (since $e_i^* > 0$ when the foreign country exports good i), while an unorganized home export industry suffers from an export tax (since $e_i^* < 0$ when the foreign country imports good i). In the former case, the terms-of-trade considerations argue for a positive tariff, and the industry's lobbying efforts push in the same direction. In the latter case, the government's desire to tax exports in order to drive up their world price finds support from organized groups representing industries other than the exporting one, whose members are consumers of the exportable good. Only in cases of organized export sectors and unorganized import sectors do the special and general interests come into conflict — at least as far as the sign, as opposed to the size, of the desired trade policy is concerned. Then the nature of the equilibrium policy depends upon the specific circumstances.

Consider, for example, an organized export industry (so that $e_i^* < 0$ and $I_{iL} = 1$). This industry is more likely to secure an export subsidy the greater is industry output,

the smaller are the price sensitivities of domestic supply and demand, and the smaller is the weight a that home politicians place on aggregate welfare. A large domestic output raises the stakes for the owners of the specific input and makes them willing to bid more for support. Such bids are more likely to be effective when the politicians are less concerned with the public interest and when the deadweight loss associated with a given departure from free trade is small (i.e., $|M_i^*|$ is small). On the other hand, for a given value of a and given conditions in the domestic market, the equilibrium policy is more likely to take the form of an export tax the smaller in absolute value is the foreign import demand elasticity. This accords with intuition, since the home country's market power in trade varies with the inverse of the foreign elasticity, and so the potential social gains from trade taxes become larger as $|e_i^*|$ declines. We note that the second term can outweigh the first even if the government pays no attention whatsoever to national welfare (i.e., $a = 0$). This is because the members of the various interest groups share in the terms of trade gains from trade taxes, and they may collectively bid for an export tax for industry i even though the lobby that represents the industry presses for a subsidy.

It is interesting to compare the policy outcomes in our model with those derived by Johnson (1953/54) under the assumption that governments maximize social welfare. This comparison allows us to isolate the role that domestic politics play in determining the outcome of a trade war. We note that our model reproduces the Johnson equilibrium as a limiting case, when the governments care overwhelmingly about voters' welfare (so that a and a^* approach infinity).⁸ Then the governments apply the familiar

⁸ The Johnson equilibrium also obtains when all voters belong to a lobby group ($\alpha_L = 1$) and all industries are politically organized ($I_{iL} = 1$ for all i). In this case, all individuals are able to express their political demands to the politicians, and so all are equally represented in the political process. The opposing interest groups neutralize one another in their attempts to transfer income to themselves, and what remains is only the terms-of-trade motive for trade policy that potentially benefits them all.

inverse elasticity rules in setting trade taxes.

In making the comparison, we focus on the special case in which both countries have constant trade elasticities. We may limit our attention to the policy setting game in a single industry inasmuch as the equilibrium policy responses τ_i^0 and τ_i^{*0} depend only on the characteristics of industry i and aggregate variables (see [17] and [17*]). For concreteness, we make the home country the importer of good X_i , so that its import demand curve is given by $M = m(\tau\pi)^\epsilon$, with $m > 0$ and $\epsilon = -e_i > 1$.⁹ The foreign country's export supply function has the form $-M^* = m^*(\tau^*\pi)^{\epsilon^*}$, with $m^* > 0$ and $\epsilon^* = e_i^* > 0$.

Figure 1 shows the Johnson equilibrium at point J. This point lies at the intersection of two best response functions, BB for the home country and B*B* for the foreign country, where "B" refers to the benevolent dictators that rule each country. The curves are vertical and horizontal, respectively, in the constant elasticity case. The inverse elasticity rule gives the equilibrium policies in the Johnson equilibrium, $\tau_J = 1 + 1/\epsilon^*$ and $\tau_J^* = 1 - 1/\epsilon$. These are, of course, a tariff at home ($\tau_J > 1$) and an export tax abroad ($\tau_J^* < 1$).

We examine next the trade war between politically motivated governments. The market clearing world price for good i can be found using (10) and the expressions that define the constant elasticity import demand and export supply functions. We find

$$(18) \quad \pi(\tau, \tau^*) = \left[\frac{m}{m^*} \right]^{\frac{1}{\epsilon + \epsilon^*}} \left[\frac{1}{\tau} \right]^{\frac{\epsilon}{\epsilon + \epsilon^*}} \left[\frac{1}{\tau^*} \right]^{\frac{\epsilon^*}{\epsilon + \epsilon^*}}$$

Also, (17) and (17*) give the equilibrium policy responses, which in the constant elasticity case, can be written as

⁹ We omit the industry subscript for the time being, since all parameters and variables refer to industry i .

$$(19) \quad \tau = \left[1 + \frac{1}{\epsilon^*}\right] \left[1 - \frac{I_L - \alpha_L}{a + \alpha_L} \frac{X(\tau\pi)}{\epsilon m(\tau\pi)^{-\epsilon}}\right]^{-1},$$

and

$$(19^*) \quad \tau^* = \left[1 - \frac{1}{\epsilon}\right] \left[1 - \frac{I_L^* - \alpha_L^*}{a^* + \alpha_L^*} \frac{X^*(\tau^*\pi)}{\epsilon^* m^*(\tau^*\pi)^{\epsilon^*}}\right]^{-1},$$

where the π in (19) and (19^{*}) represents the equilibrium $\pi(\tau, \tau^*)$ given in (18).

