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Protection For Sale In A General Oligopolistic Equilibrium (GOLE) Framework*

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We consider how the lobbying of organized sectors serves to affect the equilibrium trade policy of a country, where the market structure is oligopolistic. We find that the lobbying of threshold sectors - sectors which would not be competitive enough to export or produce in the absence of protection - have opposite welfare effects on the domestic country as compared to the lobbying of non-threshold sectors. The former enhances the country's national welfare while the latter worsens it. In addition, we also find that lobbying which results in "dumping" is detrimental to the welfare of the Home country.

Keywords: Protection for sale, Lobbying, General Oligopolistic Equilibirum (GOLE), Industrial targetting policy

1. Introduction

President Obama has on numerous accounts tried to limit the influence of lobbyists in the policy making process of the USA. For example, he barred registered lobbyists from political appointments, and banned spoken communication between outsiders and federal officials about stimulus contracts in 2009. From the viewpoint of the International Trade literature, President Obama's battle against lobbying makes perfect sense, since economists are in general agreement that lobbying leads to the creation of deadweight loss. Having said so, is lobbying for protection against foreign competition, or for the promotion of domestic exports, always bad for the domestic economy? Should a government seek to limit all organized domestic sectors' access to the government uniformly?

This paper argues that the effect of lobbying by domestic sectors on the national welfare of the home country depends on whether the organized sector is a threshold sector or not. We define a threshold sector as either one of the following: an import-competing sector whose goods would not be produced at all in the absence of protection against foreign competition; or an exporting sector whose goods would not be exported at all in the absence of an export subsidy. The oil and natural gas sector in Japan would be a good example of the former; and Japan's smartphone industry today, or semiconductor industry in the 1950s–60s, would be good examples of the latter.

Our results suggest that while a greater degree of protection being granted to non-marginal sectors in response to their lobbying is indeed harmful to the Home country, the opposite can be said for threshold

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sectors. This finding is in tandem with the observations of Noland (2007), who argues that one of the reasons why present-day Japan has met with such limited success in trying to model her past industrial-targetting policies could be due to political economy considerations, where resources in Japan have been increasingly directed to large, politically influential sectors, instead of marginal sectors. Based on these results, we argue that a government could seek to improve the welfare of its country by seeking to limit non-threshold sectors' access to the government, while being more receptive towards the lobbying of threshold sectors. This paper builds on the work of Itoh and Kiyono (1987), who exemplified that although protectionism almost always reduces a country's economic welfare, there is a specific type of trade policy that does improve the welfare of the country implementing it: an export subsidy (or import tariff) that is levied on so-called "marginal goods", that is, goods that are not exported (produced) at all, or are exported (produced) only in small amounts under free trade, but whose exports (output) can be promoted considerably by export subsidies (import tariffs). Our contributions to the literature are as follows. First, we consider an oligopolistic market structure, as opposed to the perfectly competitive markets analyzed by Itoh and Kiyono (1987). Second, we incorporate heterogeneity in terms of productivity levels at the sectoral level to the Itoh and Kiyono (1987) paper. Finally, while Itoh and Kiyono (1987) are simply concerned with the effects of industrial targtting policies in the absence of political economy considerations, this paper aims to shed light on the welfare effects of lobbying by threshold and non-threshold sectors.

2. The Model

2.1 Demand

We begin by considering two countries, Home and Foreign, which are symmetric in all aspects, with the exception that they may differ in terms of their unit labor or technological requirements. In each country, there is a numeraire good and a continuum of non-numeraire goods. We assume that Home's income is always large enough to ensure that some non-negative amount of the numeraire is consumed. Citizens have identical preferences, which are continuum-quadratic. Adopting the structure of the General Equilibrium Oligopolistic (GOLE) model developed by Neary (2003b), the instantaneous utility derived from the consumption activities of all domestic citizens is:

$$\begin{aligned} U[\{x(z)\}] &= x_0 + \int_0^1 u[x(z)]dz \\ &= x_0 + a\int_0^1 x(z) - \frac{b}{2}x(z)^2 dz \end{aligned} \tag{1}$$

