COLLECTIVE ACTION AND PROTECTION

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ABSTRACT

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Richard Damania and Per G. Fredriksson

This paper provides a new explanation for the formation of protectionistic lobby groups. The level of collusion is shown to be a crucial determinant of the ability of firms to sustain lobbying. Tacit collusion is found to be necessary for firms to organize lobbying when there are fixed set-up cost associated with lobbying. Moreover, the effect of tariffs on the level of collusion is, in turn, shown to be important. It is demonstrated that the degree of protection obtained depends critically upon the cross price elasticity of demand between the domestic good and the foreign import. We thereby provide an explanation for the mixed empirical evidence on the effect of industry concentration on protection. Finally, the equilibrium tariff rate in imperfectly competitive sectors is determined, which yields new insights into the determination of tariffs. (JEL D70, F13)

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NON TECHNICAL SUMMARY

Empirically collusive industries are known to be highly effective lobbyists. The reasons for this unclear and poorly understood. This paper provides a new explanation for the formation of protectionistic lobby groups. The level of collusion is shown to be a crucial determinant of the ability of firms to sustain lobbying. It is demonstrated that a critical determinant of the degree of protection obtained depends upon the cross price elasticity of demand between the domestic good and the foreign import. We thus provide an explanation for the mixed empirical evidence on the effect of industry concentration on protection. Finally, the equilibrium tariff rate in imperfectly competitive sectors is determined, which yields new insights into the determination of tariffs.
“Hence, there seems to be relatively little direct empirical support for the Olson (1965) influential theoretical study on collective action.”

(Jan Potters and Randolph Sloof (1996, p. 418))

I. INTRODUCTION

The standard explanation for why collective action by industries is facilitated by the existence of fewer firms, provided by Olson (1965), is that such industries are less affected by free-riding problems. They organize cooperative political action more easily because greater concentration lowers the cost of political action [see also, for example, Hardin (1982) and Sandler (1992)]. Moreover, in the trade policy area, Rodrik (1986) finds that non-cooperative lobbying contributions fall as the number of firms increases. Pecorino (1998), on the other hand, disagrees with Olson (1965), and argues that cooperation on lobbying for protection does not necessarily becomes harder as the number of firms increases.

In this paper we suggest an alternative perspective on firms’ ability to organize collective action in the trade policy area. We argue that a number of factors which have been ignored in the literature influence the ability of firms in concentrated industries to organize lobbying. Rather than analyzing the effect of the number of firms in an industry, our discussion centers on the effects of the level of collusion, and the effect of the policy instrument itself on collusion. Moreover, we extend the existing literature by exploring the impact that fixed costs associated with lobbying have on equilibrium tariffs and collusion.

We identify the circumstances under which more collusion results in greater lobbying for trade protection. The degree of collusion, and the effect of protection on the level of collusion, is shown to have important implications for an industry’s ability and incentive to
lobby for greater tariffs in an import competing sector.\textsuperscript{1} We demonstrate that a higher tariff increases the incentive for firms in an oligopoly to collude, when the cross-price elasticity of demand between the domestically produced good and the imported substitute is sufficiently low.\textsuperscript{2} Second, we show that collusion increases the ability of firms in a duopoly to form a protectionist lobby with sufficient funds to both offer politicians campaign contributions and cover any fixed costs associated with lobbying. Specifically, it is demonstrated that in the absence of fixed costs associated with lobbying activities, lobby group formation is not constrained by free riding. However, with fixed lobbying costs, the incentive to free ride can only be overcome if the equilibrium is sufficiently collusive. Finally, the model is used to derive the tariff structure in sectors characterized by imperfect competition. The level of protection is intimately related to the ability of the industry lobby to form. Our findings include some new major determinants of the tariff level in imperfectly competitive sectors, such as (\textit{i}) the effect of the tariff (lobbying) on collusive profits, and (\textit{ii}) the existing profit margin.\textsuperscript{3}

Our explanation of lobby group organization and the success of collusive (concentrated) industries emphasizes the \textit{benefits} of lobbying. In contrast, Olson’s discussion focuses on the transaction \textit{costs} associated with lobby group formation. In our model it is the \textit{additional} effect of the tariff on the surplus from lobbying, through an increase in collusion, that enables collusive industries to sustain non-cooperative lobbying.

\textsuperscript{1} Since import protection is the primary form of trade restriction (except in the agricultural sector), we restrict our analysis to an import competing sector. Article XVI of the GATT calls for the member countries to remove all export subsides on non-primary products, and minimize such subsidies on primary products.

\textsuperscript{2} See Itoh and Ono (1982), Ono (1984), Harris (1985), and Krishna (1989) for discussions of the effect of (primarily quantitative) trade protection in facilitating collusion between domestic and foreign firms. However, in this paper we focus on the seemingly more widespread case of a domestic oligopoly that confronts a large number of foreign competitors.

\textsuperscript{3} We find some preliminary evidence that sectors with low cross-price elasticities have high tariff rates. For example, the most protected U.S. manufacturing sector in 1986, Rubber and Plastics Footwear, with a tariff rate equal to around 40 percent, had an estimated cross-price elasticity equal to 0.29 [see Ray (1991) and Reinert and Roland-Holst (1992)].
In surveys, Rodrik (1995) and Potters and Sloof (1996) point out that the empirical literature presents mixed evidence on the political advantages that high concentration confers. Thus, the exact relationship between concentration and protection appears weaker than argued by Olson (1965). For example, whereas Pincus (1975), Caves (1976), Marvel and Ray (1983), Godek (1985), Walter and Pugel (1985), and Trefler (1993) found significant relationships between industry concentration and the level of protection, Finger et al. (1982), Baldwin (1985), and Anderson and Baldwin (1987) report a negative relationship. The present paper provides an explanation for this ambiguity. Since these studies use data sources from dissimilar countries, across varied industries, and time periods, the cross-price elasticity of demand differ between the data sets used. Our results may suggest that the cross-price elasticity may not always have been sufficiently low in concentrated industries to induce lobbying for protection. We suggest that Olson’s description may be incomplete, since it fails to take account of the strategic incentives of firms in concentrated industries, in particular the ones with relatively high levels of collusion.

Our model of political choice builds on Grossman and Helpman (1994), who uses the common agency model by Bernheim and Whinston (1986). Grossman and Helpman (1994) model lobby groups that offer promises of political contributions in return for favorable trade

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4 There are also a number of empirical studies that test Olson’s transaction cost theory on government policies other than trade policy. In addition, the effects of the potential rents have also been explored. The results are again inconclusive. Pittman (1988) finds that the level of federal regulations significantly determines the level of campaign contributions, but only in concentrated industries. Salamon and Siegfried (1977) report that larger industries are less successful in their political efforts. Moreover, they find a positive relationship between an industry’s ability to avoid taxes and firm size, but a negative relationship between political success and concentration. Zardkoohi (1985) finds no effect of concentration on Political Action Committee (PAC) contributions, but a positive relationship between the interaction of concentration and the potential rents. Esty and Caves (1983) argue that seller concentration increases political activity, but not because it reduces free-riding. Instead they argue that concentrated industries have more unified interests. Grier et al. (1994) find that industries with greater potential benefits from government assistance contribute more to PACs but that the ability to realize these benefits is restricted by collective action problems. See also Pincus (1975), Godek (1985) and Gardner (1987) for studies of the impact of geographical concentration.

5 Factors that influence the cross-price elasticity include the presence of foreign-owned affiliates, entry barriers, union presence (see Bloningen and Wilson (1999)) and the quality difference between the domestic and foreign goods (see Bronnenberg and Wathieu (1996) and Sethuraman et al. (1999)).