Figure 1 shows the equilibrium responses for an industry with active lobby groups in both countries (i.e., $I_L = I_L^* = 1$). The home country's equilibrium response function (19) is represented by PP ("P" for political), the foreign country's (19^{*}) by P^{*}P^{*}. The PP curve lies everywhere to the right of BB and has a u-shape: it asymptotes to BB at $\tau = 1 + 1/\epsilon^*$ and to a ray from the origin as τ grows large.¹⁰ The P^{*}P^{*} curve lies everywhere above B^{*}B^{*} and always slopes upward.¹¹

Point W depicts the political equilibrium in the trade war.¹² This point lies to the

¹⁰ From (19) we see that $\tau \rightarrow \infty$ if and only if the term in the second parenthesis on the right-hand side approaches zero. Since $X(\tau\pi)/(\tau\pi)^{-\epsilon}$ is an increasing function of $\tau\pi$, this gives a unique value for $\tau\pi$ and therefore τ/τ^* (see [18]) as τ grows large.

¹¹ The right-hand side of (19^{*}) declines in the foreign price $p^* = \tau^*\pi$, because foreign exports ($m^* p^{*\epsilon^*}$), which are the difference between foreign output and demand, are more sensitive to p^* than foreign supply (X^*). But, from (18), we see that the foreign price $\tau^*\pi$ increases in τ^*/τ . It follows that P^{*}P^{*} must slope upward. We note that the slope would be ambiguous if the sector's input owners were unorganized (i.e., if $I_L^* = 0$)

¹² The diagram shows a unique equilibrium, as exists when the P^{*}P^{*} curve is steeper than the PP curve for τ and τ^* large. If instead the PP curve becomes steeper as τ and τ^* grow large, then the curves must have either zero or two intersections. In the event that there are two, our remarks apply only to the equilibrium associated with the first crossing.

northeast of the Johnson equilibrium at point J. Evidently, the politically motivated governments tilt trade policies in favor of their organized special interests; the home tariff is higher in the political equilibrium than in the Johnson equilibrium, while the foreign export tax is lower or possibly even a subsidy.¹³ The politically motivated governments respond to the pressures brought by their domestic interest groups, who bid for protective policies with their campaign support.

Next consider how the policy outcomes change when the political climate does. Suppose the home politicians were to become less sensitive to the public interest and more concerned with their own campaign finances; this would be represented in our model by a decrease in a . We take first the case of a home import good (with organized industries in each country), as depicted in Figure 1. The decline in a causes the PP curve to shift up, moving the equilibrium up and to the right along the fixed P^*P^* schedule.¹⁴ The new equilibrium entails a higher import tariff in the home country and a lower export tax (or higher export subsidy) in the foreign country. The increase in the tariff comes about in the first instance because the lobby perceives a smaller marginal cost of "buying" protection from the government. Since, the foreign lobbies and foreign government expect a more protectionist stance from the home government, the political calculus changes there as well. In particular, a higher domestic tariff means *ceteris paribus* a lower world price for the good. This decreases both the private benefit and social cost of an export subsidy, but the latter falls by proportionately more. Thus, the

¹³ The trade war generates both higher import tariffs and higher export taxes than the Johnson equilibrium for industries in which the import-competing interests are organized while the export interests are not. Where the export interests are organized and the import-competing interests are not, the trade taxes are lower in both countries than at J, and may even turn to subsidies in one or both countries. Finally, import tariffs are lower and export taxes higher than at J in industries that have organized lobbies in neither country; then the organized groups representing other industries bid unopposed for lower consumer prices, at the expense of the unrepresented specific factor owners.

¹⁴ Given τ , equation (19) requires an increase in τ^* in response to a decline in a , so that π rises and X/M falls.

industry's willingness to pay for a subsidy (or to resist a tax) declines by less than cost to the government of providing the favor. The new foreign policy is more favorable to the foreign industry.

We note that the rise in the import tariff and the fall in the export tax have offsetting implications for the internal prices in each country. A higher home import tariff raises the home price despite the resultant improvement in the terms of trade, but the fall in the foreign export tax pushes the home price down via its effect on π . Similarly, the increase in τ^* puts upward pressure on p^* , but the terms of trade movement associated with the rise in τ works in the opposite direction. The figure shows, however, that τ/τ^* must rise.¹⁵ Since $\tau\pi$ is an increasing function of τ/τ^* and $\tau^*\pi$ is a decreasing function of this same ratio, the decline in a causes the internal price of a home import good to rise at home and fall abroad.

The change in the political environment affects organized export industries in much the same way. Figure 2 shows the policy outcome for such a sector. Since our labeling convention makes the foreign country the exporter of the good in question, we represent a reduction in the government's concern about aggregate welfare by a cut in a^* . This shifts the P^*P^* curve to the left. The export tax (or subsidy) may rise or fall, while the import tariff always falls. But no matter which way the exporting country's policy changes, τ/τ^* must fall, so again the internal price rises in the country that experiences the change in its political environment and falls in the other. In both the export and import cases, an increased government sensitivity to the concerns of special interests in one country raises the profits of the organized factor owners in that country at the expense of their counterparts abroad.