The aggregate national utility function written above is to be interpreted as follows. In each country, there is a numeraire good denoted good *0*; and a continuum of non-numeraire goods or sectors, each sector denoted $z \in [0,1]$. x_0 denotes the total amount of good 0 consumed, and $x(z)$ the total amount of each good z consumed, for any $z \in [0,1]$. The sub-utility function,—which assumes the form $u[x(z)] = ax(z) - \frac{b}{2}x(z)^2$—captures the utility which Home's citizens derive from their consumption of a single non-numeraire good, z. Denoting the first uncentered moment of consumption as $\mu_1^x = \int_0^1 x(z)dz$ and the 2nd uncentered moment of consumption as $\mu_2^x = \int_0^1 x(z)^2 dz$ allows us to rewrite the preferences of Home's citizens as $U[\{x(z)\}] = x_0 + a\mu_1^x - \frac{b}{2}\mu_2^x$. Solving Home's utility-maximization problem yields the demand

$$x(z) = \frac{1}{b}[a - \lambda p(z)] \tag{2}$$

and inverse demand functions for good $z \in [0, 1]$.

$$p(z) = a - bx(z) \tag{3}$$

The indirect national utility function, which is solved by substituting the direct demand function into the aggregate national utility function, is

$$\begin{aligned}\tilde{U}[p(z), I] &= \left(I - \frac{a}{b}\mu_1^p + \frac{1}{b}\mu_2^p\right) + \frac{1}{2b}(a^2 - \mu_2^p) \\ &= I + \left\{\frac{a^2}{2b} - \frac{a}{b}\mu_1^p + \frac{\mu_2^p}{2b}\right\}\end{aligned}$$

where I is Home's aggregate national income, and $\{\frac{a^2}{2b} - \frac{a}{b}\mu_1^p + \frac{\mu_2^p}{2b}\}$ is the gross national consumer surplus (CS) from the consumption of non-numeraire goods by Home's citizens.

2.2 Supply

We now turn to the supply side of the economy. Labor is the only factor of production in our model, and is available in inelastic supply at the national level. Let Home's aggregate labor supply be denoted L; and Foreign's aggregate labor supply be denoted L^*. The numeraire is produced one-to-one using labor, so the equilibrium wage rate in each country (w) is equal to unity. We assume that while the market structure of good x_0 is perfectly competitive, each of the non-numeraire sectors is oligopolistic. That is, each non-numeraire sector is characterized by a few firms which are large within their own sectors, but small in relation to the entire economy. There is no entry or exit of firms in each period, so the number of firms in each sector (n in Home and n^* in Foreign) is assumed to be fixed. The model also asumes away trade costs. An important implication of this is that for each sector, the same equilibrium price $p(z)$ will prevail across both countries, under Free Trade. Following the original GOLE model developed by Neary (2003b), when a non-numeraire sector (i.e. sector z) opens up to trade, it could belong to either one of the following three regimes, depending on the number of surviving (or actively-producing) firms in each country for that particular sector.

1. Regime H: $[n > 0, n^* = 0]$. Here, both the Home and Foreign markets are served by Home firms alone, and there are no actively producing Foreign firms.
2. Regime HF: $[n > 0, n^* > 0]$. Here, both Home and Foreign firms are engaged in active production. That is, there is a positive number of Home and Foreign firms in the sector.

3. Regime F: $[n = 0, n^* > 0]$. Here, both the Home and Foreign markets are served by Foreign firms alone.

The Free Trade equilibrium of a particular domestic sector depends on the trade regime which it belongs to. This is derived by solving the profit-maximization problem of a single domestic firm in a particular sector z, when the firm competes via Cournot competition against all its rival firms in the two countries:

$$\max_{y_i(z)} \pi_i(y_{-i}(z), y_i(z)) = \{p(y_{-i}(z) + y_i(z)) - \alpha(z)\}y_i(z)$$

where π_i denotes the profits of firm i in sector z; $y_i(z)$ is the output of firm i in sector z; $y_{-i}(z)$ is the output of all its rivals in the same sector; $p(y_{-i}(z) + y_i(z))$ is the price of good z; and $\alpha(z)$ is the unit labor requirement in sector z. Sectoral-level variables can then be attained by aggregating across the total number of firms in Home.