6 Earlier contributions to the literature on the political economy of trade policy include Findlay and Wellisz (1982), Hillman and Ursprung (1988) and Hillman (1989).
policies. In their paper lobby groups represent the owners of sector-specific capital in sectors with perfect competition. Lobby group formation is simply taken as given, and considerations of market structure and collusion are absent from their model. Moreover, their model takes no account of the potential fixed costs associated with lobbying. In practice, lobby groups (and trade associations) incur set-up costs such as maintaining offices and support staff, the hiring of lawyers and lobbyists, etc. These costs are necessary to influence policymakers, but are largely unrelated to the degree of protection obtained, and may be regarded as fixed costs associated with lobbying. We extend Grossman and Helpman (1994) by introducing fixed lobbying costs into the model. We demonstrate that in the absence of fixed costs there is no incentive for firms to free ride on their rival’s political contributions in the model by Grossman and Helpman (1994). However, when firms incur fixed lobbying costs, some degree of tacit collusion is shown to be necessary to render lobbying feasible and individually rational. This is because some of the benefits which accrue to firms from lobbying are public, while the costs are private. Thus, each firm has an incentive to free ride on its rival's contributions.

We analyze a three-stage game, where the timing is as follows. In the first stage, each firm decides whether to pay for the fixed costs associated with lobbying and offer the government a joint contribution schedule. If both firms decide that this is in their interest, a protectionist lobby group is organized. The lobby offers the government a contingent contribution schedule that mirrors the attractiveness of the policy selected. In the second stage, the government selects the tariff that maximizes its own payoff, and collects the corresponding contribution. This tariff rate is not implemented until the subsequent period, i.e. the lobby faces a lag of one period from the time of its lobbying effort to the time of

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7 This point has been largely overlooked in the literature, which assumes that lobby group formation must be taken as given in the Grossman-Helpman model because of the incentive to free ride. However, we show that in this model free riding on contributions does not occur without fixed costs of lobbying.
harvesting its reward. This reflects the delay caused by administrative procedures, legislative processes, and other lags from the time it takes to gather information and lobby to when the final decisions are made and implemented by policy makers. In the third stage, the two firms determine the optimal output levels, given the tariff rate that materializes in the present period (due to the lobbying carried out in the previous period). The model is solved by backward induction. The game is repeated over an infinite horizon, so that tacit collusion in both the lobbying and output stages may occur under certain circumstances.9 Firms use a trigger strategy.

Pecorino (1998) studies free-riding in firms’ lobbying for protectionism. He finds that an increase in the number of firms in an industry does not necessarily imply that free-rider problems increase, and that cooperation may be sustained even under perfect competition, i.e. with an infinite number of firms. The present paper is also related to Mitra (1999) who endogenizes the organization of lobby groups using the Grossman and Helpman (1994) model. He employs an industrial organization-endogenous market structure–approach to find the equilibrium number of lobby groups. Mitra argues that industries which are more likely to organize have large capital stocks, inelastic demand functions, few capital owners, and are geographically concentrated. The analysis hinges on a comparison of the net benefit of organizing with the fixed cost of doing so, and appeals to communication-based refinements of the Nash equilibrium. A discussion of free-riding problems is absent. Thus, while Mitra focuses upon the determination of the equilibrium number of lobby groups, this paper deals with the incentive to free ride within a lobby group. Finally, Damania and Fredriksson (2000) study pollution taxation, and argue that collusive industries may more easily form lobby groups that oppose such taxes. However, lower pollution taxes themselves reduce

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8 A contribution schedule offered by one firm alone is not considered equivalent to lobby group formation in this paper.
collusion, and thus mitigate the incentive to lobby. Damania and Fredriksson (2000) do not consider fixed lobbying costs.\textsuperscript{10}

The paper is organized as follows. Section II describes the duopoly model, and analyses the effect of a tariff on collusion. Section III discusses the political equilibrium and Sections IV and V analyses collective action problems associated with lobbying. Section VI studies the determination of tariff protection in import competing sectors with imperfect competition, and Section VII gives a brief conclusion.

II. THE OUTPUT MARKET

Consider a domestic duopoly in a small country that produces an importable good and faces a perfectly competitive world market. The foreign and domestically produced goods are imperfect substitutes.\textsuperscript{11} The domestic good price is \( p \), and the world market price is \( p^* \). The domestic market is protected by a tariff \( \tau \in T \), which implies that the foreign substitute is sold on the domestic market at a price \( P = (1 + \tau)p^* \). The demand for the domestic and foreign goods in the economy under consideration are given by \( Q = Q(p, P) \) and \( Q^* = Q^*(P, p) \), respectively, where we assume \( \partial Q / \partial p < 0, \partial Q / \partial P > 0, \partial Q^* / \partial P < 0, \) and \( \partial Q^* / \partial p > 0 \). The inverse demand functions are given by \( p = p(Q, P) \) and \( P = P(Q^*, p) \), where we assume \( \partial p / \partial P > 0 \). It is further supposed that the own price effect on demand for the domestic good exceeds the cross price effect, i.e. \( |\partial Q / \partial p| > |\partial Q / \partial P| \).

The owners of the duopoly are assumed to constitute a negligible part of the population and thus their aggregate utility function equals the firm’s profit function. Taking

\textsuperscript{9} Friedman (1971), Axelrod (1981), Hardin (1982), and Radner (1986) show that collective action can be sustained in infinitely repeated games, depending on the discount factor. Our contribution does not build on this argument.

\textsuperscript{10} Rodrik (1995) surveys the literature on the political economy of trade policy.

\textsuperscript{11} The duopoly may be sustainable even with free trade due to the role of product, industry, political, and “home bias” factors (see also Bloningen and Wilson (1999)).
the tariff and contribution schedules as given, the profits of the domestic firm \( i, i=1,2 \), are defined as

\[
\pi_i = (p(Q, P) - c)q_i - S_i(\tau) - F_i, \tag{1}
\]

where \( c \) is a constant marginal cost, \( q_i \) denotes output of firm \( i \), and \( Q = q_i + q_j \). Whereas \( S_i(\tau) \) is firm \( i \)'s contribution paid to the government contingent on the tariff level, \( \tau \), \( F_i \) represents firm \( i \)'s contribution to the fixed costs of lobbying.\(^{12}\) The fixed costs are associated with organizing lobbying activities, e.g. setting up an office with support staff, travelling to meetings with government officials, or hiring lobbyists that carry out the lobbying activities for the firms [see Moe (1980) for a further discussion]. For simplicity we will denote the aggregate lobbying costs of firm \( i \) as \( S_i(\tau, F_i) \), where \( S_i(\tau, F_i) = S_i(\tau) + F_i \). An active lobby requires \( S_i(\tau, F_i) > F_i \), \( \forall i, i=1,2 \), i.e. the fixed costs are covered and both firms offer the government prospective funds.

Define the sum of consumer surplus from consumption of both substitutes and tariff revenues as

\[
W^{CONS}(\tau) \equiv \int_0^Q p(Q, P)dQ - \int_0^{\dot{Q}} P(p^*, \tau)dQ^* - (P - \tau)p^*Q^*. \tag{2}
\]

Aggregate social welfare gross-of-contributions is given by the sum of expression (2) and gross-of-contributions profits,

\[
W(\tau) \equiv W^{CONS}(\tau) + \tilde{\pi}, \tag{3}
\]

where \( \tilde{\pi} = \tilde{\pi}_i + \tilde{\pi}_j \), \( \tilde{\pi}_i = \pi_i + S_i(\tau, F_i) \). In a one-shot game, output levels are defined by the Cournot-Nash equilibrium which is denoted \( q_i^* \in \arg\max \pi_i \). The first-order condition of firm \( i \)'s profit function (1) is given by

\(^{12}\) Lobby group formation is discussed in more detail below.
Let \( q_i^n = q_j^n = q^n \) be the solution to Eqn. (4).