The analysis shows how the domestic political environments color the strategic

¹⁵ At each point along P^*P^* the curve is flatter than a ray to that point from the origin. This implies that τ^*/τ falls as we move out and to the right along the curve.

interactions between countries engaged in a trade war. We have seen that a decline in a — arising perhaps because the home country elects a government with a lesser concern for aggregate welfare or because the political rules change so as to make campaign contributions more valuable — leads the foreign country to change its policy in a direction that improves the home country's terms of trade. In an industry in which the home country imports, the foreign export tax is reduced or its subsidy is increased. In an industry in which the home country exports, the foreign import tariff comes down. This raises the possibility that *a government that is unresponsive to the public interest might actually serve the general voter well in a trade war, because the self-interested government can credibly commit to a policy of aggressive support for the domestic industry.*

4. TRADE TALKS

We have portrayed the interactions between elected officials who pursue their own self interest while setting their nations' trade policies. These officials will not be bothered by the deadweight losses that stem from the internal struggles over income distribution in their country. But they will be bothered by another type of inefficiency that characterizes the equilibrium of section 3. In a trade war, each government acts unilaterally, taking the anticipated actions of its rivals as given. Such noncooperative behavior proves costly not only to the average citizen, but also to the incumbent politicians themselves. The elected representatives will see an incentive to negotiate with one another in order to improve their own political fortunes. In this section we study equilibria that emerge from trade negotiations between politically motivated governments.

We allow the governments to bargain over the trade policy schedules τ and τ^* . For the moment, we also allow the governments to negotiate a transfer payment R that the foreign country pays to the home treasury as part of the negotiated agreement (R

may be positive or negative).¹⁶ Some trade pacts such as the European Community's common agricultural policy actually call for such inter-country transfers. However, as we will see below, the bargaining game has essentially the same equilibrium when R is constrained to zero. Thus, our results apply also when transfers are infeasible.

It proves convenient for the exposition to begin with the case where factor ownership is highly concentrated, so that organized owners of specific factors comprise a negligible fraction of the voting population in each country. With $\alpha_L = \alpha_L^* = 0$, the members of lobby groups enjoy a negligible share of the total surplus from consuming non-numeraire goods and they pay or receive a negligible fraction of the head taxes or subsidies levied by the governments. Thus, the members of the interest groups worry only about their factor incomes and the amount of their political contributions. In the trade negotiation game, the organized lobbies tie their contributions to the policies that emerge from the international talks; i.e., contributions are functions of τ and τ^* . In general the lobbies might also condition their contributions on the size of the international transfer. But they need not do so here, because their members are so few in number that they receive or contribute only a negligible fraction of any government payment that is made.

Confronted with the set of contribution schedules $\{\Lambda_i(\tau, \tau^*)\}$, the home government comes to the bargaining table with the goal of maximizing

$$(20) \quad v^G = \sum_{i \in L} \Lambda_i(\tau, \tau^*) + a[\Omega_A(\tau, \tau^*) + R].$$

The first term in (20) is the total amount of campaign contributions. The second term represents per capita welfare weighted by the parameter a reflecting the government's concern for the public interest. Notice that the transfer R has been added to the

¹⁶ While we allow official, government-to-government transfers, we do not allow side-payments (i.e., "kickbacks") from one set of politicians to the other.

previously defined measure of per capita welfare. This reflects our assumption that transfer payments are combined with any net revenue from trade taxes and subsidies, and that the government redistributes the surplus (or collects the shortfall) on an equal per capita basis. The same is true of the foreign government, so its objective becomes

$$(20^*) \quad v^{*G} = \sum_{i \in L^*} \Lambda_i^*(\tau^*, \tau) + a^*[\Omega_A^*(\tau^*, \tau) - R].$$

For now, we do not commit ourselves to any particular bargaining procedure. Rather we assume only that the politicians settle on an outcome that is efficient from their own selfish perspectives. In other words, we assume that the trade policies that emerge from the negotiation are such that v^G could not be raised without lowering v^{*G} . The Nash bargaining solution and Rubinstein's (1982) noncooperative bargaining equilibrium, among others, have this efficiency property. Efficiency requires the governments to choose the trade policy vectors to maximize the weighted sum

$$(21) \quad a^* v^G + a v^{*G} = a^* \sum_{i \in L} \Lambda_i(\tau, \tau^*) + a \sum_{i \in L^*} \Lambda_i^*(\tau^*, \tau) + a^* a [\Omega_A(\tau, \tau^*) + \Omega_A^*(\tau^*, \tau)].$$

Once this sum has been maximized, the governments can use the international transfer to select (almost) any utility pair (v^G, v^{*G}) on the straight line defined by (21).¹⁷

We are now in a position to define an equilibrium in the two-stage game where lobbies set contribution schedules noncooperatively in the first stage and the governments bargain over trade policies in the second.

¹⁷ Equation (21) is derived as a weighted sum of (20) and (20*), after canceling R. The only restriction on feasible (v^G, v^{*G}) is that neither government can promise to transfer to the other country more than the entirety of the national product.

Definition 3: An equilibrium trade agreement consists of sets of political contribution functions $\{\Lambda_i^o\}_{i \in L}$ and $\{\Lambda_i^{*o}\}_{i \in L^*}$, and a pair of trade policy vectors τ^o and τ^{*o} such that:

