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Protectionist Lobbying and Strategic Investment

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ABSTRACT

Why are some uncompetitive industry sectors so effective in lobbying for greater protection and support? This paper attempts to explain the lobbying success of these industries in terms of the strategic role of investment in technology as a credible commitment device. By eschewing potentially profitable investment opportunities firms credibly signal to the government that the cost of a tariff reduction will be substantial. This enables the firms to lobby more effectively for policy concessions Political considerations may therefore provide a significant incentive for firms to reject investment in newer technologies, even when these lower production costs.

JEL Codes: D70, F13

Keywords: Tariffs, Investment, Lobbying

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I Introduction

A growing body of literature suggests that some older and uncompetitive industries often form highly effective lobby groups, which resist reforms such as the elimination of trade barriers.[1] Moreover, while successful in lobbying, such industries have at times been slow to adopt newer and more efficient technologies.[2] Theoretically, this finding seems paradoxical. Rapidly expanding "sunrise" industries with more resources at their disposal, ought to be better placed to lobby effectively and garner more favourable treatment, than their declining counterparts.

This paper attempts to address this issue by exploring the interaction between a firm's investment strategy and its lobbying influence on government policy. It is shown that the level of protection received by domestic firms is influenced by their prior investment decisions. By precommitting to (older) relatively high cost production techniques, firms can tilt the political game with policy makers in their favour.

The analysis is based on a domestic oligopoly which competes with foreign producers. The domestic firms are protected by a tariff and therefore have an incentive to lobby for greater protection. Lobbying is introduced into this framework by drawing on the well established common agency model of political support developed by Grossman and Helpman (1994), which has been widely applied in a number of contexts (see, e.g. Fredriksson, 1997, Damania, 2001). Accordingly, it is assumed that a self-interested government cares about both, aggregate welfare and the political contributions it receives from lobby groups[3]. Firms seek to influence government policy by offering political contributions to the government, in the expectation of securing greater tariff protection. The government in turn, selects the policy that maximizes its own welfare.[4]

It is shown that when lobbying occurs firms have an incentive to underinvest in technology. Specifically, in a political equilibrium, the tariff which is set by the government depends on the level of political contributions that it receives, and the welfare costs of the chosen policy. By adopting a less efficient technology, the firm credibly signals to the government that a reduction in tariffs will result in substantially lower profits. In the political equilibrium, lobby group contributions are linked to profits. Hence, a decline in profits leads to a fall in political donations. A government which values political contributions is therefore induced to adopt a policy which mitigates the decline in profits and contributions. In essence, by underinvesting in technology, the firms need to spend less on political contributions, so that lobbying for protection becomes more productive.

In deciding on whether to invest in more efficient equipment, the firm will trade off the usual cost and benefits of investment, against the need to spend more on lobbying, as investment in technology increases. Consequently, lobbying diminishes the net benefits from investment. The analysis therefore predicts that when governments are receptive to lobby group demands, higher levels of protection may be associated with relatively lower levels of investment in technology. That is firms adopt the "puppy dog" strategy (Fudenberg and Tirole, 1994).

This paper is related to two distinct strands of literature: political economy models of protection in declining industries and the strategic trade policy literature. The political economy literature has paid close attention to the role of special interest lobbying on trade policy. However, these studies ignore the effects of a firm's investment decisions on lobbying incentives and policy outcomes. Long and Vousden (1991), Grossman and Helpmann (1996) and Baldwin (1993) are examples in this vein. On the other hand, the strategic trade policy literature focuses upon oligopolistic competition and the strategic investment incentives of firms. These models ignore the influence of special interest group lobbying on policy decisions (e.g. Spencer and Brander, 1992, Krugman, 1984, Bouet, 2001).

This paper combines the political economy approach, with the strategic trade policy models. The analysis is most closely related to Damania (2001) who explores environmental policy and lobbying in the context of a simple monopoly[5]. However, to our knowledge all the existing literature has thus far assumed that lobby group formation and individual firm contributions to a lobby group are predetermined. This paper extends the literature by allowing lobby group contributions to be endogenously determined. Grossman and Helpman (1994) argue that the neglect of collective action problems is a significant weakness in the literature, similarly Persson and Tabellini (2000, p. 175) note that the common agency approach to lobbying " lacks an explanation of the process whereby some groups get politically organized …" In what follows we investigate whether free riding on political contributions undermines efforts to form a lobby group. The paper derives an important result which shows that lobbying remains both feasible and effective, in a non-cooperative equilibrium. The results are therefore robust to the usual collective action problems that make high levels of cooperation difficult to sustain.

It is useful to note that the conclusions of this paper contradict those of the strategic trade policy models, when firms compete using quantities. The strategic trade literature predicts that investment in technology rises with the level of protection.[6] This occurs because higher levels of tariff protection, shift profits from the foreign firm to the domestic industry. Under Cournot competition, the adoption of a more efficient technology by one firm, lowers its marginal costs and allows it to credibly commit to higher output levels. There is therefore a strategic incentive for each firm to over-invest in cost reducing technology. In contrast, the results presented in this paper suggest that if firm lobbying plays a significant role in determining protection levels, the conclusions of the strategic trade policy models of Cournot competition may be reversed.

The analysis is based on the following sequence of events. In the first stage the firms simultaneously choose their production equipment, from a continuum of available production technologies. The second stage defines the political equilibrium, in which the tariff is determined in a lobbying game. In the final stage the firms choose output levels.

The remainder of this paper is organised as follows. Section II outlines the basic structure of the model, derives the political equilibrium and describes the manner in which investment influences political contributions. Section III deals with the problem of investment and outlines the circumstances under which lobbying diminishes the incentive to invest in new technology. Section IV concludes the paper.

II. The Model

The aim of this paper is to examine the lobbying incentives of established industries which face competition from foreign producers. Moreover, when protected by tariffs or quotas, these industries may be characterized by imperfect competition. We therefore assume that a domestic duopoly which is protected by a tariff, faces competition from a foreign rival.[7] The duopoly may be sustainable even with free trade due to "home bias" and other factors (see Blonigen and Wilson, 1999). For simplicity it is assumed that the industry produces a homogenous product.

Let $X = x^i + x^j$ be the output of the domestic firms i and j. Let y be the output of the foreign firm. Then total industry output is $Q = X + y$. The inverse demand function is defined as $P(Q) = P(X + y)$; with $P' < 0, P'' < 0$. The firms compete using quantities as the strategic variable.[8]

The cost to each firm of producing output level q ($q = x^i, x^j, y$) is given by the cost function $C^i(w(\tau^i), q)$, where $w(\tau^i)$ is the input price and τ^i defines the type of production technology used by each firm. For given input prices and technology, production costs are increasing and convex in output (i.e. $\partial C^i/\partial q > 0$, $\partial^2 C^i/\partial q^2 > 0$). Section III defines the properties of the production technology in more detail. However, at this stage we note that the technologies defined as $\tau^i \in [1, T]$, are distinguished by the fact that higher values of τ^i correspond to technology with lower production costs (i.e. $\partial w/\partial \tau^i < 0$). Hence, the technologies with larger values of τ^i may be regarded as more cost effective and efficient. These assumptions imply that total and marginal production costs decline with more efficient technologies. We further assume that $C^i(w(\tau^i), q)$ satisfies all the usual properties of a cost function.[9]

The analysis is based on the following sequence of events. In stage 1 the firms simultaneously determine investment levels in equipment (i.e. choice of τ). The next stage defines the political equilibrium where each firm determines its political contributions (S^i) independently, while the government sets the tariff (t) to maximize its payoffs. In the final stage, the firms compete using quantities as the strategic variable. As usual, the model is solved by backward induction.