It is assumed that the firms interact over an indefinite period of time. It is well established that under certain conditions this provides an incentive to tacitly collude. Tacit collusion, however, gives rise to the familiar problem that each firm has an incentive to defect, given that its rival sets some collusive output level. More specifically, let \( q_j^c \) denote some collusive output level set by firm \( j \). Then the defection output level of its rival \( i, q_i^d, \) is determined by

\[
\pi_i^d = (p(q_i^d, q_j^c) - c)q_i^d - S_j(\tau, F_i),
\]

where \( q_i^d \) is firm \( i \)'s defection output level. The first superscript will hereafter apply to the output stage (and the second to the lobbying stage, as discussed below). The first-order condition of Eqn. (5) is

\[
\frac{\partial \pi_i^d}{\partial q_i^d} = p'q_i^d + p - c = 0.
\]

Defection can be prevented if firms adopt a credible and severe threat of retribution. In what follows it is assumed that firms employ the familiar “grim trigger strategy” to deter defection. Specifically, both firms abide by the tacit agreement and produce at some collusive output level as long as there is no defection. However, if a firm defects its rival immediately reverts to the Cournot-Nash equilibrium output level denoted \( q_i^n \) so that the collusive agreement is dissolved. This strategy serves to deter defections if the following incentive compatibility constraint is satisfied:

\[
\pi_i^d(q_i^d, q_j^c, \tau, F_i) - \pi_i^c(q_j^c, \tau, F_i) - \pi_j^c(q_i^d, q_j^c, \tau) \leq \frac{\pi_i^c(q_i^d, q_j^c, \tau, F_i) - \pi_j^c(q_i^d, q_j^c, \tau)}{r},
\]
where \( r \) is the discount rate, \( \pi^i_n(q^n_i, q^n_j, \tau, F_i) \) are profits of firms \( i=1,2 \) at the Cournot-Nash equilibrium output level \( (q^n_i, q^n_j) \), and \( \pi^i_c(q^c_i, q^c_j, \tau, F_i) \) are collusive profits of firms \( i=1,2 \).

When Eqn. (7) is satisfied, firm \( i \) has no incentive to deviate from the collusive output level, \( q^c_i \), given \( \tau \).

In determining its own tacitly collusive output level each firm must consider the impact of its production decision on its rival’s incentive compatibility constraint. More specifically, this requires that firm \( i \)’s collusive output levels are determined by the solution to the constrained maximization problem:

\[
\begin{align*}
\text{Max}_{q^c_i} \quad & \pi^i_c(q^c_i, q^c_j, \tau, F) \equiv \pi^i_c(q^c_i, q^c_j, \tau, F) + \pi^j_c(q^c_i, q^c_j, \tau, F_j) \\
\text{s.t.} \quad & \Omega_j \equiv \pi^j_j(q^d_j, q^c_i, \tau, F_j) - \pi^j_j(q^c_j, q^c_i, \tau, F_j) - \frac{\pi^j_j(q^c_j, q^c_i, \tau, F_j) - \pi^j_j(q^c_j, q^c_i, \tau)}{r} \leq 0.
\end{align*}
\]

(8.1)

(8.2)

If constraint (8.2) does not bind the monopoly output level can be sustained. This is defined by the solution to

\[ q^M = \frac{Q^M}{2} \in \arg \max(p(Q) - c)Q. \]

(9)

When constraint (8.2) binds there is constrained collusion with output in the interval \( q^c_i \in (q^M, q^n) \). Suppose the constraint (8.2) binds at some output level \( q^c_i \). The following Lemma describes a useful property of the equilibrium which is frequently used in what follows.

**Lemma 1:** An increase in firm \( j \)’s output lowers its rival’s incentive to defect, i.e. \( \frac{d\Omega_j}{dq^c_j} < 0 \).
**Proof:** Let \((q^c_i, q^c_j)\) be the output levels at the constrained maximum where the incentive compatibility constraint (8.2) binds. By symmetry we have \(q^c_i = q^c_j = q^c\), and \(\Omega_i = 0\). Suppose that Lemma 1 is not true, then \(\frac{d\Omega_i}{dq^c} \geq 0\). Then by constraint (8.2), a fall in the collusive output level, \(q^c\), brings output closer to the unconstrained joint profit maximizing level and raises collusive profits. Since \(\frac{d\Omega_i}{dq^c} \geq 0\), this does not prompt any defection. This, however, contradicts the hypothesis that \(q^c_j\) is the solution to the constrained maximum in (8.2). Thus \(\frac{d\Omega}{dq^c} < 0\). *Q.E.D.*

Lemma 1 reveals that when firm \(j\)’s collusive output level increases, both the rival’s incentive to defect and its collusive profits decrease. However, the profits obtained by the rival from defection decline more rapidly than do its profits from collusion. There is therefore less incentive to defect. This implies that a firm may influence its rival’s incentive to tacitly collude by changing its own output level. It follows that when a firm determines its collusive output level it must take into account the impact of its production decisions on its rival’s incentive to defect.\(^{13}\) As is well known, the properties of the resulting equilibria depend critically upon the prevailing discount rate. Accordingly, rearranging constraint (8.2) we define a threshold discount rate:

\[
r_q \equiv \frac{\pi^c_i (Q^c, \tau, F_i) - \pi^n_i (q^n_i, q^n_j, \tau)}{\pi^n_i (q^n_i, q^n_j, \tau, F_i) - \pi^c_i (Q^c, \tau, F_i)},
\]

(8.2’)

where \(Q^c = q^c_i + q^c_j\), and \(\tau\) is the tariff level determined by lobbying, where applicable (discussed below). Let \(r\) be the prevailing discount rate. There are three distinct cases.

\(^{13}\) This explains the structure of the optimization problem in Eqns. (8.1) and (8.2).
Case (A). Assume \( r = r_q \). The constraint (8.2) holds with equality which implies that we have constrained collusion. In this case output levels are determined by the solution to the incentive compatibility constraint. This is termed a “balanced temptation equilibrium” (see Friedman (1971)). In a balanced temptation equilibrium the industry is neither as collusive as in the joint profit maximizing outcome, nor as competitive as in the Cournot-Nash equilibrium. Thus, collusive output levels lie in the intermediary range between the joint profit maximizing level and the Cournot-Nash equilibrium level.

Case (B). Assume \( r < r_q \). The incentive compatibility constraint (8.2) holds with slack, and collusive output levels are determined by unconstrained joint profit maximization. In this case each firm produces half the monopoly output level, denoted by \( q_i^m \), \( i = 1, 2, i \neq j \).

Case (C). Assume \( r > r_q \), \( \forall q_i \in [q_i^m, q_i^a] \). The incentive compatibility constraint is violated and collusion is not sustainable. Hence output levels are at the Cournot-Nash equilibrium.

In what follows our main focus will be Case (A), since we wish to investigate the impact of marginal changes in collusion on equilibrium protection levels and lobbying. For future reference, we begin by deriving the effect of a change in the tariff on profits. Differentiation of Eqn. (1) yields

\[
\frac{d\pi_i}{d\tau} = p \left( \frac{\partial \pi_i}{\partial q_i^m \frac{\partial q_i}{\partial P}} + q \frac{\partial p}{\partial P} \right).
\] (10)

The first term on the right hand side of Eqn. (10) is the effect of the tariff on collusion, and the second term defines the effect of a higher price of the foreign good. Whereas the former effect increases the ability of the domestic firms to raise prices through an increase in collusion, the latter term increases profits through a direct increase in the price of the domestic good and a reduction in the amount supplied from abroad. When output is at the
joint profit maximising level $q_i^M$, $\partial \pi_i(q_i^M) / \partial q_i^M = 0$, by the Envelope Theorem. Since $\partial p / \partial P > 0$, it follows that in this case

$$\frac{d\pi_i(q_i^M)}{d\tau} = p^* q_i^M \frac{\partial p}{\partial P} > 0.$$  

(11)

Note, however, that when constraint (8.2) binds, $\partial \pi_i(q_i) / \partial q_i \neq 0$. However, since $q_i \in (q_i^M, q_i^d)$ it follows that $\partial \pi_i(q_i) / \partial q_i \geq 0$. Thus, Eqn. (10) is unambiguously positive. Not unexpectedly, higher tariffs always result in increased collusive profits. However, whether an increase in the tariff induces greater collusion depends critically upon the manner in which the tariff affects the payoffs from collusion relative to those from defection. Proposition 1 explores the effect of the tariff on the incentive to collude, as defined by the incentive compatibility constraint (8.2).