3. The General Oligopolistic Equilibrium (GOLE)

3.1 Equilibrium Production and Trade Patterns For Arbitrary Home and Foreign Costs

The General Oligopolistic Equilibrium (GOLE) is a situation where each and every sector across the entire continuum of sectors: $z \in [0, 1]$ is in a state of equilibrium. Making use of the fact that profits are proportional to output, Home firms can only be profitable if and only if $\alpha(z) < a$ under regime H: $[n > 0, n^* = 0]$; and $\alpha(z) < \frac{a+n^*\alpha^*(z)}{n^*+1}$ under regime HF: $[n > 0.n^* > 0]$.[1] In other words, the threshold level of productivity for producing is $\alpha(z) = a$ under Regime H, and $\alpha(z) = \frac{a+n^*\alpha^*(z)}{n^*+1}$ under Regime HF.[2] Following Dornbusch, Fischer and Samuelson (1977), we assume that sectors can be ranked unambiguously in terms of their unit labor (i.e. technological) requirements. This allows us to assume, without loss of generality, that $\frac{\partial\alpha(z)}{\partial z} > 0$ and $\frac{\partial\alpha^*(z)}{\partial z} < 0$. Further, following Neary (2003a), let us suppose that Home and Foreign's unit labor requirements can be expressed as linear functions of z, so that: Home's unit labor requirements are $\alpha(z) = \alpha_0 + z$, and Foreign's unit labor requirements are $\alpha^*(z) = \alpha_0^* + (1 - z)$. Then, it follows that the condition for a domestic sector to export (under Free Trade) is: $\alpha(z) < \alpha^*(z)$.[3] In other words, the cutoff level of productivity for exporting under Free Trade is $\alpha(z) = \alpha^*(z)$. (See Figure 1 in Tables and Figures).

Denoting Home's cutoff or threshold (i.e. least efficient) sector as $\widetilde{z}$; and Foreign's cutoff or threshold (i.e. least efficient) sector as $\widetilde{z}^*$, it follows that the range of sectors $z \in [0, \widetilde{z}^*)$ belong to regime H: $[n > 0, n^* = 0]$; $z \in [\widetilde{z}^*, \widetilde{z})$ belong to regime HF: $[n > 0, n^* > 0]$; and $z \in [\widetilde{z}, 1]$ belong to regime F: $[n = 0, n^* > 0]$. Further, labelling Home's least productive export sector as $\widetilde{z}^x$, it is clear that for any

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[1] This is because these conditions must be satisfied in order for $y > 0$ ($\Leftrightarrow \pi > 0$).

[2] By the assumption of symmetry, we deduce that Foreign firms are profitable if and only if $\alpha^*(z) < a$ under regime F: $[n = 0, n^* > 0]$; and $\alpha^*(z) < \frac{a+n\alpha(z)}{n+1}$ under regime HF: $[n > 0, n^* > 0]$.

[3] This is because Home's import volume: $M = -\{\frac{n[a-\alpha(z)]-n^*[a-\alpha^*(z)]-2nn^*[\alpha(z)-\alpha^*(z)]}{b(1+n+n^*)}\}$ is equal to zero when $\alpha(z) = \alpha^*(z)$; positive when $\alpha(z) > \alpha^*(z)$; and negative when $\alpha(z) < \alpha^*(z)$.

sector $z \in [0, \widetilde{z}^x)$, Home firms are exporting firms (i.e. they produce and sell to both the Home and Foreign markets); while for any sector $z \in [\widetilde{z}^x, \widetilde{z})$, Home firms are import-competing firms (i.e. they produce only for the Home market, and face import competition from Foreign firms in the sector). The implications of the above with respects to special interest politics, are as follows. First, Home firms in sectors $z \in [0, \widetilde{z}^x)$ have an interest in receiving protection in the form of export subsidies. Second, Home firms in sectors $z \in [\widetilde{z}^x, \widetilde{z})$ have an interest in receiving protection in the form of import tariffs. Finally, Sectors $z \in [\widetilde{z}, 1]$ are devoid of special interests, since there are no active Home firms in these sectors. In the section that follows, we turn our attention to the partial equilibrium in Home, when the Home government sets a protectionist trade policy in the form of an export subsidy for domestic sectors within the range $z \in [0, \widetilde{z}^x)$; and an import tariff for sectors within the range of $z \in [\widetilde{z}^x, 1)$.