In an attempt to influence the level of protection, each domestic firm offers political contributions S^i to the government. Thus, domestic firm i's profits are defined as:

$$\Pi^i = P(Q)x^i - C(w(\tau^i)x^i) - S^i \qquad (i = 1,2;\ i \neq j) \quad \text{(1a)}$$

In keeping with the existing literature we assume that the foreign firm, being located overseas, has no leverage on domestic policy issues and therefore does not engage in lobbying (see, e.g. Grossman and Helpman, 1995). The foreign firm's profits are given by:

$$\Pi^y = P(Q)y - C(w(\tau^y), y) - ty \qquad \text{(1b)}$$

where t is the tariff.

Stage 3 Output Competition

We begin by solving the final stage of the game in which output levels are determined. Taking investment levels, the tariff and contributions as given, equilibrium output levels are given by the solutions to the first order conditions:

$$P + \frac{\partial P}{\partial x^i}x^i - \frac{\partial C(w(\tau^i), x^i)}{\partial x^i} = 0 \quad (i,j = 1,2;\ i \neq j) \qquad \text{(1c)}$$

$$P + \frac{\partial P}{\partial y}y - \frac{\partial C(w(\tau^y), y)}{\partial y} \qquad \text{(1d)}$$

Let $x^i = x^j = x^n$ denote the symmetric equilibrium solution of the domestic firms.[10]

For future reference, the following well known comparative static properties of the equilibrium are briefly described. The proofs are relegated to the Appendix.

$$\frac{dx^n}{dt} > 0, \frac{dy}{dt} < 0, \frac{dQ}{dt} < 0 \qquad \text{(2a)}$$

Equation (2a) reveals that with greater protection (higher tariffs) the domestic firms expand their output levels, while the foreign firm's output contracts. This occurs because a higher tariff shifts demand from the foreign to the domestic industry and results in an increase in domestic output levels. However, overall, domestic consumption of the good is declining in the tariff (i.e. $\frac{dQ}{dt} < 0$).

$$\frac{dx^i}{d\tau^i} > 0, \frac{dy}{d\tau^y} > 0 \qquad (i,j = 1,2; i \neq j) \qquad \text{(2b)}$$

Equation (2b) suggests that adoption of a more efficient technology by a firm, lowers its production costs and thus induces an expansion in its own output level.

$$\frac{dx^i}{d\tau^j} < 0, \frac{dy}{d\tau^j} < 0, \frac{dx^i}{d\tau^y} < 0 \qquad (i,j = 1,2; i \neq j) \qquad \text{(2c)}$$

Finally, equation (2c) summarises the well known result that investment in an oligopoly has strategic effects.[11] *Ceteris paribus,* the adoption of a more efficient technology by one firm, lowers its marginal costs, and allows the firm to credibly commit to more aggressive (i.e. higher) output responses. Since quantities are strategic substitutes, the commitment to a higher output by one firm induces its rival to lower its production levels in response.

Stage 2: The Political Equilibrium

Having defined equilibrium output levels, we now consider the manner in which political contributions are determined. For given technology (τ), each domestic firm will choose its political contributions (S^i) to maximise profits, taking account of the impact of its choices on output market competition in stage 3. Each firm solves:

$$\underset{S^i}{Max}\ \Pi^i = P(Q)x^i - C(w(\tau^i)x^i) - S^i \qquad (i = 1,2;\ i \neq j) \quad (3a)$$

where x^i is defined as the solution to (1c) and (1d).

The associated first-order condition is[12]:

$$\frac{\partial \Pi^i}{\partial t}\frac{\partial t}{\partial S^i} - 1 = 0 \qquad (i = 1,2;\ i \neq j) \quad (3b)$$

Note that since $\frac{\partial \Pi^i}{\partial t} = x^i \frac{\partial P}{\partial Q}(\frac{\partial y}{\partial t} + \frac{\partial x^j}{\partial t}) > 0$, then (3b) defines an interior solution only if $\frac{\partial t}{\partial S^i} > 0$. This implies that lobbying will occur only if higher political contributions (S^i) induces the government to set a higher tariff (t).

Following Grossman and Helpman (1994), the government is assumed to maximize a weighted sum of the political contributions it receives and aggregate social welfare. Define the sum of consumer surplus and tariff revenues as:

$$W^C \equiv \int_0^Q P(Q)dQ - P(Q)Q + ty \qquad (4a)$$

Aggregate social welfare gross-of-contributions is given by the sum of expression (4a) and gross-of-contributions profits (denoted $\tilde{\Pi}$)

$$W \equiv W^C + \tilde{\Pi}, \qquad (4b)$$

where: $\tilde{\Pi} = \tilde{\Pi}^i + \tilde{\Pi}^j; \tilde{\Pi}^i = \Pi^i + S^i;\ (i = 1,2, i \neq j)$.

The government's objective function is given by a weighted sum of political contributions and social welfare (Grossman and Helpman, 1994):

$$G = S + \alpha W \qquad (4c)$$

where: α is the weight given to aggregate social welfare relative to political contributions $S = S^i + S^j$.

This specification of government utility is widely used in the political support literature. It is based on the assumption that political donations are valued by governments because of their many uses, such as funding election campaigns, retiring debt from previous elections and deterring rivals. On the other hand social welfare is included to capture the notion that the prospect of retaining power may be linked to average welfare in the economy (Grossman and Helpman, 1994). By this interpretation, the weight (α) given to social welfare is determined by factors such as the level of political competition, political stability, and the policies of rivals. There are several alternative models of self interested government behavior. The most significant of these are models of political competition (see, Persson and Tabellini, 2001 for a survey). However, the formulation of government utility used in (4c) subsumes many of the important features of lobbying and political competition that are captured in the alternative models of government behaviour and is therefore used in this paper (Persson and Tabellini, 2001, Grossman and Helpman, 1994).

For future reference let the welfare maximizing level of domestic output be defined as:

$$t^* = Argmax\ W \qquad (4d)$$

where $t^* = \dfrac{P'(X(\partial x^i/\partial t) + y((\partial X/\partial t) + (\partial y/\partial t)) - y}{\partial y/\partial t} \geq 0$ is the tariff required to achieve the welfare maximizing output level $Q^* > 0$. Define W^* as the resulting (maximal) level of welfare at Q^*.[13] The second order condition for a maximum requires that $\partial^2 W/\partial t^2 < 0$, which is assumed to hold.

A subgame perfect Nash equilibrium for this game is a contribution (S^i) for each firm and a tariff (t^L), such that: *(i)* the contribution is feasible and maximises each firm's payoffs, taking the other firm's contributions as given; (*ii*) the policy t^L maximizes the government's welfare, *G*, taking the contributions as given.