**Proposition 1:** In a tacitly collusive equilibrium, an increase in the tariff increases the domestic firms' incentive to collude iff the cross price elasticity of demand between the domestic good and the foreign good is sufficiently low.

**Proof:** Totally differentiating constraint (8.2) and applying the envelope theorem yields

$$\frac{d\Omega_i}{d\tau} = p^* \left[ \frac{\partial \pi_i^d}{\partial P} + \frac{1}{r} \frac{\partial \pi_i^a}{\partial P} - \left( 1 + \frac{1}{r} \right) \frac{d\pi_i^c}{dP} \right],$$  

(12)

where $dP / d\tau = p^*$. Expanding the last term on the right-hand side of Eqn. (12), employing

$$\pi_i^c = (p^*(q^c, P) - c)q^c,$$  

(1')

yields

$^{14}$ This can be verified from the first-order condition which implies that $= p'(\mathcal{Q}) + p - c \geq 0$, $\forall q_i \in (q_i^M, q_i^d)$. 

12
\[
\frac{d\pi_i^c}{d\tau} = p^c \left( \frac{\partial \pi_i^c}{\partial q_i^c} \frac{\partial q_i^c}{\partial P} + q_i^c \frac{\partial p_i^c}{\partial P} \right) = p^c \left[ \left( \frac{\partial p_i^c}{\partial q_i^c} - q_i^c + p_i^c - c \right) \frac{\partial q_i^c}{\partial P} + q_i^c \frac{\partial p_i^c}{\partial P} \right].
\]

Moreover, from Eqn. (11) we know that
\[
\frac{d\pi_i^k}{d\tau} = p^k q_i^k \frac{\partial p_i^k}{\partial P}, \quad \text{for } k = d, n.
\]

Substituting Eqn. (13) and Eqn. (11') into Eqn. (12) yields
\[
\frac{d\Omega_i}{d\tau} = p^c \left[ q^d \frac{\partial p^d}{\partial P} + q^n \frac{\partial p^n}{\partial P} \right] > 0 \quad \text{i ff}
\]
\[
\frac{\partial q^c_i}{\partial P} \frac{P}{q^c_i} < \frac{rP^d \left( q^d \frac{\partial p^d}{\partial P} + q^n \frac{\partial p^n}{\partial P} \right) - P \frac{\partial p^c_i}{\partial P}}{q^c \left( \frac{\partial p^c_i}{\partial q^c_i} q^c + p^c - c \right)},
\]

where \( \varepsilon_{q/P} \) is the cross price elasticity of demand between the domestic good and the foreign good price in the collusive equilibrium. Q.E.D.

A low cross-price elasticity of demand, \( \varepsilon_{q/P} \), often called the Armington elasticity, implies that an increase in the tariff (i.e. a rise in the price of the foreign good) leads to a relatively small increase in the demand for the domestic good. This is likely to occur when the two goods are not close substitutes, e.g. when the quality differences between the goods is large.15 Bronnenberg and Wathieu (1996) show that the lower the quality difference the higher the cross-price effect, and Bloningen and Wilson (1999) find that a greater quality

\[15\] Bloningen and Wilson (1999) report a 0.81 average for 146 cross-price elasticities between U.S. and foreign consumption goods, with a standard deviation equal to 0.63 and a minimum (maximum) of −0.96 (3.52). Significant explanatory variables include the degree of presence of foreign-owned downstream affiliates (positive sign), median firm size (negative), unionization (negative sign), and the ratio of industry imports from developing countries (negative sign). Sethuraman et al. (1999) report cross-price elasticities between 0.754 and 0.022 depending on how close the competing substitutes’ prices (and thus qualities) are. This “neighborhood effect” states that substitutes that are closer to each other in price have larger cross-price effects than brands that are priced further apart.
difference between home and foreign goods (as measured by the ratio of industry imports from developing countries) gives a lower Armington elasticity. This implies that in collusive industries, a tariff facilitates greater collusion between domestic firms when the foreign rivals produce relatively dissimilar goods. Intuitively, when the domestic and foreign goods are not close substitutes, the colluding domestic firms can profitably restrict domestic output (i.e. raise price), without fear of losing consumers to the foreign substitute. In these circumstances, a higher tariff results in an increase in the degree of collusion in the domestic market. The tariff thus acts as a device which facilitates collusion (see also Krishna (1989)).

III. POLITICAL EQUILIBRIUM

This section explores the effects of lobbying by firms on the tariff level in the political equilibrium. We now explicitly take into account the timing of lobbying. It is assumed that if the industry lobby is formed in period $t$, this yields benefits in the form of a higher tariff in the following period. The firm offers the government a political contribution schedule $S_i(\tau_{t+1})$ in stage one. This schedule depends on the tariff that the government implements in period $t+1$. Let subscripts denote time, in addition to the firm-specific notation introduced previously. The aggregate political expenditures of the lobby group are defined as

$$S_i(\tau_{t+1}, F_i) = [S_{i_1}(\tau_{t+1}) + F_{i_1}] + [S_{j_1}(\tau_{t+1}) + F_{j_1}].$$

(16)

The component of lobby group expenditures transferred to the government is contingent on the tariff chosen by the government. Note also that this tariff policy is not implemented until the beginning of the next period. Given knowledge of the contribution schedule, the government selects its optimal tariff policy and collects the associated contribution from the lobby.

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16 The timing of the lobbying game is closely tied to the sequence of events in the output stage of the game, where a firm defects in period $t$ and in that period, collusion by the rival continues. With the timing as in our
When selecting the tariff policy, the government is assumed to maximize a weighed sum of the aggregate political contributions (received in period \( t \)) and aggregate social welfare gross-of-contributions (from period \( t+1 \)). This implies that in period \( t \) the government’s objective function is given by

\[
G_t(\tau_{t+1}) = S_t(\tau_{t+1}) + \frac{\alpha}{1+r} W(\tau_{t+1}),
\]

where \( \alpha \) is the weight given to aggregate social welfare relative to political contributions.\(^{17} \)

From Lemma 2 of Bernheim and Whinston (1986) and Proposition 1 of Dixit et al. (1997), the following two necessary conditions yield a subgame perfect Nash equilibrium \( \{S^*_u, \tau^*_{t+1}\}_{i=1,2} \) when both firms offer the government political contribution schedules:

- \( \tau^*_{t+1} \) maximizes \( G_t(\tau_{t+1}) = S_t(\tau_{t+1}) + \frac{\alpha}{1+r} W(\tau_{t+1}) \) on \( T; \)

- \( \tau^*_{t+1} \) maximizes \( \frac{\pi^c_{t+1}(Q_{t+1}, \tau_{t+1}, F^c) + \pi^f_{t+1}(Q_{t+1}, \tau_{t+1}, F^f)}{1+r} + G_t(\tau_{t+1}) \) on \( T. \)

Maximizing (CI) and (CII) and substituting appropriately reveals that in equilibrium the contribution schedule of the industry lobby group (when both firms participate in the lobbying process) satisfies

\[
\frac{1}{1+r} \frac{\partial \tilde{\pi}^c_{t+1}(Q_{t+1}, \tau_{t+1}, F^c) + \tilde{\pi}^f_{t+1}(Q_{t+1}, \tau_{t+1}, F^f)}{\partial \tau_{t+1}} = \frac{\partial S^*_u(\tau_{t+1})}{\partial \tau_{t+1}},
\]

where \( \tilde{\pi}^c_{t+1} \equiv (p(Q) - \theta \tau)q_i \) are profits gross of contributions. Eqn. (18) suggests that in equilibrium the change in the lobby group’s contribution equals the effect of the tariff on the utility (profits) of the lobby group, i.e. the schedule is locally truthful. By substituting Eqn.