3.2 Protectionist-Trade-Policy Equilibria

Now consider that the Home government decides to protect its domestic sectors, by implementing an export subsidy (denoted τ^x) on domestic exports to Foreign; and an import tariff (τ^m) on foreign-produced goods that are imported by Home. The export subsidy $\tau^x = p_s^F - p_c^*$ drives a wedge between the price paid by Foreign consumers (p_c^*) and the price received by Home producers from their exports to the Foreign market (p_s^F). On the other hand, the import tariff $\tau^m = p_c - p_s^{*H}$ drives a wedge between the price paid by Home consumers (p_c) and the price received by Foreign producers from their exports to Home (p_s^{*H}). In what follows, we shall adopt the use of terminology in Grossman and Helpman (1994), where we shall refer to a positive incidence of an export subsidy or import tariff as "protection", and a negative incidence of either of the above as "negative protection". Suppose the Foreign government does not implement any trade policy. The equilibrium situation for each Home sector will then depend on the sector's trade regime; as well as its export status. There will be four types of partial equilibria in particular: one for exporting domestic sectors under Regime H (that is, for $z \in [0, \widetilde{z}^*)$); for exporting domestic sectors under Regime HF ($z \in [\widetilde{z}^*, \widetilde{z}^x)$); for import-competing domestic sectors under Regime HF ($z \in [\widetilde{z}^x, \widetilde{z})$); and for import-reliant domestic sectors under Regime F ($z \in [\widetilde{z}, 1]$). We derive the partial equilibrium for each of the above ranges of sectors, by solving the profit-maximization problem(s) of a representative firm in each country, when firms compete via Cournot competition. The partial equilibria for each of the four ranges of sectors are summarized in Tables 1–4 (in Tables and Figures) respectively. From this point onwards, all variables that have to do with the consumer will be denoted with a subscript c; and all variables that have to do with the producer (or supplier) will be denoted with a subscript s. Foreign suppliers/consumers will be denoted with the asterisk sign; and Home suppliers/consumers without. The quantity supplied and price charged in the Foreign country will be marked with a superscript F; and the quantity supplied and price charged in the Home country with a superscript H.

4. Lobbying

We are now ready to consider how the government's choice of trade policy may be influenced by the special interests of organized sectors within the Home economy. Suppose that an exogenously determined subset of sectors (Z_O) choose to become politically-active, with the rest of the subset $Z_U = (1 - Z_O)$ remaining politically inactive. The numeraire sector is untaxed and remains politically inactive. Further, import-reliant sectors between the range of $z \in [\widetilde{z}, 1]$ are devoid of political interests and hence do not lobby, since there are no active Home firms in these sectors. Following Grossman and Helpman (1994), we assume that all firms in a sector act as one entity when it comes to making political contributions. In other words, if a sector is politically organized, then all the firms within the sector would make positive contributions in the same amount. Conversely, if a sector is not organized, then all the firms within that sector would make zero political contributions. When the Home government is subject to the lobbying of organized domestic sectors, the government's policy instrument becomes a composite vector $\tau = \{\tau_O^{x,H}, \tau_O^{x,HF}, \tau_O^{m,HF}, \tau_U^{x,H}, \tau_U^{x,HF}, \tau_U^{m,HF}, \tau_U^{m,F}\}$, which is composed of the following 7 vectors: $\tau_O^{x,H}$, which is a vector of export subsidies for politically organized exporting sectors under Regime H: $[n > 0, n^* = 0]$; $\tau_O^{x,HF}$, which is a vector of export subsidies for politically organized exporting sectors under Regime HF: $[n > 0, n^* > 0]$; $\tau_O^{m,HF}$, which is a vector of import tariffs for politically organized import-competing sectors under Regime HF: $[n > 0, n^* > 0]$; $\tau_U^{x,H}$, which is a vector of export subsidies for unorganized exporting sectors under Regime H: $[n > 0, n^* = 0]$; $\tau_U^{x,HF}$, which is a vector of export subsidies for unorganized exporting sectors under Regime HF: $[n > 0, n^* > 0]$; $\tau_U^{m,HF}$, which is a vector of import tariffs for unorganized import-competing sectors under Regime HF: $[n > 0, n^* > 0]$; and $\tau_U^{m,F}$, which is a vector of import tariffs for sectors under Regime F: $[n = 0, n^* > 0]$.