From Lemma 2 of Bernheim and Whinston (1986) the following necessary conditions yield a subgame perfect Nash equilibrium $\{S,t^L\}$:

$$t^L \in Argmax\ G = S + \alpha W; \qquad \text{(SI)}$$

$$t^L \in Argmax\ \Pi(t) + G \qquad \text{(SII)}$$

Condition (SI) asserts that the equilibrium tariff t^L must maximize the government's payoff, given the contribution offered by the industry lobby group. Condition (SII) requires that t^L must also maximize the joint payoff of the firms and the government. If this condition is not satisfied, the lobby group will have an incentive to alter its strategy to induce the government to change the tariff, and capture more of the surplus. Maximizing (SI) and (SII), and performing the appropriate substitutions, yields the political equilibrium contribution of the lobby group which satisfies:

$$\frac{\partial \Pi^L}{\partial t} = \frac{\partial S^L}{\partial t}. \qquad \text{(5a)}$$

S^L = contributions at equilibrium tariff t^L, Π^L = profits at equilibrium tariff t^L.

Equation (5a) implies that in equilibrium, the change in the industry's political contribution (i.e. $\frac{\partial S^L}{\partial t}$), equals the effect of the tariff on industry profits (i.e. $\frac{\partial \Pi^L}{\partial t}$). Thus, as noted by Grossman and Helpman (1994), the political contribution schedule is *locally truthful*. As in Bernheim and Whinston (1986), this concept can be extended to a contribution schedule that is globally truthful. This yields a function which accurately mirrors the preferences of the lobbyist's at all policy points. The Appendix provides a discussion of the existence of this equilibrium.

Having determined the slope of the contribution schedule, it is necessary to derive an expression for the level of contributions in a political equilibrium. Grossman and Helpman demonstrate that with one lobby group, the equilibrium contribution to the government is defined by the difference in social welfare, when the tariff is set at the welfare maximising rate t^* and at the political equilibrium rate t^L. Specifically:

$$S^L = \alpha(W^* - W^L) \qquad (5b)$$

Where: W^* is the level of social welfare which eventuates when the tariff is set at the welfare maximising level t^* and W^L is the level of social welfare when the tariff is set at the political equilibrium level t^L.

Observe that $\alpha(W^* - W^L)$ defines the loss of utility to the government when the tariff deviates from the welfare maximising level. Equation (5b) reveals that political contributions perfectly compensate the government for the welfare loss associated with participation of the lobby group in the political process. The welfare loss is weighted by the factor α in order to adjust for its importance in the government's objective function.

Clearly, the equilibrium defined in equation (5b) can be sustained only if the individually rational contributions of firms as given in (3b) are sufficient to compensate the government for its utility loss from raising the tariff (i.e. 5b). If this condition does not hold the government has no incentive to raise the tariff above the welfare maximising level so that there can be no effective lobbying. Lemma 1 explores this issue in greater detail and outlines an important property of the equilibrium that has been overlooked in the literature.

Lemma 1 *The individually rational contributions of the firms (as defined in (3b)), equals the amount that is necessary to induce the government to raise the tariff above the welfare maximizing level (as defined in (5b)).*

***Proof*:** From equation (3b) the profit maximising political contributions offered by each domestic firm to the government satisfy the first-order condition

$$\frac{\partial \Pi^i}{\partial t}\frac{\partial t}{\partial S^i} - 1 = 0 \qquad \text{(i=1,2; i≠j)} \qquad \text{(I)}$$

Note that since $\frac{\partial \Pi^i}{\partial t} = x^i \frac{\partial P}{\partial Q}(\frac{\partial y}{\partial t} + \frac{\partial x^j}{\partial t}) > 0$, then (I) defines an interior solution only if $\frac{\partial t}{\partial S^i} > 0$. The tax schedule $t(S)$ is thus monotonic and hence its inverse exists.[14] By the property of inverse functions (I) can therefore be rearranged as:

$$\frac{\partial \Pi^i}{\partial t} = \frac{\partial S^i}{\partial t}. \qquad \text{(i=1,2; i≠j)} \qquad \text{(II)}$$

Observe that (II) is the local truthfulness condition, necessary for a subgame perfect Nash equilibrium in equation (5a).

Since both domestic firms are symmetric, then aggregating equation (II):

$$\frac{\partial \Pi}{\partial t} \equiv 2\frac{\partial \Pi^i}{\partial t} = \frac{\partial S}{\partial t} \equiv 2\frac{\partial S^i}{\partial t}. \qquad \text{(III)}$$

The first-order-condition corresponding to condition (SI) of the political equilibrium requires that:

$$\frac{\partial \Pi}{\partial t} = -\alpha \frac{\partial W}{\partial t}. \qquad \text{(IV)}$$

Substitute (IV) in (III), and integrate:

$$S^L = 2\int_{t^*}^{t^L} \frac{\partial \Pi^i}{\partial t} dt = -\alpha \int_{t^*}^{t^L} \frac{\partial W}{\partial t} dt = -\alpha(W^L - W^*) = \alpha(W^* - W^L). \qquad \text{(V)}$$

where W^L = welfare at political equilibrium tariff t^L and W^* = welfare at the welfare maximimising equilibrium tariff t^*.

Expression (V) defines the equilibrium level of lobby group contribution payments. It is equal to the equilibrium contribution amount defined in (5b), which is necessary to compensate the government for raising the tariff above the welfare maximizing level. *Q.E.D*

Lemma 1 reveals that the individually rational (Nash) contributions which maximise a firm's profits (i.e. (3b)), are equal to the contributions necessary to support a subgame perfect equilibrium of the political game with higher tariff levels (i.e. (5b)). Observe that, since the benefits from paying political contributions accrue to the entire (domestic) industry rather than the individual firm, the problem is analogous to that of the private provision of a public good. Hence each firm has an incentive to "undersupply" lobbying contributions, relative to the amount that would be paid in a fully cooperative equilibrium with no free-riding. Lemma 1 shows that the lobbying equilibrium in this model does not require contributions (i.e. cooperation) between lobbyists beyond that which obtains from independent firm optimisation. Hence, the individually rational Nash contributions of each firm are sufficient to compensate the government for its utility loss from raising the tariff above the welfare maximising level. Accordingly, lobbying is not undermined by collective action problems that require levels of cooperation beyond the individually rational level. [15]

Recall that technology levels are chosen in Stage 1 and are therefore taken as given (in Stage 2) when political contributions are determined. However, in choosing its technology levels each firm will take account of the impact of its investment decisions on political contributions. It is therefore instructive to examine the consequences of varying technology levels (in Stage 1) on the political equilibrium in (Stage 2).

Lemma 2: *The adoption of more efficient technology* τ^i *in Stage 1, increases the aggregate political contributions paid to the government.*

$$\text{(i.e. } \frac{dS}{d\tau^i} = \frac{dS^i}{d\tau^i} + \frac{dS^j}{d\tau^i} > 0 \ \ (i = 1,2 \ i \neq j)).$$

Proof: *See Appendix*

Intuitively, this result follows from the local truthfulness property (equation (5a)), which states that political contributions mirror the marginal profitability of any policy change. *Ceteris paribus,* the adoption of a more efficient technology by firm *i*, lowers its production costs and thus raises profits. Since a given tariff level now yields higher profits, by local truthfulness, political contributions rise.[16] Hence investment in technology makes lobbying for protection more expensive for the firms.