- (a) $(\tau^o, \tau^{*o}) = \arg \max_{(\tau, \tau^*)} a^* \sum_{i \in L} \Lambda_i^o(\tau, \tau^*) + a \sum_{i \in L^*} \Lambda_i^{*o}(\tau^*, \tau) + a^* a [\Omega_A(\tau, \tau^*) + \Omega_A^*(\tau^*, \tau)]$;
- (b) for every organized lobby $i \in L$ there does not exist a feasible contribution function $\Lambda_i(\tau, \tau^*)$ and a pair of trade policy vectors (τ^j, τ^{*j}) such that:
- (i) $(\tau^j, \tau^{*j}) = \arg \max_{(\tau, \tau^*)} a^* [\Lambda_i(\tau, \tau^*) + \sum_{j \neq i, j \in L} \Lambda_j^o(\tau, \tau^*)] + a \sum_{j \in L^*} \Lambda_j^{*o}(\tau^*, \tau) + a^* a [\Omega_A(\tau, \tau^*) + \Omega_A^*(\tau^*, \tau)]$
 and (ii) $\Omega_i(\tau^j, \tau^{*j}) - \Lambda_i(\tau^j, \tau^{*j}) > \Omega_i(\tau^o, \tau^{*o}) - \Lambda_i^o(\tau^o, \tau^{*o})$;
- (c) for every organized lobby $i \in L^*$ there does not exist a feasible contribution function $\Lambda_i^*(\tau^*, \tau)$ and a pair of trade policy vectors (τ^j, τ^{*j}) such that:
- (i) $(\tau^j, \tau^{*j}) = \arg \max_{(\tau, \tau^*)} a^* \sum_{j \in L} \Lambda_j^o(\tau, \tau^*) + a [\Lambda_i^*(\tau^*, \tau) + \sum_{j \neq i, j \in L^*} \Lambda_j^{*o}(\tau^*, \tau)] + a^* a [\Omega_A(\tau, \tau^*) + \Omega_A^*(\tau^*, \tau)]$
 and (ii) $\Omega_i^*(\tau^j, \tau^{*j}) - \Lambda_i^*(\tau^j, \tau^{*j}) > \Omega_i^*(\tau^{*o}, \tau^o) - \Lambda_i^{*o}(\tau^{*o}, \tau^o)$.

Condition (a) of the definition stipulates that the equilibrium settlement is efficient from the point of view of the two negotiating governments. Note that efficiency here means maximization of the joint welfare of the two sets of politicians, not Pareto efficiency for all households in the world economy. Condition (b), analogous to the similarly labeled condition of Definition 1, requires that it be impossible for any organized interest group in the home country to gain by restructuring its contribution schedule, considering that the two governments will settle on a different agreement when one of them faces an altered set of incentives. The same must be true for organized interest groups in the foreign country, which is the meaning of condition (c). Finally, the equilibrium trade agreement entails a certain transfer, R^o , the size of which will depend upon the details of the bargaining process.

Notice the similarity between the structure of this two-stage game and the problem that we solved in Grossman and Helpman (1992) to derive equilibrium policies for a small country. In the case of a small country, the organized lobbies set contribution schedules that induce their common agent (the government) to take a policy action in light of the perceived costs to the agent. The various schedules are set simultaneously and each constitutes a best response to the others. Here there are two sets of organized lobbies, but still they set their schedules simultaneously and noncooperatively. While there is no identifiable common agent, we can interpret the objective function in (21) as being that of an "as if" mediator or a surrogate world government. In other words, the equilibrium trade agreement is the same as would arise if a single decision maker had the preferences given on the right-hand side of (21) and a large set of interest groups comprising the organized lobbies of both countries bid to influence this agent's decisions. Once again, the equilibrium policies can be found by application of Lemma 2 in Bernheim and Whinston (1986). That is, we replace conditions (b) and (c) of Definition 3 by the requirement — analogous to (11) — that the negotiated policy outcome must maximize the joint welfare of each organized lobby and the hypothetical mediator, when the contribution schedules of all other lobbies are taken as given. The formal proof, which follows along the lines of the proof of Proposition B–W in Grossman and Helpman (1992), builds on the idea that lobby i could construct a new contribution schedule so as to capture part of the surplus from a switch to the jointly optimal policy, if the mediator were choosing a policy that did not maximize joint welfare. More formally, our requirement can be written as

$$(22) \quad (\tau^o, \tau^{*o}) = \arg \max_{(\tau, \tau^*)} a^* [\Omega_j(\tau, \tau^*) - \Lambda_j^o(\tau, \tau^*)] + a^* \sum_{i \in L} \Lambda_i^o(\tau, \tau^*) + a \sum_{i \in L} \Lambda_i^{*o}(\tau^*, \tau) + a^* a [\Omega_A(\tau, \tau^*) + \Omega_A^*(\tau^*, \tau)] \quad \text{for all } j \in L,$$

and

$$(22^*) \quad (\tau^0, \tau^{*0}) = \arg \max_{(\tau, \tau^*)} a[\Omega_j^*(\tau^*, \tau) - \Lambda_j^{*0}(\tau^*, \tau)] + a \sum_{i \in L} \Lambda_i^0(\tau, \tau^*) + \\ a \sum_{i \in L^*} \Lambda_i^{*0}(\tau^*, \tau) + a^* a[\Omega_A(\tau, \tau^*) + \Omega_A^*(\tau^*, \tau)] \quad \text{for all } j \in L^* .$$

Now we introduce the assumption, as we did before, that all contribution schedules are differentiable around the equilibrium point. Then we can make use of the first-order conditions that characterize the solutions to the maximization in condition (a) of Definition (3) and the maximizations in (22) and (22*). Combining these, we find that the equilibrium contribution schedules again are locally truthful and that the agreed-upon policies must satisfy

$$(23) \quad a^* \sum_{i \in L} \nabla_{\tau} \Omega_i(\tau^0, \tau^{*0}) + a \sum_{i \in L^*} \nabla_{\tau} \Omega_i^*(\tau^{*0}, \tau^0) + \\ a^* a[\nabla_{\tau} \Omega_A(\tau^0, \tau^{*0}) + \nabla_{\tau} \Omega_A^*(\tau^{*0}, \tau^0)] = 0 ;$$

$$(23^*) \quad a^* \sum_{i \in L} \nabla_{\tau^*} \Omega_i(\tau^0, \tau^{*0}) + a \sum_{i \in L^*} \nabla_{\tau^*} \Omega_i^*(\tau^{*0}, \tau^0) + \\ a^* a[\nabla_{\tau^*} \Omega_A(\tau^0, \tau^{*0}) + \nabla_{\tau^*} \Omega_A^*(\tau^{*0}, \tau^0)] = 0 .$$