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\(^{17} \)As discussed by Grossman and Helpman (1994), contributions can be used for, e.g., political advertising, whereas a greater average level of social welfare increases the probability of the government winning re-election in a (implicitly modeled) future election.
(18) into the first order condition of (CI), the political equilibrium tariff in a given period $t$, $\tau^*_t$, is found to be the solution to

$$\frac{\partial \pi(Q)}{\partial \tau_t} + \alpha \frac{\partial W(\tau^*_t)}{\partial \tau_t} = 0. \tag{19}$$

A similar condition holds also for $\tau^*_{t+1}$ in period $t+1$.\(^{18}\) We therefore drop the time subscripts from hereon, when they are unnecessary. Note that the equilibrium tariff is necessarily greater than the welfare-maximizing tariff, which we define as

$$\tau^* \in \text{Argmax } W(\tau). \tag{20}$$

This is because the industry lobby’s effort to raise the tariff is unopposed in this model. Note also that expression (19) implies that the lobby receives a weight of $(1+\alpha)$ in the government’s welfare maximization, whereas consumers receive a weight of $\alpha$ only.

Bernheim and Whinston (1986) and Grossman and Helpman (1994) extend the concept of local truthfulness to a contribution schedule that is globally truthful, i.e. a contribution schedule which accurately represents the preferences of the interest group at all trade policy points. The equilibrium contribution to the government (with one lobby group) is given by the difference in social welfare when the government sets the welfare maximizing tariff $\tau^*$, and at the political equilibrium $\tau$. Specifically, the necessary contribution to the government for the industry lobby group (or the one lobbying firm) is defined by

$$S(\tau) = \alpha[W(\tau^*) - W(\tau^*)], \tag{21.1}$$

which thus perfectly compensates the government for the welfare loss associated with the participation of the industry lobby group in the political process. The welfare loss is weighted by $\alpha$ in order to adjust for its importance in the government’s objective function.

\(^{18}\) Taking the discount factor into consideration does not change the results since both the lobby and the government discount the benefits of lobbying in period $t$ by the same factor.
As noted above, in the present model we extend the analysis by Grossman and Helpman (1994) and Dixit et al. (1997) by assuming that there are fixed costs associated with lobbying. Thus, lobbying is feasible only if total industry contributions are sufficient to (i) completely cover the fixed costs of lobbying, $F$, and (ii) compensate the government for the welfare loss of lobbying as defined in (21.1), such that

$$S(\tau, F) = \alpha[W(\tau^*) - W(\tau)] + F. \quad (21.2)$$

Under symmetry, each firm $i$ must contribute

$$S_i(\tau, F) = \frac{S(\tau, F)}{2} \quad (21.3)$$

for lobbying to occur, i.e., in a symmetric equilibrium the firms are assumed to both offer identical contribution schedules to the government and identical funds for the purpose of covering the fixed costs. We denote the symmetric equilibrium lobbying expenditures by $S_i^*(\tau, F) = S_j^*(\tau, F_i)$.

Having defined the optimal levels of industry contributions and lobbying expenditures, we now determine whether the firms have sufficient incentive to form a lobby.

**IV. THE DECISION TO FORM A LOBBY GROUP**

Since firms are assumed to interact over an indefinite period, each firm’s decision to offer a contribution schedule and pay its share of the fixed cost at each point in time, i.e., to participate in the activities of the lobby group, will be influenced by its long-term profitability. We now analyze the conditions under which it is rational for firms to offer a contribution schedule and participate in the lobbying process, rather than to free ride. It is assumed that tacit collusion is sustainable in the output stage of the game, so that output levels are given by the solution to the problem stated in (8.1) and (8.2).
The Finite Period Game

We begin by considering the symmetric one-shot equilibrium contribution levels at some output level which is determined in the final stage of the game. To gain greater insight into the incentives to form a lobby group, we begin by investigating lobby group formation in a finite period game. We first show that without fixed costs, free riding does not occur in lobbying. However, with fixed costs of lobbying, a lobby group is unable to organize in a finite period game.

Proposition 2: Assume that there are no fixed costs associated with lobbying. In a finite period game the firms have no incentive to free ride on the contributions paid to the government.

Proof: With zero fixed lobbying costs, the net profits of firm $i$ are given by

$$\pi^*_i = (p^*_i Q^*_i, \tau_i) - c) q^*_i - S_i(\tau_{i+1}).$$

In a finite period game, the profit maximising political contributions offered to the government satisfy the first-order condition

$$\frac{d\pi^*_i}{dS^*_i} = \frac{\partial\pi^*_i}{\partial \tau_{i+1}} \frac{\partial S^*_i}{\partial \tau_{i+1}} - 1 = 0.$$  \hspace{1cm} (22)

Assume a smooth and monotone contribution function so that the inverse exists. Rearranging Eqn. (22) yields

$$\frac{\partial\pi^*_i}{\partial \tau_{i+1}} = \frac{\partial S^*_i}{\partial \tau_{i+1}}.$$  \hspace{1cm} (23)

19 The results in Propositions 2 and 3 do not depend on the assumption that there is collusion in the output market. The results would continue to hold under other modes of oligopolistic competition. All that is required is the assumption that profits are increasing in the tariff. The assumption of a finite period game is made merely for expositional purposes in this subsection to highlight an important property of the equilibrium.

20 This assumption is implicit in the Grossman-Helpman model which assumes that $\partial S_i/\partial \tau > 0$. 
Observe that (23) is the local truthfulness condition, necessary for a subgame perfect Nash equilibrium. From condition (19) we have
\[
\frac{\partial \pi^*}{\partial t_{r+1}} = -\alpha \frac{\partial W(t^*_{r+1})}{\partial t_{r+1}}.
\] (19')
Substituting in Eqn. (23), summing over all \( i \), and integrating yield
\[
S^*_i = 2 \frac{\partial \pi^*}{\partial t_{r+1}} d t_{r+1} = -\alpha \frac{\partial W(t^*_{r+1})}{\partial t_{r+1}} d t_{r+1} = -\alpha (W(t^*_{r+1}) - W(t^*_{r+1})) = \alpha (W(t^*_{r+1}) - W(t^*_{r+1})).
\] (24)
Expression (24) defines the equilibrium level of variable lobby group contribution payments in a finite-period game. It is equal to the equilibrium contribution amount defined in Eqn. (21.1), which is necessary to compensate the government for raising the tariff above the welfare maximizing level. \textit{Q.E.D}

This result implies that once a lobby group is formed in the first period, the contributions necessary for a subgame perfect equilibrium of the political game are exactly equal to the individual rational (Nash) contributions which maximize each firm’s profits. Thus, in the absence of fixed lobbying costs the subgame perfect political equilibrium does not require contributions from each firm in a lobby group beyond the individually rational levels.\textsuperscript{21}

However, with fixed costs associated with lobbying, political influence is feasible only if firms make sufficient contributions to cover the fixed costs of lobbying. Proposition 3 deals with this issue.