Lemma 3: *The adoption of more efficient technology by domestic firms in Stage 1 leads to a lower tariff being set in the political equilibrium, if the demand function is not too convex.*

$$\text{(i.e. } \frac{dt^L}{d\tau^i} < 0 \text{ if } R > -1/Q_t, \text{ where } R = P''Q/P' \ \ (i,j = 1,2;\ i \neq j)).$$

Proof: See Appendix.

Intuitively, this result may be explained as follows. From equation (5a) we know that political donations are truthful, in the sense that they reflect variations in payoffs which result from a change in the tariff. Suppose that a firm chooses not to invest in a more efficient technology. *Ceteris paribus*, production costs will be relatively higher, so that a given level of protection yields lower profits. By Lemma 2, political contributions will decline. A government that values political contributions, has an incentive to adopt policies which raise profits and political donations. To maintain contribution levels, the government therefore raises (or does not lower) the tariff level. The requirement that demand not be too convex is a regularity condition that is widely used in much of the strategic trade literature (see, Brander and Spencer (1992)). It ensures that higher tariffs improve domestic payoffs. This requirement is always satisfied for a linear demand curve. Lemma 3 therefore reveals that when this condition holds, then in a lobbying equilibrium the adoption of a more efficient technology will lead to lower levels of protection. In keeping with much of the literature, it is assumed that this convexity requirement holds.

This finding has important implications for firms' investment strategy. If firms can credibly commit to higher production costs in earlier stages of the game, they can lower the political contributions that will be paid in the ensuing political equilibrium. The next Section deals with the circumstances in which technology can be used as a credible commitment device.

IV Technology Choice

This Section investigates the manner in which political lobbying influences the firm's choice of production technology. We begin by defining the properties of the available technologies.

Let $\tau^i \in [1, T] \subset \Re_+$ $(i = 1,2;\ i \neq j)$ be the continuum of existing production technologies. The technologies in τ^i are distinguished by their associated production costs. Specifically, there exists a one-to-one mapping from the set of technologies (τ^i) to the costs associated with each technology ($w(\tau^i)$). It is assumed that

$\frac{\partial w(\tau^i)}{\partial \tau^i} < 0, \quad \frac{\partial^2 w(\tau^i)}{\partial \tau^{i2}} < 0$ .Thus, higher values of τ^i correspond to equipment which embodies lower production costs. The cost of purchasing equipment associated with a given technology of type $\tau^i \in [1, T]$ is given by $K(\tau^i)$. It is assumed that $K(\tau^i)$ is a sunk cost and that $\frac{\partial K(\tau^i)}{\partial \tau^i} > 0$, $\frac{\partial^2 K(\tau^i)}{\partial \tau^{i2}} > 0$. This implies that the efficient technologies, with correspondingly lower production costs, are more expensive to purchase.

In Stage 1 each firm will choose a type of technology (τ^i) to maximise profits, taking account of is technology choice on all the other decision variables (i.e. output, political contributions and the tariff). Thus:

$$\underset{\tau^i}{Max} \quad \hat{\Pi}^i = P(Q)x^n - C(w(\tau^i, x^n)) - S^i - K(\tau^i) \qquad (6a)$$

The first order condition is:[17]

$$\frac{\partial K(\tau^i)}{\partial \tau^i} = P'(\frac{\partial x^j}{\partial \tau^i} + \frac{\partial y}{\partial \tau^i}) - \frac{\partial C}{\partial w}\frac{\partial w}{\partial \tau^i} - \frac{dS^i}{d\tau^i} \qquad (6b)$$

Equation (6b) reveals that the type of equipment (τ^i) adopted depends on a variety of factors, which encompass political, strategic and cost considerations. Each of these is discussed briefly below. The firm acquires the type of equipment at which the marginal cost of purchasing a more efficient technology (i.e. $\frac{\partial K(\tau^i)}{\partial \tau^i}$), is set equal to the net marginal benefits of the improved technology. These include the marginal benefits in the form of cost savings from this technology (i.e.- $\frac{\partial C}{\partial w}\frac{\partial w}{\partial \tau^i}$). In addition, from Lemma 2 we know that adoption of a more efficient technology raises political contributions by the local truthfulness property. Thus, the need to lobby more intensively partly diminishes the benefits of acquiring a more cost effective technology and lowers the level of investment in technology. These effects are captured in the term-$\frac{dS^i}{d\tau^i}$. Finally, as noted earlier, investment in cost saving technologies has strategic output effects (equation (2c)). Adopting a more efficient technology allows a firm to credibly commit to more aggressive (i.e. higher) output responses. Since quantities are strategic substitutes, the commitment to a higher output induces a rival to lower its production levels, thereby raising the expected profits of the firm that invests. Oligopolistic output competition therefore induces firms to increase investment levels. The strategic output effects are summarised by the terms $P'(\frac{\partial x^j}{\partial \tau^i}+\frac{\partial y}{\partial \tau^i})$.

Observe that in the absence of lobbying, firms would simply equate the marginal cost of acquiring a more efficient technology to the marginal benefits in the form of cost savings and strategic effects from the equipment. It is therefore important to investigate whether lobbying results in (higher) lower investment in technology. This issue is dealt with in the following Proposition.

Define the choice of technology under lobbying as:

$$\tau_L^i \in Arg \max \ \hat{\Pi}^i = P(Q_L)x_L^n - C_L(w(\tau_L^i), x_L^n) - S_L^i - K(\tau_L^i)$$

Where: $Q_L = Q(\tau_L^i, t^L)$; t^L = tariff in the lobbying equilibrium, x_L^n is the corresponding output of firm i = 1,2, subscript *L* on variables denoted terms in the lobbying equilibrium.

Define the choice of technology in the absence of lobbying as:

$$\tau_u^i \in Arg \max \ \Pi_u^i = P(Q_u)x_u^n - C_u^i(w(\tau_u^i), x_u^n) - K(\tau_u^i)$$

Where: $Q_u = Q(\tau_u^i, t^*)$ is industry output when the tariff is at the welfare maximising level t^* and there is no lobbying and x_u^n is the corresponding firm output level, subscript *u* on variables denotes terms in the absence of lobbying.

PROPOSITION 1*: If the production costs associated with less efficient technologies are sufficiently high, then lobbying lowers the level of investment in technology.*

(i.e. $\tau^i_L < \tau^i_u$ *if* $\left(\frac{\partial C_L}{\partial w_L}\frac{\partial w_L}{\partial \tau_L{}^i} - \frac{\partial C_u}{\partial w_u}\frac{\partial w_u}{\partial \tau_u{}^i}\right) > P' x^i_L(\frac{\partial x_L{}^j}{\partial \tau_L{}^i} + \frac{\partial y_L}{\partial \tau_L{}^i})$ - $P' x^i_u(\frac{\partial x_u{}^j}{\partial \tau_u{}^i} + \frac{\partial y_u}{\partial \tau_u{}^i})$*)*

Proof: The first order condition when there is no lobbying is given by:

$$\frac{\partial K(\tau_u{}^i)}{\partial \tau_u{}^i} = P' x^i_u(\frac{\partial x_u{}^j}{\partial \tau_u{}^i} + \frac{\partial y_u}{\partial \tau_u{}^i}) - \frac{\partial C_u}{\partial w_u}\frac{\partial w_u}{\partial \tau_u{}^i} \qquad \text{(I)}$$