It is straightforward to calculate the partial derivatives in (23) and (23*). Substituting these expressions, we obtain

$$(24) \quad a^* [I_{jL} X_j + a(\tau_j^0 - 1) \pi_j M_j'] (\pi_j + \tau_j^0 \pi_{j1}) + \\ a [I_{jL}^* X_j^* + a^*(\tau_j^{*0} - 1) \pi_j M_j'] \tau_j^{*0} \pi_{j1} = 0 \quad \text{for } j \in L ;$$

$$(24^*) \quad a [I_{jL}^* X_j^* + a^*(\tau_j^{*0} - 1) \pi_j M_j'] (\pi_j + \tau_j^{*0} \pi_{j2}) + \\ a^* [I_{jL} X_j + a(\tau_j^0 - 1) \pi_j M_j'] \tau_j^0 \pi_{j2} = 0 \quad \text{for } j \in L^* .$$

Equations (24) and (24*) are two sets of equations that, if independent, might be used

to solve for τ^o and τ^{*o} . However, we find that these equations are linearly dependent.¹⁸ In other words, the equilibrium requirements that we have stated so far determine only the vector of ratios, $\bar{\tau}^o \equiv (\tau_1^o/\tau_1^{*o}, \tau_2^o/\tau_2^{*o}, \dots, \tau_n^o/\tau_n^{*o})$, but not the vectors τ^o and τ^{*o} individually. We will explain the meaning of this finding presently; but first we derive from (24) and (24*) the following equation that implicitly gives the equilibrium policy ratio in industry i :

$$(25) \quad \tau_i^o - \tau_i^{*o} = \left[-\frac{I_i L}{a} \frac{X_i}{\pi_i M_i'} \right] - \left[-\frac{I_i^* L}{a^*} \frac{X_i^*}{\pi_i M_i^{*'}} \right] \quad \text{for } i = 1, 2, \dots, n.$$

Notice that when both sides of (25) are divided by τ_i^{*o} , the trade policies enter this equation only in ratio form.¹⁹

Upon reflection, it is clear why Definition 3 — which we have used to characterize an equilibrium trade pact — only pins down the ratio of the two country's trade policies and not the levels of those policies. The definition stipulates that the equilibrium must be efficient for the two governments without specifying how the surplus will be divided between them. But the ratio τ_i/τ_i^* determines the internal prices p_i and p_i^* , which in turn determine industry outputs, demands, trade flows, and factor prices in each country. In short, the allocation of resources does not depend separately on τ_i and τ_i^* ,

¹⁸ To establish this, use the properties of the price functions $\pi_j(\cdot)$ stated in footnote 7.

¹⁹ That is, X_i and M_i' are functions of $p_i = \tau_i \pi_i$, which is homogeneous of degree zero in τ_i and τ_i^* . Similarly, X_i^* and $M_i^{*'}$ are functions of $p_i^* = \tau_i^* \pi_i$, which also is homogeneous of degree zero in τ_i and τ_i^* . Finally, the term $\tau_i^* \pi_i$ appears directly in the denominator of both bracketed expressions, once the equation has been divided through by τ_i^* . Thus, all of these can be expressed as functions of the ratio, τ_i/τ_i^*

and neither does the joint welfare available to the two governments.²⁰

This brings us to an important point: *Equation (25) must characterize the equilibrium trade agreement even if inter-country transfer payments are constrained to be zero.* Since allocations do not depend separately on the sizes of the policy wedges in the two countries, the governments can mimic any international transfer payment by increasing (or decreasing) some τ_i and τ_i^* while holding their ratio constant. Consider what this would do to trade tax revenue in each country. The revenues that the home country derives from the trade tax or subsidy in industry i total $r_i = (\tau_i - 1)\pi_i M_i$, while those that the foreign country collects amount to $r_i^* = (\tau_i^* - 1)\pi_i M_i^*$. An equiproportionate increase in τ_i and τ_i^* leaves $\tau_i \pi_i$, $\tau_i^* \pi_i$, M_i , and M_i^* unchanged. Therefore tax receipts must rise in the country that imports good X_i and fall in the country that exports this good. Moreover the offsetting changes in government revenue are of exactly the same size.²¹ We see that an equiproportionate increase in τ_i and τ_i^* is in every way equivalent to a direct transfer from the exporting country to the importing country. It follows that a bargain that is efficient when transfers are feasible remains so when they are not.

Recall that we have so far restricted attention to the case in which lobby group members constitute a negligible fraction of the total voting population. We can now extend the analysis to the more general case. When $\alpha_L \geq 0$ and $\alpha_L^* \geq 0$, the following formula applies in place of (25):

²⁰ Mayer (1981) noted this point in his discussion of efficient bargaining between two, aggregate-welfare-maximizing governments.