4.1 The Governent's Objective Function

Following Grossman and Helpman (1994), Home's government chooses the equilibrium trade policy vector: $\overline{\tau} = \{\overline{\tau}_O^{x,H}, \overline{\tau}_O^{x,HF}, \overline{\tau}_O^{m,HF}, \overline{\tau}_U^{x,H}, \overline{\tau}_U^{x,HF}, \overline{\tau}_U^{m,HF}, \overline{\tau}_U^{m,F}\}$ by maximizing its objective function, which is a weighted aggregate of national welfare and political contributions.

$$\begin{aligned} G &= \xi W + C \\ &= \xi \widetilde{U} + C \end{aligned} \tag{4}$$

where $\xi > 0$ is the weight which the government attaches to national welfare (relative to political contributions); W is gross national welfare; $\widetilde{U}$ is Home's indirect utility from the consumption activities of all her citizens; and C is the total amount of contribution dollars which the government receives from organized sectors.[4]

[4] The equivalence between W and $\widetilde{U}$ stems from the fact that both gross national welfare and indirect utility are equal to the sum of national income and consumer surplus.

4.2 Stages Of The Lobbying Game

The lobbying game proceeds as follows.

1. In stage 1 of the game, an exogenously-determined fraction—which is less than or equal to 1-of all the domestic sectors become politically organized. Each lobby group $z \in Z_O$ presents the government with a contribution schedule $C(z)$, which maps every possible policy vector to a specific level of contributions.
2. In stage 2 of the game, the government chooses the equilibrium trade policy vector $\overline{\tau} = \{\overline{\tau}_O^{x,H}, \overline{\tau}_O^{x,HF}, \overline{\tau}_O^{m,HF}, \overline{\tau}_U^{x,H}, \overline{\tau}_U^{x,HF}, \overline{\tau}_U^{m,HF}, \overline{\tau}_U^{m,F}\}$, based on the proposed contribution schedules of each and every organized sector. The equilibrium policy vector is chosen with the aim of maximizing the government's objective function.
3. The lump sum of export subsidies granted to Home's exporting sectors are financed by taxing all domestic citizens equally. On the other hand, the lump sum of tariff revenue collected from Home's import-competing or import-reliant sectors are rebated to all domestic citizens equally.
4. Finally, the government collects $C(z)$ from each organized sector.

4.3 Truthful Contributions

A key question is how each organized sector $z \in Z_O$ determines the amount of political contributions it will pay to the government. Following the original Protection For Sale model, we restrict contributions to be globally truthful, so that $\forall z \in Z_O$, $C(z) = \Pi(z) - B(z)$,[5] where $B(z)$ is a scalar representing some base level of welfare for the sector.[6] On the other hand, $C(z) = 0$, $\forall z \in Z_U$. We know from Dixit, A., Grossman, G. M. and Helpman, E. (1997) that an equilibrium of a Common Agency game is characterized by three conditions:

1. Feasibility of the contributions. That is, each organized sector must be able to afford its proposed schedule of contributions. This is satisfied by assumption in our model.
2. Optimality of the policy vector to the agent (i.e. government) within the set of feasible actions, given the principals' (i.e. organized sectors') contribution schedules.
3. Optimality of the policy and payments vectors to every principal (i.e. organized sector), subject to feasibility constraints and to the agent (i.e. government)'s individual rationality constraint.

Conditions 2 and 3 simply mean that the equilibrium policy vector must optimize the net profit function of each and every organized sector—which is the sector's gross profits less its contributions to the government—; and the objective function of the government consecutively.

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[5] Note that $\Pi(z)$ denotes the gross sectoral profits of the domestic sector z, as opposed to $\pi(z)$ which denotes the profits of a single domestic firm in that sector.

[6] According to Bernheim B. D. and Whinston, M. D. (1986), in the Nash equilibrium of the lobbying game we have just described—with each lobby group optimally choosing its contribution schedule C taking as given the schedules of all other lobby groups, and knowing that the trade policy τ will be chosen to maximize the government's objective function—the lobby groups can do no better than to select a contribution schedule of the form $C = \max[0, \Pi - B]$, where B is constant. This implies that the welfare of each lobby group net of its contributions becomes $\Pi - C = \min[\Pi(\tau), B]$, so B is an upper bound on net welfare.

4.4 The Utilitarian Benchmark

As is standard in the political economy literature, it is appropriate that we first derive the socially optimal policy $\widehat{\tau} = \{\widehat{\tau}^{x,H}, \widehat{\tau}^{x,HF}, \widehat{\tau}^{m,HF}, \widehat{\tau}^{m,F}\}$ that will serve as our benchmark for later analysis.[7] This is the policy that the government would implement in the absence of lobbying by organized sectors, and it is derived by maximizing the government's objective function with respects to the policy for each of the 4 different ranges of sectors, when $C(z)$ is set to zero $\forall z \in [0,1]$.