When firms lobby from equation (6b) the associated first order condition is:

$$\frac{\partial K(\tau_L{}^i)}{\partial \tau_L{}^i} = P' x^i_L(\frac{\partial x_L{}^j}{\partial \tau_L{}^i} + \frac{\partial y_L}{\partial \tau_L{}^i}) - \frac{\partial C_L}{\partial w_L}\frac{\partial w_L}{\partial \tau_L{}^i} - \frac{dS^i}{d\tau_L{}^i} \qquad \text{(II)}$$

Suppose that $\tau^i_u > \tau^i_L$, then $\frac{\partial K(\tau^i_u)}{\partial \tau^i_u} > \frac{\partial K(\tau^i_L)}{\partial \tau^i_L}$ (since by assumption $\frac{\partial K^i(\tau)}{\partial \tau^i}$>0, $\frac{\partial^2 K^i(\tau)}{\partial \tau^2}$>0). From (I) and (II) this implies that the right hand side of (II) must be less than that of (I):-

$$P' x^i_L(\frac{\partial x_L{}^j}{\partial \tau_L{}^i} + \frac{\partial y_L}{\partial \tau_L{}^i}) - \frac{\partial C_L}{\partial w_L}\frac{\partial w_L}{\partial \tau_L{}^i} - \frac{dS^i}{d\tau_L{}^i} < P' x^i_u(\frac{\partial x_u{}^j}{\partial \tau_u{}^i} + \frac{\partial y_u}{\partial \tau_u{}^i}) - \frac{\partial C_u}{\partial w_u}\frac{\partial w_u}{\partial \tau_u{}^i} \qquad \text{(III)}$$

Recall that by Lemma 2 $-\frac{dS^i_L}{d\tau^i_L}$ > 0. It then follows that the RHS of (I) always exceeds that of (II) if:

$$P' x^i_L(\frac{\partial x_L{}^j}{\partial \tau_L{}^i} + \frac{\partial y_L}{\partial \tau_L{}^i}) - \frac{\partial C_L}{\partial w_L}\frac{\partial w_L}{\partial \tau_L{}^i} < P' x^i_u(\frac{\partial x_u{}^j}{\partial \tau_u{}^i} + \frac{\partial y_u}{\partial \tau_u{}^i}) - \frac{\partial C_u}{\partial w_u}\frac{\partial w_u}{\partial \tau_u{}^i} \qquad \text{(IV)}$$

Which holds if

$$\frac{\partial C_L}{\partial w_L}\frac{\partial w_L}{\partial \tau_L{}^i} - \frac{\partial C_u}{\partial w_u}\frac{\partial w_u}{\partial \tau_u{}^i} > P' x^i_L(\frac{\partial x_L{}^j}{\partial \tau_L{}^i} + \frac{\partial y_L}{\partial \tau_L{}^i}) - P' x^i_u(\frac{\partial x_u{}^j}{\partial \tau_u{}^i} + \frac{\partial y_u}{\partial \tau_u{}^i})$$

QED

Proposition 1 formalises the condition that underinvestment in technology acts as a credible commitment device, only if less efficient technologies are associated with sufficiently high production costs. Intuitively, when the cost increase from rejecting a more efficient technology is sufficiently large, underinvestment provides a credible signal to the government that a reduction in tariffs will result in substantially lower profits. Since political contributions are linked to profits, a decline in profits leads to a fall in political donations. A government that values political contributions is therefore induced to adopt a more favourable policy towards firms. Thus there will be higher levels of tariff protection associated with lower levels technological investment.

Stated differently, when the cost saving from adopting a more efficient technology is sufficiently high, underinvestment in the first stage of the game provides a credible signal to the government that lower tariffs will result in lower political contributions. Underinvestment therefore tilts the political game in the domestic industry's favour.[18] Finally, we note that the underinvestment equilibrium is based on Nash conjectures by each firm and therefore does not involve any cooperation beyond the individually rational levels.

IV Conclusions and Implications

This paper has examined the interaction between investment, lobbying and protectionist policy decisions. The central message is that when governments are receptive to special interest group pressures, political considerations may provide an incentive for firms to reject cost saving investments. If the costs associated with less efficient technologies are sufficiently high, underinvestment in technology provides a credible signal to the government that profits and political donations will decline if tariffs are lowered. A government that values political contributions is therefore induced to adopt a more favourable policy towards firms. Hence, industries with more costly technologies are better placed to secure policy concessions.

The main findings of this paper conflict with the conclusions of the strategic trade policy models which predict that, under Cournot competition, protection induces greater investment in cost saving technology. Hence, the validity of the results presented here must rest on the empirical evidence. However, the mechanisms identified in this paper are new, hence econometric support for the conclusions is hard to find. However, there is some *indirect* empirical evidence which is consistent with the predictions of the model.

A number of studies have attempted to test the infant industry argument. At its simplest level the infant industry hypothesis asserts that newly formed industries may require time to establish and become competitive. There is therefore a need for temporary protection to allow the industry to mature, so that costs can fall to the level of international competitors. A number of empirical studies have tested this hypothesis. It has been found that infant industries continue to be protected many decades beyond the anticipated period of protection. More importantly, increased protection has been associated with higher production costs (Kruger and Tuncer (1982), Baldwin (1988), Baldwin (1992), Lucas (1984)). These findings appear to be consistent with a key prediction of the model: underinvestment in cost saving initiatives can be credibly used to sustain high levels of protection.

There is further support for the results from a number of industry based studies. In an econometric study of lobbying in the agricultural sector, Eliste and Fredriksson (1999) find that users of older and more damaging technology obtain greater net policy support from the government. Similarly, studies of the metal industry in Korea (Truett and Truett, 1997), electronics in Brazil (Luzio and Greenstein, 1995), engineering in Indonesia (Braadbart, 1996), vehicle manufacture in South and S.E. Asia (Okamato, 2000) note that these industries are heavily protected. However, they have higher production costs than their international rivals and produce goods that lag behind the technological frontier. These conclusions once again appear to be consistent with the central conclusion of this paper. It is perhaps useful to note that the results of this paper simply indicate that less efficient industries may be more successful in securing concessions. The analysis does not suggest that tariffs will never decline.[19]

There are a number of other issues that have not been considered so far. Most important of these is the assumed form of competition in the output market. It is well known that results based on strategic interactions are highly sensitive to the assumed form of competition in oligopolistic markets. It is therefore important to determine whether the main result summarised in Proposition 1 is reversed under the assumption that firms compete in prices in the final stage of the game. Consider the problem when the duopolists compete in prices.[20] Recall from Proposition 1 and Lemma 2, that underinvestment raises costs and lowers political contributions. The credible threat of lower contributions induces the government to provide greater protection. This link between lobbying and investment is unaffected by price competition, so long as underinvestment raises production costs sufficiently. This is because the underinvestment equilibrium arises as a consequence of the interaction between the government and each firm, rather than as a result of the strategic interaction between firms. While the qualitative effects are unaffected by the form of product market competition, the quantitative impacts may differ. However, we are unable to say anything about the relative sizes at this level of generality.