²¹ Total revenues collect by taxes on world trade in good X_i amount to $r_i + r_i^* = (\tau_i - \tau_i^*)\pi_i M_i$, in view of the market-clearing condition (10). These receipts are unaffected by equiproportionate changes in τ_i and τ_i^* , since π_i falls by the same proportion and M_i does not change.

$$(26) \quad \tau_i^o - \tau_i^{*o} = \left[-\frac{I_i L - \alpha_L X_i}{a + \alpha_L \pi_i M_i'} \right] - \left[-\frac{I_i^* L - \alpha_L^* X_i^*}{a^* + \alpha_L^* \pi_i M_i^{*'}} \right] \quad \text{for } i = 1, 2, \dots, n.$$

This can be derived in one of two ways. First, we can impose $R = 0$ and solve the common agency problem involving lobbies with objectives $v^i = \Omega_i(\tau, \tau^*) - \Lambda_i(\tau, \tau^*)$ and $v^{*i} = \Omega_i^*(\tau^*, \tau) - \Lambda_i(\tau^*, \tau)$, and a hypothetical mediator who maximizes the right-hand side of (21). Then the derivation proceeds as before. Alternatively, we can allow $R \neq 0$, but then we must permit the lobbies to condition their contributions on the sizes of the transfers obtained by their governments as part of the trade agreement. If we allow for this dependence and write $\Lambda_i(\cdot) = \bar{\Lambda}_i(\tau, \tau^*) + \lambda_i R$, and similarly for the foreign lobbies, then we can once again derive (26) as the outcome of the common agency problem.²²

Equation (26) reveals that, relative to free trade, the negotiated trade agreement favors the industry group that has greater political clout. We have $\tau_i/\tau_i^* > 1$ when the first bracketed term on the right hand side exceeds the second and $\tau_i/\tau_i^* < 1$ when the second exceeds the first. Since $\tau_i/\tau_i^* = 1$ in free trade and the home (foreign) domestic price is an increasing (decreasing) function of τ_i/τ_i^* , it is the politically stronger industry that winds up with greater profits than in free trade.

Several components enter into the measurement of political power. Note that these are the same ones that determined the size and sign of the trade policy in the small country analysis of Grossman and Helpman (1992). First and foremost, political power derives from representation in the political process. If the specific factor owners in industry i are organized in one country and not in the other, then the organized group always secures from the trade agreement a gain relative to free trade. When both country's specific factor owners are organized in some industry, then the more powerful

²² We can also show that no lobby can improve its lot by deviating to an arbitrary contribution function $\Lambda_i(\tau, \tau^*, R)$ in place of the one with the form $\bar{\Lambda}_i(\tau, \tau^*) + \lambda_i R$.

group is the one with the greater stake in the negotiation (i.e., X_i versus X_i^*), the one with the government that places less weight on aggregate welfare (i.e., a versus a^*), and the one in the country where a smaller fraction of the voting population bids for policies (i.e., α_L versus α_L^*). Also, an industry interest group at home gains a political advantage relative to its foreign counterpart if the home import demand or export supply is less price sensitive than that abroad. A high price sensitivity raises the cost to a government of distorting prices and thus makes the government less open to the industry's bids for protection.

We note that when the interest groups in industry i enjoy equal political power in the two countries, the trade pact will dictate an import tariff in the importing country that exactly matches the export subsidy in the exporting country. In the event, internal prices, world prices, and industry outputs and profit levels will be the same as in free trade. This finding points to the conclusion that whatever aggregate efficiency losses result from the negotiated trade agreement, these stem not from the mere existence of special interest politics in the two countries, but from differences in the extent of the political pressures that the interest groups can bring to bear. A trade negotiation pits the powerful lobbies in one country against those in another, and thereby neutralizes (to some extent) the power of each one.

Notably absent from the formula in (26) is any measure of the relative market power of the two countries. That is, the foreign trade elasticities — which fully determine the Johnson equilibrium and appear as components of the trade war equilibrium discussed in section 3 — are neglected by the hypothetical mediator of the trade agreement. As is well known, policy induced terms of trade movements benefit one country at the expense of the other and impose a deadweight loss on the world economy. An efficient negotiation will eliminate this source of deadweight loss while perhaps compensating the party that otherwise would have captured the benefits by a more direct means.

It is time now to introduce a specific bargaining procedure, in order to show how this determines the division of surplus between the two negotiating parties. For illustrative purposes, we adopt the Rubinstein (1982) bargaining model, as extended by Sutton (1986) to incorporate the risk that the negotiations might break down at any moment when an agreement has not been reached.

Suppose that the two governments meet at the bargaining table with the trade war equilibrium of section 3 as the status quo. The governments take turns proposing vectors of trade policies τ and τ^* to replace those in the noncooperative equilibrium. When one government makes an offer, the other can accept or reject. If it accepts, the agreement goes into effect immediately. If it rejects, then a period of time passes during which the policies given in (17) and (17*) remain in force. At the end of the period the talks may terminate exogenously or else the second government will get an opportunity to make a counterproposal. Termination happens with probability $(1 - e^{-\beta\Delta})$, where Δ represents the length of a bargaining period and β is a parameter measuring the likelihood of a breakdown per unit time. The process of alternating proposals continues until either an agreement is reached or a breakdown occurs. In the event of the latter, the noncooperative equilibrium continues indefinitely.

In this setting, the cost of failing to reach an immediate agreement is twofold. First, the noncooperative equilibrium applies during the bargaining period. Second, the parties face an exogenous risk that the talks will come to an end. To capture the time cost of delay we introduce discount rates ρ and ρ^* for the two governments. These could arise, for example, if all politicians and factor owners in a country had the same discount rates and if the politicians did not collect their promised contributions until after the talks were completed.²³ The discount rates imply, for example, that the home

²³ The governments' discount factors also reflect the fact that the incumbent politicians may not remain in power forever. We view the discount factors as a simple way to capture whatever costs the governments perceive to be associated with delay in reaching an agreement.

government perceives the value of an agreement reached after k rounds of bargaining to be $e^{-\rho\Delta(k-1)}$ times as great as the value of an agreement with identical provisions that is signed immediately.