\textsuperscript{21} An immediate implication of this finding is that \textit{absent} fixed costs, free riding amongst firms is not a problem which constrains lobbying in the model. This is because the political equilibrium is sustained by the individually rational (Nash) contributions of each firm. With the exception of Goldberg and Maggi (1999), this issue appears to have been overlooked in the literature. Moreover, in this case the political equilibrium is identical whether the lobbyists are assumed to be "groups" representing an entire industry or simply the firms acting individually. Intuitively, this follows directly from the local truthfulness condition.
Proposition 3: In a finite period game, firms have no incentive to contribute to the fixed costs of lobbying.

Proof: In the absence of lobbying firms' profits in any period $t$ are given by
\[ \pi^c_w(\tau^w_i) = (p_i(\tau^w_i) - c)q_c^i(\tau^w_i). \]  
(25)

With lobbying profits equal
\[ \pi^*_w(\tau^*_i) = (p_i(\tau^*_i) - c)q^*_c(\tau^*_i) - S^*_w(\tau^*_{t+1}) - F^*_w. \]  
(1‴′)

Clearly, for lobbying to occur in any period $t$, we must have
\[ \pi^*_w(\tau^*_i) > \pi^c_w(\tau^w_i). \]  
(26)

When inequality (26) holds firms have an incentive to form a lobby group and contribute their share of the fixed costs of lobbying. However, a firm which free rides on the fixed costs earns in the defection period
\[ \pi^{cd}_w(\tau^*_i) = (p_i(\tau^*_i) - c)q^*_c(\tau^*_i) - S^*_w(\tau^*_{t+1}) > \pi^c_w(\tau^w_i). \]  
(27)

Eqn. (27) implies that given a rival's contribution to the fixed costs of lobbying, a firm gains by free riding on these contributions in the penultimate period of the game. By backward induction it follows that neither firm will contribute to the fixed costs. Without contributions to the fixed costs, no contribution schedule is offered to the government, and the welfare maximizing tariff is selected by the government. Thus, if the fixed costs of lobbying are non-zero, a lobby group cannot be sustained in a finite period game in the lobbying stage. Q.E.D.

Thus, once a lobby group is formed, in any finite period game, each firm has an incentive to free-ride by withholding its contributions to fixed costs. Knowing this, neither firm will contribute to the fixed costs, so that a lobby group will not be formed.  

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22 For notational brevity, the remaining arguments of $p$ are left out.
The Infinitely Repeated Lobbying Game

As is well known, greater levels of cooperation can be sustained in an infinitely repeated game framework. Accordingly, we explore whether the fixed costs of lobbying can be covered when firms interact over an infinite horizon. If contributions are to be increased beyond the finite-period Nash equilibrium levels, then firms must adopt some credible strategy to sustain these higher contributions. As in the previous section we consider the possibility of deterring free riding on the fixed costs of lobbying by employing the familiar grim-trigger strategy. Thus, it is assumed that each firm abides by a tacitly collusive strategy which requires it to contribute half the amount implied by Eqn. (21.3) to the lobby group as long as its rival does not defect (i.e., free rides). If, however, the rival deviates from this strategy the firm immediately reverts to the one-shot Nash equilibrium. From Proposition 2 this implies that there is no lobbying as the fixed costs of lobbying are not covered. In this case, the government sets \( \tau^w \) to maximize social welfare. This strategy will serve to deter free riding if the following incentive compatibility constraint is satisfied:

\[
\pi_i^{cd}(\tau^*) - \pi_i^{ce}(\tau^*, F_i) \leq \frac{\pi_i^{ce}(\tau^*, F_i) - \pi_i^{cn}(\tau^w)}{r},
\]

where \( \pi_i^{cd}(\tau^*) = (p(\tau^*) - c)q^c(\tau^*) - S_i(\tau^*) \) are the profits of firm \( i \) when it colludes in the output stage but free rides on its contribution to fixed costs, given that its rival contributes the full amount \( S_j^*(\tau^*, F_j) \), and \( \pi_i^{ce}(\tau^*, F_i) = (p(\tau^*) - c)q^c(\tau^*) - S_i(\tau^*) - F_i \) are profits when both firms abide by the collusive agreement in both the output and lobbying stages by contributing symmetric amounts \( S_i^* \) and \( S_j^* \), respectively.24 Finally,  

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23 The problem is similar in some respects to the private provision of a discrete public good. The literature suggests that in general agents will free ride on their contributions, unless certain stringent conditions are satisfied. For instance, in a number of models, free riding is the dominant strategy unless there exists a credible mechanism to repay all prior contributions in the event that free riding occurs (see Admati and Perry (1991) and Palfrey and Rosenthal (1984)).

24 As is customary in most supergame models, it is assumed that the game is stationary so that time subscripts on the profit function can be ignored. This requires that \( \tau_i = \tau_{i+k} \) and \( \tau_i = \tau_{i+k} \), \( k=1,2,... \), and thus time
\( \pi_i^{cn}(\tau^w) = (p(\tau^w) - c)q^c(\tau^w) \) are profits when firm \( i \) colludes in the output stage, but there is no lobbying so that the tariff equals the welfare maximizing level, \( \tau^w \).

The left hand side of constraint (28) defines the one period gains to firm \( j \) when it free rides on the lobbying costs in the present period, while the right hand side defines the profits foregone because lobbying ends and the tariff is set at \( \tau^w \) in the next period. When constraint (28) is satisfied, contributing to the fixed costs of the lobby group is the individually rational strategy for each firm. We rearrange (28) to define a critical discount rate

\[
 r_L = \frac{\pi_i^{cc}(\tau^*, F_j) - \pi_i^{cn}(\tau^w)}{\pi_i^{cd}(\tau^*) - \pi_i^{cc}(\tau^*, F_j)}. \tag{28'}
\]

Observe that from Eqn. (28’) it follows that the equilibrium contributions of \( S_i^*, i = 1, 2, i \neq j \), can be sustained by this strategy if the prevailing discount rate is \( r \leq r_L \).

Having defined the conditions necessary to make lobbying feasible in an infinitely repeated game, we now turn to the equilibrium properties. We explore the factors which influence the incentive to form a lobby group. We therefore begin by assuming that lobbying is feasible which by Eqn. (28’) requires \( r \leq r_L \). The properties of the resulting equilibria depend not only on the level of the prevailing discount rate but also on the relative positions of the critical levels \( r_L \) and \( r_\tau \) as defined in Eqns. (8.2’) and (28’), respectively. In what follows, we are interested in analyzing the manner in which changes in the degree of collusion in the output market affect the incentive to contribute to the lobby group. Hence, we focus only on those equilibria in which lobbying is feasible and there is constrained tacit

\[\text{subscripts on } \pi^{cc}, \pi^{cd}, \text{ and } \pi^{cn} \text{ can be ignored. The incentive compatibility constraint in (28) and the timing of events assumed is analogous to the usual case of output collusion between firms, where defection output is the same in each period and if a defection occurs in period } t, \text{ the rivals hold output at the collusive level in the period in which a defection occurs. Thus, the defecting firm enjoys a one period gain from defection. Similarly, in this case, a firm which defects on its fixed costs at time } t \text{ enjoys a one period gain of a higher tariff in period } t. \]

25 The incentive compatibility constraint (28) is based on the implicit assumption that tacit collusion in the output stage is feasible, even in the absence of lobbying. Altering this assumption would merely strengthen the results outlined below without altering the qualitative conclusions.
collusion.\footnote{There are other equilibria in the model with lobbying where output is at the joint profit maximizing outcome, i.e. \( r \leq r_L \) and \( r < r_q \). In this case lobbying and tacit collusion in the output stage are sustainable. Since \( r < r_q \), the incentive compatibility constraint in equation (8.2) holds with slack, and output is at the joint profit maximizing level. For brevity this case is ignored since marginal variations in contributions have no effect on the degree of collusion in the output market when constraint (8.2) holds with slack (i.e. the joint profit maximizing outcome is sustainable). Finally, we could also have \( r \leq r_L \) and \( r > r_q \). From equation (28'), lobbying is incentive compatible since \( r \leq r_L \). However, since \( r > r_q \), tacit collusion in the output stage of the game cannot be sustained. Thus,}

This is equivalent to assuming that \( r = r_q \leq r_L \). Moreover, we require that Eqn. (21.3) holds, i.e. symmetry. Thus, if \( S < S^* \) there is no lobbying, the tariff equals \( \tau^w \), and \( d\tau / dS = 0 \).