Another important issue is the assumed sequence of events. The credible commitment effects stem from the assumption that firms determine their investment first and the government chooses its policy taking the investment decision as given. This seems reasonable if it is supposed that investment in technology is a long run decision variable, while the details of government policies are influenced by lobby group pressures and more immediate (short term) political concerns.[21] If, however, firms delay their investment decisions so that the sequence of events is reversed, then investment can no longer have a credible commitment effect. Clearly, delaying investments would be the rational strategy for firms if they expect a regime change that brings in a government which places no weight on political contributions from the industry lobby group.

Finally, it worth noting that the results in this paper are consistent with those of Wright (1995), who explores the time consistency of future tariff policies. Wright demonstrates that a policy of tariff removal can be rendered time inconsistent if a firm increases its costs. However, Wright does not does not explicitly model lobbying or the political process, and abstracts from investment and credibility issues. Thus, even though the objective and framework of Wright's analysis differs from this paper, the results lend further support to the basic conclusions of this model.

APPENDIX

PROOFS OF EQUATIONS (2a) - (2c):
Totally differentiating (1a) and (1b), gives the comparative statics system of equations:

$$\begin{bmatrix} \Pi^i_{ii} & \Pi^i_{ij} & \Pi^i_{iy} \\ \Pi^j_{ji} & \Pi^j_{jj} & \Pi^j_{jy} \\ \Pi^y_{yi} & \Pi^y_{yj} & \Pi^y_{yy} \end{bmatrix} \begin{bmatrix} dx^i \\ dx^j \\ dy \end{bmatrix} = -\begin{bmatrix} 0 \\ 0 \\ \Pi^y_{yt} \end{bmatrix} dt - \begin{bmatrix} \Pi^i_{i\tau^i} \\ 0 \\ 0 \end{bmatrix} d\tau^i - \begin{bmatrix} 0 \\ \Pi^j_{j\tau^j} \\ 0 \end{bmatrix} d\tau^j \qquad \text{(A1)}$$

where:subscripts denote partial derivatives, $\Pi^i_{ii} = \frac{\partial^2 P}{\partial x^{i2}} x^i + 2\frac{\partial P}{\partial x^i} - \frac{\partial^2 C^i}{\partial x^{i2}} < 0$, $\Pi^i_{ij} = \frac{\partial^2 P}{\partial x^i \partial x^j} x^i + 2\frac{\partial P}{\partial x^j} < 0$, $\Pi^i_{it} = 0$, $\Pi^i_{i\tau^i} = -\frac{\partial^2 C^i}{\partial x^i \partial w^i}\frac{\partial w}{\partial \tau} > 0$, $\Pi^y_{yt} = -1$. Note that *i* and *j* are symmetric.

By the SOCs it is assumed that the determinant denoted $\Delta < 0$ and that the following usual assumptions are mantained:

$$\left|\Pi^i_{ii}\right| > \left|\Pi^i_{ij}\right|, \left|\Pi^j_{jj}\right| > \left|\Pi^j_{ji}\right|, \left|\Pi^y_{yy}\right| > \left|\Pi^j_{ji}\right|, \left|\Pi^y_{yy}\right| > \left|\Pi^y_{yi}\right| = \left|\Pi^y_{yj}\right| \qquad \text{(A2)}$$

Solving (A1) (using symmetry between i and j):

$$\frac{dx^i}{dt} = \frac{\Pi^j_{jy}\Pi^y_{yt}(\Pi^j_{jj} - \Pi^i_{ij})}{\Delta} > 0 \qquad \text{(A3)}$$

$$\frac{dy}{dt} = \frac{-\Pi^y_{yt}\left(\left(\Pi^j_{jj}\right)^2 - \left(\Pi^i_{ij}\right)^2\right)}{\Delta} < 0 \qquad \text{(A4)}$$

$$\frac{dx^i}{d\tau^i} = -\frac{\Pi^i_{i\tau^i}(\Pi^j_{jj}\Pi^y_{yy} - \Pi^j_{jy}\Pi^y_{yj}}{\Delta} > 0 \qquad \text{(A5)}$$

$$\frac{dx^j}{d\tau^i} = -\frac{\Pi^i_{i\tau^i}(\Pi^j_{ji}\Pi^y_{yy} - \Pi^j_{jy}\Pi^y_{yi})}{\Delta} < 0 \qquad \text{(A6)}$$

$$\frac{dy}{d\tau^i} = -\frac{\Pi^i_{i\tau^i}(\Pi^j_{ji}\Pi^y_{yj} - \Pi^j_{jj}\Pi^y_{yi})}{\Delta} < 0 \qquad \text{(A7)}$$

LEMMA 2
Totally differentiating (3b), gives the comparative static system of equations:

$$\begin{bmatrix} \Pi^i_{S^iS^i} & \Pi^i_{S^iS^j} \\ \Pi^j_{S^jS^i} & \Pi^j_{S^jS^j} \end{bmatrix} \begin{bmatrix} dS^i \\ dS^j \end{bmatrix} = -\begin{bmatrix} \Pi^i_{S^i\tau^i} \\ 0 \end{bmatrix} d\tau^i - \begin{bmatrix} 0 \\ \Pi^j_{S^j\tau^j} \end{bmatrix} d\tau^j \qquad \text{(A8)}$$

Let D > 0 be the determinant of the system with $\left|\Pi^i_{S^iS^i}\right| > \left|\Pi^i_{S^iS^j}\right|, \left|\Pi^i_{S^iS^i}\right| > \left|\Pi^j_{S^jS^j}\right|$, $\Pi^i_{S^iS^i}$ < 0, $\Pi^j_{S^jS^j} < 0$, $\Pi^i_{S^i\tau^i} = \frac{\partial x^i}{\partial \tau^i} P'(\frac{\partial y}{\partial t} + \frac{\partial x^j}{\partial t}) > 0$, $\Pi^i_{S^i\tau^j} = \frac{\partial x^i}{\partial \tau^j} P'(\frac{\partial y}{\partial t} + \frac{\partial x^j}{\partial t}) < 0$.
Solving:

$$\frac{dS^i}{d\tau^i} = \frac{\Pi^i_{S^i\tau^i}\Pi^j_{S^jS^j} + \Pi^i_{S^i\tau^i}\Pi^i_{S^jS^j}}{D} > 0 \quad \text{(A9)}$$

$$\frac{dS^j}{d\tau^i} = \frac{-\Pi^j_{S^j\tau^i}\Pi^i_{S^iS^i} + \Pi^i_{S^i\tau^i}\Pi^j_{S^jS^i}}{D} \gtrless 0 \quad \text{(A10)}$$

$$\frac{dS}{d\tau^i} \equiv \frac{dS^i}{d\tau^i} + \frac{dS^j}{d\tau^i} = \frac{(\Pi^i_{S^jS^i} - \Pi^i_{S^iS^i})(\Pi^j_{S^j\tau^i} + \Pi^i_{S^i\tau^i})}{D} > 0 \quad \text{(A11)}$$

LEMMA 3

By condition (SI) in the text, the tariff is determined by the government to maximise its welfare. The tariff thus satisfies the first order condition:

$$G_t = P'X(x^i_t + y_t)(1+\alpha) + \alpha(y + ty_t - P'Q_tQ) = 0 \quad \text{(A12)}$$

where subscripts denote partial derivatives. Totally differentiate (A12) and rearrange:

$$\frac{dt}{d\tau^i} = \frac{-G_{t\tau^i}}{G_{tt}} \quad \text{(A13)}$$

By the SOC it is assumed that $G_{tt} < 0$. Thus sign of $dt/d\tau^i$ = sign of $G_{t\tau^i}$.