In this bargaining game neither government has an incentive to offer a set of policies when another set would provide strictly greater welfare to both governments. In other words, the offers must maximize the right-hand side of (21). Let the maximal value for this expression be \bar{v} . Then we can think of the governments as bargaining directly over the instantaneous welfare levels v^G and v^{*G} subject to the constraint that $a^*v^G + av^{*G} = \bar{v}$. Once a distribution of welfare has been agreed upon, the governments can implement the agreement by choosing policies that satisfy (26) and that divide the trade tax revenues as required by the agreement.

We can solve the bargaining game in the manner suggested by Sutton (1986). Let the home country make the first offer and denote its proposed division of the surplus by (v_H^G, v_H^{*G}) . Of course the proposal must satisfy

$$(27) \quad a^*v_H^G + av_H^{*G} = \bar{v}.$$

Moreover, the offer will be such as to induce immediate acceptance while leaving the foreign government with no extra surplus relative to what it could achieve by refusing the offer. If the foreign government accepts, it receives v_H^{*G} forever. If it rejects, the noncooperative equilibrium continues on for a period of at least Δ . Then, with probability $(1 - e^{-\beta\Delta})$ the negotiations end and the noncooperative equilibrium persists forever; and with probability $e^{-\beta\Delta}$ the foreign government gets the opportunity to make a counteroffer, which we denote by (v_F^G, v_F^{*G}) . The foreign government would always choose an offer that would (just) be accepted, so it can count on a flow of utility v_F^{*G} after the delay of Δ , if the talks do not break down. The home offer that makes the foreign government just indifferent between accepting and rejecting satisfies

$$\frac{v_H^{*G}}{\rho^*} = \frac{1 - e^{-\rho^* \Delta}}{\rho^*} v_N^{*G} + \left[\frac{(1 - e^{-\beta \Delta}) e^{-\rho^* \Delta}}{\rho^*} v_N^{*G} + \frac{e^{-\beta \Delta} e^{-\rho^* \Delta}}{\rho^*} v_F^{*G} \right],$$

where v_N^{*G} is the flow of utility to the foreign government in the noncooperative equilibrium of section 3. The two terms on the right-hand side represent, respectively, the present value of the utility flow during the period before the first possible counteroffer (from time 0 to time Δ), and the expected value of the flow from that time onward. Rearranging this equation gives

$$(28) \quad v_H^{*G} = [1 - e^{-(\beta + \rho^*) \Delta}] v_N^{*G} + e^{-(\beta + \rho^*) \Delta} v_F^{*G}.$$

We derive now the offer that the foreign government would make were it to reach the stage of counterproposing. The counteroffer (v_F^G, v_F^{*G}) satisfies

$$(27^*) \quad a^* v_F^G + a v_F^{*G} = \bar{v}$$

and it provides the home politicians with just enough utility to make them indifferent between accepting the offer and waiting for the chance of still another bargaining round. This indifference condition implies

$$(29) \quad v_F^G = [1 - e^{-(\beta + \rho) \Delta}] v_N^G + e^{-(\beta + \rho) \Delta} v_H^G,$$

where v_N^G is the flow of utility to the home government in a trade war.

We solve the four equations (27), (27*), (28) and (29) for the offer (v_H^G, v_H^{*G}) and the counteroffer (v_F^G, v_F^{*G}) . Since the initial offer always is accepted, we can readily calculate the division of surplus in the modified Rubinstein game. As is usual in such

games, the outcome of the bargaining depends on which government can make the initial offer. However, the advantage from going first disappears as the time between offers shrinks to zero. With continuous bargaining (i.e., $\Delta \rightarrow 0$), the equilibrium trade pact yields the following flows of utility to the two governments:

$$(30) \quad v^G = \frac{1}{2+\gamma+\gamma^*} \left[\frac{1+\gamma^*}{a^*} \bar{v} + (1+\gamma) v_N^G - \frac{a}{a^*} (1+\gamma^*) v_N^{*G} \right];$$

$$(30^*) \quad v^{*G} = \frac{1}{2+\gamma+\gamma^*} \left[\frac{1+\gamma}{a} \bar{v} + (1+\gamma^*) v_N^{*G} - \frac{a^*}{a} (1+\gamma) v_N^G \right];$$

where $\gamma = \rho/\beta$ and $\gamma^* = \rho^*/\beta$. Here, the division of the surplus depends on the fallback positions. That is, each government captures more of the gains from cooperation the greater is its measure of political well being in the trade war equilibrium. As usual, a higher level of welfare in the status quo ante gives a negotiator a stronger position at the bargaining table. Each government also gains more from the trade agreement the more patient it can be while bargaining. Patience gives a negotiator a credible threat to decline a low offer, and thus her rival must offer more to ensure an agreement without delay.

5. CONCLUSION

Whether governments clash in trade disputes or negotiate over trade agreements, their actions in the international arena reflect political conditions back home. Previous studies of cooperative and noncooperative trade relations have focused on governments that are immune from political pressures and that act as benevolent servants of the public interest. In this paper we have taken a first step toward introducing domestic politics into the analysis of international economic relations.

We suppose that politicians are concerned both with per capita real incomes and

campaign contributions. To amass contributions, the politicians are willing to cater to special interest groups. But inefficient policies are costly in terms of general voter support. The politicians balance these conflicting objectives by choosing policies that maximize an indicator of political well being. Meanwhile, the interest groups bid competitively for policy influence. The equilibrium interaction between interest groups and the government determines the latter's objective function in the international realm.