\section{V. LOBBY GROUP FORMATION AND COLLUSION}

In this section we explore the properties of the lobbying equilibria when there is constrained tacit collusion in the output market. We determine whether the incentive to offer a contribution schedule is affected by variations in the degree of collusion. To assess the effects of collusion on the incentive to lobby we investigate the impact of an exogenous change in collusive output levels in the lobbying equilibrium. In order to do so, define

\[ \Psi_i \equiv \pi_i^{cd} (\tau^*) - \pi_i^{cc} (\tau^*, F_i) (1+\frac{1}{r}) + \frac{\pi_i^{cn}(\tau^w)}{r} \] (29)

as the incentive compatibility constraint in the lobbying stage of the game. The following proposition states our main result on the relationship between collusion and the formation of a protectionist lobby group.

\textbf{Proposition 4:} \textit{Ceteris paribus, if the cross price elasticity of demand between the domestic good and foreign substitute is sufficiently low, the incentive to contribute to the fixed costs of lobby group organization is increasing in the degree of collusion in the output stage, in equilibrium (i.e.} \( \frac{d\Psi}{dQ^{cc}} > 0 \)).
**Proof:** Consider the effect of an increase in industry collusive output levels in the lobbying equilibrium on incentive compatibility constraint (29). Differentiation of (29) yields:

\[
\frac{d\Psi}{dQ^{cc}} = \frac{\partial \pi_i^{cd}(\tau^*)}{\partial Q^{cc}} = \frac{\partial \pi_i^{cc}(\tau^*, F_i)}{\partial Q^{cc}} \left(1 + \frac{1}{r}\right) + \frac{\partial \pi_i^{cn}(\tau^w)}{\partial Q^{cn}} \frac{1}{Q^{cc}} r.
\] (30)

To find the sign of expression (30), we sign each term on the right-hand side as follows. Consider the last term of (30) where

\[
\frac{\partial Q^{cn}}{\partial Q^{cc}} = \frac{\partial \pi_i^{cn}(\tau^w)}{\partial \tau^w} \frac{\partial \tau^w}{\partial Q^{cc}}.
\] (31)

By definition, \(\tau^w\) is the welfare maximizing tax rate, where no lobbying takes place. It follows that \(\tau^w\) is unaffected by output levels in the lobbying equilibrium, i.e.

\[
\frac{\partial \tau^w}{\partial Q^{cc}} = 0.
\] (32)

Combining Eqns. (30), (31), and (32) implies that

\[
\frac{d\Psi}{dQ^{cc}} = \frac{\partial \pi_i^{cd}(\tau^*)}{\partial Q^{cc}} - \frac{\partial \pi_i^{cc}(\tau^*, F_i)}{\partial Q^{cc}} \left(1 + \frac{1}{r}\right).
\] (30')

Since \(\pi_i^{cc} = \pi_i^{cd} - F_i - S_i\), it follows that

\[
\frac{\partial \pi_i^{cd}(\tau^*)}{\partial Q^{cc}} = \frac{\partial \pi_i^{cc}}{\partial Q^{cc}} + \frac{\partial S_i}{\partial Q^{cc}}.
\] (33)

which can be substituted into Eqn. (30') to yield

\[
\frac{d\Psi}{dQ^{cc}} = -\frac{\partial \pi_i^{cc}(\tau^*)}{\partial Q^{cc}} \left(1 - \frac{1}{r}\right) + \frac{\partial S_i}{\partial Q^{cc}} \left(1 + \frac{1}{r}\right).
\] (30'')

output levels are set at the Cournot-Nash equilibrium. In this case lobbying takes place even in the absence of tacit collusion in the output market.
Next, recall that from Eqn. (21.1), \( S_i = (\alpha/2)[W(\tau^w) - W(\tau^*)] \). Moreover, since \( \tau^w \) is the welfare maximising tariff, then \( \partial W(\tau^w)/\partial Q^{cc} = (\partial W(\tau^w)/\partial \tau^w)(\partial \tau^w/\partial Q^{cc}) = 0 \) since \( \partial W(\tau^w)/\partial \tau^w = 0 \) and \( \partial \tau^w/\partial Q^{cc} = 0 \). Thus,

\[
\frac{\partial S_i}{\partial Q^{cc}} = -\frac{\alpha}{2} \frac{\partial W(\tau^*)}{\partial Q^{cc}}.
\]

Expression (34) must be negative since (i) \( \tau^* > \tau^w \), and (ii) \( Q^*(\tau^*) < Q^*(\tau^w) \) since by Proposition 1 a higher tariff diminishes the incentive to defect, and by Lemma 1 collusive output levels decline, and (iii) by the assumption for a unique maximum \( \partial^2 W(\tau^w)/\partial Q^{cc^2} < 0 \). Thus \( \partial W(\tau^*)/\partial Q^{cc} > 0 \). Finally, note that a uniform expansion of output beyond the joint profit maximizing level necessarily lowers the profits of each firm,

i.e. \( \frac{\partial \pi^{cc}_i(\tau^*, F_i)}{\partial Q^{cc}} < 0, \forall Q^{cc} \in [Q^{Mc}, Q^{mc}] \). Thus, \( \frac{d \Psi_i}{d Q^{cc}} > 0 \). Q.E.D

The intuition is the following. As the level of collusion in the output stage rises, collusive profits increase. This raises the opportunity cost of free-riding in the lobbying stage of the game, since firms now have more to lose by free-riding on the rival firm’s lobbying effort. Moreover, since profits are unambiguously increasing in the tariff rate (by Eqn. (11)), the incentive to participate in lobbying is greater, the greater the tariff rate. An additional implication of Proposition 4 is that ceteris paribus, in more collusive industries the critical threshold discount level in the lobbying stage, \( r_L \), is lower.

It is notoriously difficult to find matching Armington elasticities (AE) and tariff rates in the literature. However, Reinert and Roland-Holst (1992) provide estimates for 163 sectors using U.S. import data for the years 1980-1988. Some of the most highly protected manufacturing sectors in 1986 turn out to have relatively low AEs. See Ray (1991, p.31) for
the 25 most highly protected U.S. manufacturing sectors in 1986. For example, the most protected sector, Rubber and Plastics Footwear (tariff = 40.02 %), has an estimated AE equal to 0.29. Other sectors among the top 25 for which estimated AEs are available in Reinert and Roland-Holst (1992) include Broadwoven Fabric Mills (tariff = 28.20 % (wool), and = 15.70 % (manmade); AE = 0.54), Cigarettes (tariff = 23.24 %, AE = 0.69), Narrow Fabric Mills (tariff = 23.24 %; AE = 0.69), Ceramic Wall and Floor Tiles (tariff = 19.87 %, AE = 0.88), Lace Goods, etc (tariff = 16.85 %, AE = 0.57). Thus, it appears that several well protected U.S. manufacturing sectors had low cross-price (Armington) elasticities in the 1980s.