Further differentiating (A12):

$$G_{t\tau^i} = P'X_{\tau_i}(x^i_t + y_t)(1+\alpha) + \alpha(y_{\tau^i} - P''Q_{\tau^i}Q_tQ - P'Q_{\tau^i}Q_t) \quad \text{(A14)}$$

Rearranging (A14) it can be verified that $G_{t\tau^i} < 0$ if $RQ_t > -1$ where $R = P''Q/P'$ which is the usual measure of convexity of the demand function that is used in the literature (see, e.g. Brander and Spencer (1983)).

Thus, if $R > -1/Q_t$ then $\frac{dt}{d\tau^i} = \frac{-G_{t\tau^i}}{G_{tt}} < 0$.

EXISTENCE OF A POLITICAL EQUILIBRIUM

Shapiro (1986) discusses the necessary conditions for a Cournot equilibrium in the output market to exist in a game such as that outlined in Section II. It is shown that if the first and second order conditions are satisfied a Cournot equilibrium will exist and be stable.

Showing existence of the political equilibrium is, however, somewhat more complicated and hence a brief discussion of this issue is provided here. To establish the existence of the political equilibrium it is necessary to show that the game played between the firms and the government satisfy Kakutani's fixed point theorem. To do so we introduce some further notation.

Let $S^i \in \sigma^i$ be the strategy space of firm i $(i = 1,2\ i \neq j)$
where S^i denotes contributions of firm i.
Let $t \in \sigma^G$ be the strategy space of the government
where t is the tariff.
Define $\sigma = \sigma^i \times \sigma^j \times \sigma^G$, as the Cartesian product. It defines the strategy space of the game played between the firms and the government.
Define $\Pi^i(\sigma, Q)$ as firm i's payoffs and $G(\sigma, Q)$ as the government's payoffs
Assumption 1: σ^i is compact. Note that it is closed since $0 \leq S^i \leq \Pi^i(\sigma, Q)$

Assumption 2 σ^G is compact. It is closed since $t^* \leq t \leq \hat{t}$, where t^* is the welfare maximising tariff and $\hat{t}$ is defined by the condition that $\Pi^y(\hat{t}) = 0$ (that is, the height of the tariff is such that the foreign firm earns no profits in the domestic market).
Assumption 3 $\Pi^i(\sigma, Q)$ is jointly concave with respect to S^i and Q and $G(\sigma, Q)$ is jointly concave with respect to t and Q.

Result: By theorem 2.4 of Friedman (1980) the game between the government and the firms satisfies the conditions of Kakutani's fixed point theorem and has one fixed point. An equilibrium point therefore exists.

This result may be established by showing that the following conditions hold:
Condition 1. the domain of the best reply functions are compact and convex
Condition 2. the image sets of the best reply functions are contained in σ
Condition 3. the image sets of the best reply functions are convex
Condition 4. the best reply functions are upper semicontinuous.

Note that Condition 1 is satisfied by Assumptions 1 and 2 and the fact that the Cartesian product of convex sets is convex.
To see Condition 2 define the best reply mapping of (say) the firms as:
$$r_i(\sigma) = \{S^{*i} \in \sigma^i \,|\, \Pi^i(\sigma \setminus S^{*i}) \geq \Pi^i(\sigma \setminus S^{'i}) \text{ for all } S^{'i} \in \sigma^i\}$$
That is the strategy S^{*i} is a best reply to other strategy combinations if it maximises the payoffs of i given the strategies of other players. Such an S^{*i} exists because it is a maximiser of a continuous concave function over a compact set and by construction it is required to be in σ.
To establish Condition 3 suppose that
$S^1, S^2 \in r_i(\sigma)$. Define $0 < \lambda < 1$ and $S^\lambda = \lambda S^1 + (1-\lambda)S^2$. Concavity of Π^i implies that $\Pi^i(S^\lambda) \geq \lambda\Pi^i(S^1) + (1 - \lambda)\Pi^i(S^2)$. Strict inequality implies that either or both $S^1, S^2 \notin r_i(\sigma)$, hence this yields a contradiction[22]. It follows that equality holds and $S^\lambda \in r_i(\sigma)$. So $r_i(\sigma)$ is convex.
Finally, Condition 4 follows directly from Lemma 2.5 of Friedman (1980) which proves that this property holds under Assumptions 1-3.

References

Anderson, K (1995) "Lobbying Incentives and the Pattern of Protection in Rich and Poor Countries" *Economic Development and Cultural Change, 43, 401-23*

Baldwin,R-E. (1988) *Trade Policy in a Changing World Economy* University of Chicago Press, Chicago.

Baldwin R., 1993, Asymmetric Lobbying Effects: Why Governments Pick Losers FTP, HEISUN.UNIGE.CH/pub/Baldwin/asymlobbwp5.

Baldwin,R-E. (1992) "The Case of Infant-Industry Tariff Protection", in Lal, Deepak, ed. *Development Economics* Vol 3. Ashgate, Brookfield, Vt.

Bernheim, B D. and M Whinston (1986) "Menu Actions, Resource Allocation and Economic Influence" *Quarterly Journal of Economics*, 101, 1-31.

Bloningen, B.A. and W.W. Wilson (1999) "Explaining Armington: What Determines Substitutability between Home and Foreign Goods" *Canadian Journal of Economics*, 32, 1-21.

Bouet, A (2001) "Research and Development, Voluntary Export Restraints and Tariffs" *European Economic Review, 45, 323-56.*

Braadbaart, O (1996) "Indonesian Engineering: Consumption Trends and Localisation Efforts" *Bulletin of Economic Studies,* 32, 75-104.

Damania (2001) "When the Weak Win: The role of investment in environmental lobbying" *Journal f Environmental Economics and Management,*42, 1-22.

Dixit A and J Londregan (1995) "Redistributive Politics and Economic Efficiency" *American Political Science Review, 89, 856-895.*

El-Agraa A. M. (1987) *Protection, Cooperation, Development and Integration* London, Macmillan.

Elliste, P and P. Fredriksson (1999) The Political Economy of Environmental Regulations, Government Assistance and Foreign Trade *in Trade Global Policy and the Environment* (P. Fredriksson, Ed) World Bank Paper No 402, Washington D.C.

Fredriksson, P. (1997) "The Political Economy of Pollution Taxes in a Small Open Economy" *Journal of Environmental Economics and Management,*33, 44-58.

Friedman, J. W. (1980) *Game Theory with Applications to Economics,* OUP, Oxford.

Fudenberg D, and J Tirole (1984) "The Fat Cat Effect, The Puppy Dog Ploy and the Lean and Hungry Look*" American Economic Review,* 74, 361-368.

Grossman, G E, and E Helpman (1994) "Protection for Sale" *American Economic Review*, 84. 833-850.

Grossman, G E, and E Helpman (1995) "The politics of free trade" *American Economic Review*, 85, 667-90.