In a noncooperative setting the governments neglect the impact of their policies on factor owners and politicians abroad. Each government responds to the political pressures at home, taking the policies of the other country as given. In the trade war equilibrium the governments protect all of their organized import-competing industries. The industries offer campaign contributions in exchange for import protection, while terms-of-trade considerations dictate positive tariffs even in the absence of interest group support. Tariff rates are highest in industries with the largest stakes in trade policy (i.e., greatest outputs) and in industries where foreign export supplies and home import demands are most inelastic. An inelastic foreign supply means a large aggregate gain from exploiting monopoly power in trade while an inelastic home demand means that policies can be "sold" at little social cost.

The organized owners of the factors used in export industries may not fare as well in the political equilibrium. While these groups also bid for policy support (i.e., export subsidies), a concern for the general voter pushes the government in the opposite direction. The equilibrium outcome may be either an export subsidy or an export tax, and is more likely to be a tax the smaller is home industry's output (compared to home consumption) and the smaller is the absolute value of the foreign import demand elasticity. Export industries that are unable to overcome the free rider problems associated with political organization are especially vulnerable in a trade war, since other lobby groups will push for an export tax to keep domestic prices down, and the government will see such a tax as a boon for the general voter as well.

Politically-motivated governments may be willing to enter into negotiations over a trade agreement not because they see potential social gains from trade cooperation, but because they see potential political gains for themselves. Even in the absence of a connection between aggregate welfare and re-election prospects the governments will recognize the political benefits of gaining access to foreign markets for organized export interests and of achieving reductions in government support for foreign firms competing in the domestic market. Since domestic special interests will reward politicians that secure favorable changes in a trade partner's policies, the incumbent politicians can always find a trade agreement that generates mutual gains in political support relative to the trade war equilibrium.

The equilibrium trade pact strikes a balance between the political strengths of the industry interests in the importing and exporting country. If the two sets of industry factor owners both are represented in the political process and if they have similar abilities and willingnesses to bid for policy support, then the internal prices in each country under the trade agreement will be the same as under free trade. An interest group's willingness to bid for import protection or export promotion reflects its stake in the policy outcome, while the cost to it of securing a policy support reflects the size of the deadweight loss associated with a given trade distortion and the measure of the politician's concern for aggregate welfare. Industry groups that are politically stronger than their counterparts abroad will secure exceptions from across-the-board tariff cuts or from reductions in the levels of export promotion.

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Figure 1

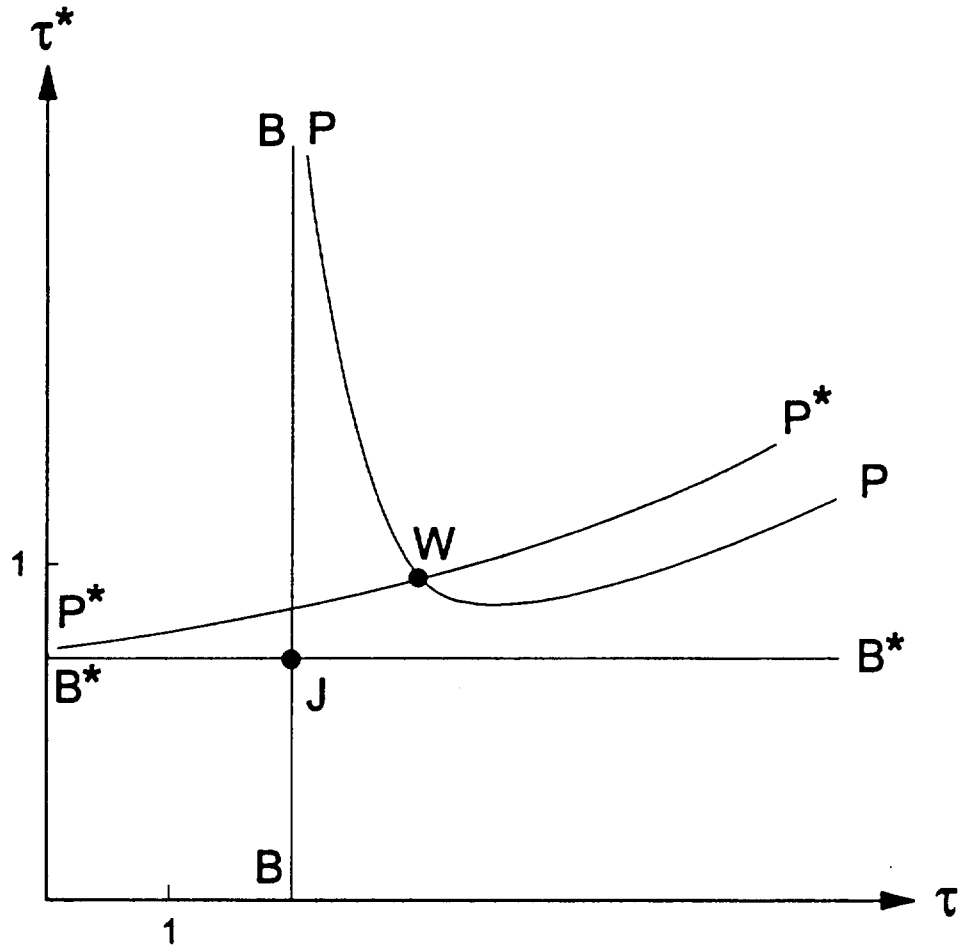


Figure 2