VI. COLLUSION AND TARIFF PROTECTION

In this section we derive the tariff that emerges in the political equilibrium. Differentiation of the expression for aggregate social welfare, (3), at the political equilibrium, yields

\[
\frac{dW(\tau^*)}{d\tau} = -Q^c \frac{\partial}{\partial Q^c} \frac{\partial Q^c}{\partial \tau} + \frac{d\pi^c}{d\tau} + \rho \frac{\partial}{\partial \tau} \frac{\partial Q^c}{\partial Q} \frac{\partial Q^*}{\partial \tau} + \rho \frac{\partial}{\partial \tau} \frac{\partial P}{\partial Q^c} \frac{\partial Q^*}{\partial \tau},
\]

which must be negative since the equilibrium tariff is greater than the welfare maximizing tariff (see above). Note that the effect of the tariff on collusive profits is given by Eqn. (10). We are now able to find an expression for the equilibrium policy.

\[27\text{ The average tariff for all manufactured goods was 4.29 percent.}\]
**Proposition 5:** Assume that the industry lobby is formed. In equilibrium, the government sets a tariff that satisfies

\[
\tau^* = \frac{m^*}{z^*} \left( \lambda^* - \frac{(1 + \alpha)}{\alpha} \xi^* \delta^* \right) \frac{\alpha}{\gamma^* + 1/Q^*},
\]

where \( m^* = \frac{p}{p^*} \) is the ratio of the domestic price to the world market price, \( z^* = \frac{Q^*}{Q} \) is the import penetration ratio, \( \lambda^* = \frac{\partial p}{\partial Q'} \frac{\partial Q'}{\partial \tau} p - \frac{1}{Q'} \frac{\partial p}{\partial \tau} dQ^* \) is the effect of the tariff on the consumer surplus derived from consumption of the domestic good, \( \xi^* = \frac{d\pi^c}{d\tau} \frac{\tau}{\pi^c} > 0 \) is the tariff elasticity of collusive profits, \( \delta^* = \frac{p-c}{p} \geq 0 \) is the profit margin, and \( \gamma^* = \frac{\partial Q^*}{\partial \tau} \frac{\tau}{Q} < 0 \) is the tariff elasticity of import demand.

**Proof:** Substituting Eqn. (35) into Eqn. (19) yields

\[
(1 + \alpha) \frac{d\pi}{d\tau} + \alpha \left( -Q' \frac{\partial p}{\partial Q} \frac{\partial Q}{\partial \tau} + p^* \frac{\partial Q}{\partial \tau} + \frac{\partial p}{\partial \tau} dQ^* + p^* \right) = 0,
\]

where \( \frac{\partial p}{\partial \tau} dQ^* = \frac{\partial p}{\partial \tau} p dQ^* = p^* \). Rearrangements and conversions to elasticities yield expression (36). Q.E.D.

Proposition 5 summarizes the equilibrium relationship between a number of endogenous variables (a modified Ramsey rule). For consistency we assume that the

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28 However, an exception on the top-25 list is Hosiery (etc), with a 21.29 percent tariff and a cross-price elasticity equal to 2.53.
denominator of expression (36) is negative, i.e. \( \gamma^* < -1/Q^* \), which implies that demand for the foreign good is sufficiently responsive to its own price. For sectors with sufficiently large imports, \( Q^* \), this holds trivially. We offer the following interpretation.

\((i)\) The industry lobby’s political effort is reflected by four terms in (36) which reflect the fact that profits are affected by tariffs through three channels. First, the tariff elasticity of collusive profits, \( \xi^* \), represents the effect of the tariff on collusive profit, i.e. the industry lobby’s incentive to bid for a greater tariff due to the consequent increase in the firms’ ability to collude. In industries where the collusive effect is relatively large, the model predicts relatively greater tariffs. Second, the profit margin, \( \delta^* \), represents the direct profit effect of the tariff through an expansion of output. An increase of output has a greater effect on profits the greater is the profit margin, and thus the greater the industry’s incentive to lobby. The model predicts that sectors with high profit margins have higher tariffs, *ceteris paribus.*\(^{29}\) Third, the import penetration ratio, \( z^* \), is negatively related to the tariff, which is similar to the perfect competition case discussed by Grossman and Helpman (1994). The lobby gains more from a small tariff increase the greater the domestic output level, i.e. when the price increase applies to a larger number of units.\(^{30}\) Finally, the relative price of the domestic and foreign goods, \( m^* \), influences the tariff level positively. As the domestic price (world market price) increases the need for the tariff increases (falls) from the industry lobby’s point of view.\(^{31}\)

\(^{29}\) Note that these first two variables, \( \xi^* \) and \( \delta^* \), directly interact with the lobby group formation variable (which takes a value of 1 in Eqn. (36)). This finding appears useful for future empirical modeling.

\(^{30}\) For example, Anderson (1980), Baldwin (1984), Anderson and Baldwin (1987), and Goldberg and Maggi (1999) find empirical support for this prediction.

\(^{31}\) In a sense this supports the finding of the literature on declining industries and protection, see Hillman (1982), Cassing and Hillman (1986), Van Long and Voudsen (1991), Brainard and Verdier (1994,1997). However, this literature focuses on the case of perfect competition between domestic and foreign industries.
(ii) The greater the government’s weight on social welfare, $\alpha$, the lower the ability of the industry lobby to influence the tariff level. Its contributions are then worth relatively less to the government.

(iii) Consumer surplus considerations are represented by two terms included in the expression for $\lambda^*$. The first term in $\lambda^*$ is the tariff elasticity of the domestic goods price. It exerts a negative pressure on the tariff as an increase in protection raises collusion and thus the price of the domestic good. This force is adjusted by the second term representing the shift of consumption towards the domestic good as the foreign goods price increases via the tariff.

(iv) A greater tariff elasticity of import demand, $\gamma^*$, reduces the deviation from the welfare maximizing level of protection, as the deadweight loss increases. This is similar to the finding of Grossman and Helpman (1994).

Proposition 5 yields a number of predictions. Whereas some of these are similar to the ones made by Grossman and Helpman (1994) for perfectly competitive sectors, others add to, and differ from, their predictions. This highlights the different forces determining protection in sectors characterized by imperfect competition and collusion, as discussed in this paper. We believe future empirical work seeking to explain tariff protection may find these predictions useful.

Finally, note that if the protectionistic lobby group is unable to form, expression (36) collapses into

$$\tau^* = \frac{m^*}{z^*} \left( \frac{\lambda^* - \xi^* \delta^*}{\gamma^* + 1/Q^*} \right).$$

(36')

This is the welfare maximizing tariff level. Although considerations of firm profits influence the tariff rate, they now do so to the same degree as consumers’ utility. The firm profits
receive the same weight in the government’s maximization as consumer surplus and tariff revenues.

VII. CONCLUSIONS

This paper has proposed a new explanation for why concentrated industries are often found to obtain greater levels of trade protection than other sectors. We draw attention to the ability of, and benefits for, such industries to form a trade lobby group and undertake lobbying for trade protection. This contrasts with the traditional approach due to Olson (1965) which focuses on transaction costs. We analyze the incentives and ability of firms to form a protectionist lobby that requires a fixed set-up cost in order to carry out its lobbying task.

It was shown that in sectors with imperfect competition, tariff protection increases the ability of firms to collude in the output market, when the cross price elasticity of demand between the domestic and foreign goods is sufficiently low. We consequently also provide an explanation for why some empirical results do not find a relationship between concentration and protection. In sectors with large cross-price elasticities of demand between the domestic and foreign goods, firms are reluctant to lobby for greater tariffs, for fear of defection from the collusive equilibrium by a rival. In these circumstances, a low tariff has the surprising effect of enforcing a greater degree of collusive discipline amongst the domestic oligopolists.

In other cases we show that collusion improves the ability of firms to organize collective action in the form of a common lobbying effort, that sustains both the necessary political contributions and covers the fixed costs associated with lobby group formation. Collusive industries have an additional incentive to engage in lobbying for greater import protection as the increase in the degree of collusion due to the tariff provides a further stimulation to lobby for greater protection.
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