Grossman, G E, and E Helpman (1996) "Rent Dissipation, Free Riding and Trade Policy" *European Economic Review*, 40, 795-803.

Hillman, A (1982) "Declining Industries and Political Support Protectionist Motives" *American Economic Review*, 72, 1180-1187.

Krueger A and B Tuncer (1982) "An Empirical Test if the Infant Industry Argument" *American Economic Review*, 72, 1142-1152.

Krugman, P (1984) "Import protection as export protection". In Kierlowszki, H (Ed) *Monopolistic Competition and International Trade*, Clarendon Press, Oxford.

Long, N.V. and N. Vousden (1991) "Protectionist Responses and Declining Industries" *Journal of International Economics*, 30, 87-103.

Lucas R E (1984) "An Empirical Test if the Infant Industry Argument: A Comment" *American Economic Review*, 74 , 1110-1111

Luzio, E and S Greenstein (1995) " Measuring the Performance of a Protected Infant

Industry" *Review of Economics and Statistics*, 77, 622-33.
Okamato, Y (2000) "Productivity in the Automotive Industry" *ASEAN Economic Bulletin,* 17, 60-73.
Shapiro C (1986) "Theories of Oligopoly Behavior" In *The Handbook of Industrial Organization,* Ed R Schmalensee and R Willig, North Holland, Amsterdam
Tirole, J (1990) *The Theory of Industrial Organization,* MIT Press, Cambridge, Massachusetes
Truett, L and D Truett (1997) "The Korean Metals Industry and Trade" *Journal of Asian Economics,* 8, 333-47.
Wright, D. (1995) "Incentives, Protection and Time Consistency" *Canadian Journal of Economics* 28, 929-938.

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[1] ElAgraa (1987) provides evidence based on inter industry studies. Some industry specific cases include: textiles in the USA (Dixit and Londregan (1995)), agriculture in developed countries (Anderson (1995)). Baldwin (1993) and Grossman and Helpman (1996) provide a general discussion of this issue.

[2] Discussion of the evidence is provided in Section IV.

[3] Political donations influence the government's decisions because of their many uses, including funding election campaigns, retiring debt from previous elections and deterring rivals.

[4] Since the focus of this paper is upon the effects of lobbying by producers, the role of an opposing consumer lobby group is suppressed. This may be justified by assuming that the benefits of a tariff are concentrated, but the costs of protection are so thinly spread that they do not provide sufficient incentive for individuals to organize a lobby group, or make political donations.

[5] Damania (2001) ignores complications that arise from the strategic interactions between firms and the analysis is thus analogous to that of the political economy literature.

[6] There is usually a restriction for this result to occur (which is often implicit in the second order conditions). It is the requirement that demand not be too convex. This condition ensures that the rent shifting benefits from the foreign to the domestic industry are sufficiently large.

[7] The results can readily be generalized to the case of an n > 2 firm oligopoly at both home and overseas.

[8] The central conclusions are not affected by the assumption of Cournot competition. This issue is addressed in Section IV.

[9] That is, the cost function $C^i(w(\tau^i), q)$ is homogenous of degree one in input price, convex in output and concave in input price.

[10] The arguments of functions are ignored for notational brevity when not essential.

[11] See, for example, Tirole (1990), p 323.

[12] The second order conditions are specified in the Appendix.

[13] We implicitly rule out an import subsidy and assume that some level of domestic production is optimal and can be achieved with a non-negative tariff. This assumption is made to simplify the proofs, but is not essential to the central results.

[14] This assumption is implicit in the Grossman Helpman model which assumes that $\partial S/\partial t > 0$ for all feasible $t > t^*$.

[15] Note that the noncooperative profit maximising (Nash) contributions of each firm are non-zero when there is an interior solution to (3a). A corner solution with zero contributions occurs when the costs of lobbying always exceed the benefits of lobbying. In this case both the fully cooperative and the non-cooperative equilibrium contributions are zero. Another property that is worth stating is that 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 (5a). Formal proofs are available from the author upon request.

[16] Since lower costs give firm *i* a greater share of the market, firm *j's* profits and (by local truthfulness) political contributions decline. However, the increase in *i'*s contributions outweighs the decline in *j*'s contributions, so that aggregate industry political contributions rise. Formally, this reflects the fact that the slope of the reaction functions are less than unity in absolute value. Hence the decline in j's contributions do not offset the increase in i's contributions.

[17] There are a number of additional terms in the first order condition which are zero. Observe that: $\frac{\partial \Pi^i}{\partial x^i}\frac{\partial x^i}{\partial \tau^i}=0$ since by (1c) $\frac{\partial \Pi^i}{\partial x^i}=0$. In addition $(\frac{\partial \Pi^i}{\partial t}-\frac{\partial S^i}{\partial t})\frac{\partial t}{\partial \tau^i}=0$, since by the local truthfulness condition in (5a) $\frac{\partial \Pi^i}{\partial t}=\frac{\partial S^i}{\partial t}$. Using these results, yields the first order condition in (6b). The first order condition for the foreign firm is $\frac{\partial K(\tau^y)}{\partial \tau^y}=P'(\frac{\partial x^j}{\partial \tau^y}+\frac{\partial x^i}{\partial \tau^y})-\frac{\partial C^y}{\partial w}\frac{\partial w}{\partial \tau^y}$.

[18] This is an example of Fudenberg and Tirole's (1984) "puppy dog" strategy.

[19] For instance a referee provided a counter-example of trade policies in the Thatcher era, where trade barriers in the older industries were systematically lowered. Our model does not suggest that such policy initiatives are impossible to introduce, but that in the high cost industries lobbying would be more effective and hence reforms are harder to introduce if the government values political donations from these industries.

[20] To avoid the discontinuity problems caused by Bertrand competition let the goods produced by the duopolists be imperfect substitutes, sold at prices P^i and P^j ($i = 1,2$ $i \neq j$).

[21] This is one of the central assumptions of the Grossman-Helpman model. It defines the short run political equilibrium, taking longer term considerations as given.

[22] To see why note that in this case $\Pi^i(S^\lambda) > \Pi^i(S^1)$, or $\Pi^i(S^\lambda) > \Pi^i(S^2)$, hence, S^1, S^2 cannot satisfy the definition of a best reply since strategy S^λ gives higher payoffs, for given strategies of all other players.

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0216 Anderson, Kym, “International Trade and Industry Policies”, July 2002. (Forthcoming in *The Cambridge Handbook of Social Sciences in Australia*, edited by I. McAllister, S. Dowrick and R. Hassan, Cambridge: Cambridge University Press, 2003).

0215 Anderson, Kym, “The New Global Economy: Opportunities and Challenges for Small Open Economies”, July, 2002. (Forthcoming as Ch. 3 in *Sustaining Singapore’s Competitiveness in the New Global Economy*, edited by R. Rajan, London: Edward Elgar, 2003).

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0208 Rajan, Ramkishen and Rahul Sen, “The Japan-Singapore “New Age” Economic Partnership Agreement: Background” March 2002. (Abbreviated version published in *Economic and Political Weekly* 37(26): 2565-6, 2002).

0207 Anderson, Kym, “Pecularities of Retaliation in WTO Dispute Settlement” March 2002. (Since published in *World Trade Review* 1(2): 123-34, July 2002.)