By replacing $\widetilde{U}$ in the government's objective function (5) with $I + CS$, and expressing

$$\begin{aligned} I =& L + \int_0^{\widetilde{z}^*} \Pi(z)dz + \int_0^{\widetilde{z}^*} \tau^{x,H}(z)M(z)dz + \int_{\widetilde{z}^*}^{\widetilde{z}^x} \Pi(z)dz + \int_{\widetilde{z}^*}^{\widetilde{z}^x} \tau^{x,HF}(z)M(z)dz + \\ & \int_{\widetilde{z}^x}^{\widetilde{z}} \Pi(z)dz + \int_{\widetilde{z}^x}^{\widetilde{z}} \tau^{m,HF}(z)M(z)dz + \int_{\widetilde{z}}^{1} \Pi(z)dz + \int_{\widetilde{z}}^{1} \tau^{m,F}(z)M(z)dz \end{aligned}$$

and

$$\begin{aligned} CS =& \int_0^{\widetilde{z}^*} u[x(z)]dz + \int_{\widetilde{z}^*}^{\widetilde{z}^x} u[x(z)]dz + \int_{\widetilde{z}^x}^{\widetilde{z}} u[x(z)]dz + \int_{\widetilde{z}}^{1} u[x(z)]dz - \\ & \int_0^{\widetilde{z}^*} p(z)x(z)dz - \int_{\widetilde{z}^*}^{\widetilde{z}^x} p(z)x(z)dz - \int_{\widetilde{z}^x}^{\widetilde{z}} p(z)x(z)dz - \int_{\widetilde{z}}^{1} p(z)x(z)dz \end{aligned}$$

in terms of the trade policy alone, we can rewrite the government's objective function as

$$\begin{aligned} G =& \xi \widetilde{U}[p(z), I] + \int_0^1 C(z)dz \\ =& \xi\{L + \int_0^{\widetilde{z}^*} \frac{n[2a^2 - 4a\alpha(z) + 2\alpha(z)^2 + \tau^{x,H}(z)^2 + 2a\tau^{x,H}(z) - 2\alpha(z)\tau^{x,H}(z)]}{b(1+n)^2} dz - \\ & \int_0^{\widetilde{z}^*} \tau^{x,H}(z) \frac{an + n\tau^{x,H}(z) - n\alpha(z)}{b(1+n)} dz + \\ & \frac{n}{b(1+2n)^2} \int_{\widetilde{z}^*}^{\widetilde{z}^x} [a + n\alpha^*(z) - \alpha(z) - n\alpha(z) + \tau^{x,HF}(z) + n\tau^{x,HF}(z)]^2 dz + \\ & \frac{n}{b(1+n)^2} \int_{\widetilde{z}^*}^{\widetilde{z}^x} [a - \alpha(z)]^2 dz - \\ & \int_{\widetilde{z}^*}^{\widetilde{z}^x} \tau^{x,HF}(z) \{ \frac{an - n\alpha(z) + n\tau^{x,HF}(z) + n^2\alpha^*(z) + n^2\tau^{x,HF}(z) - n^2\alpha(z)}{b(1+2n)} \} dz + \\ & \int_{\widetilde{z}^x}^{\widetilde{z}} \frac{n[a - n\alpha(z) - \alpha(z) + n\alpha^*(z) + n\tau^{m,HF}(z)]^2}{b(1+2n)^2} dz + \\ & \int_{\widetilde{z}^x}^{\widetilde{z}} \tau^{m,HF}(z) \{ \frac{an - n\alpha^*(z) - n\tau^{m,HF}(z) + n^2\alpha(z) - n^2\alpha^*(z) - n^2\tau^{m,HF}(z)}{b(1+2n)} \} dz + \\ & \int_{\widetilde{z}}^{1} \tau^{m,F}(z) \{ \frac{an - n\tau^{m,F}(z) - n\alpha^*(z)}{b(1+n)} \} dz + \\ & \frac{2a^2}{b} - \frac{a}{b} \int_0^{\widetilde{z}^*} \frac{a + n\alpha(z)}{(1+n)} dz + \frac{1}{2b} \int_0^{\widetilde{z}^*} \frac{[a + n\alpha(z)]^2}{(1+n)^2} dz - \\ & \frac{a}{b} \int_{\widetilde{z}^*}^{\widetilde{z}^x} \frac{a + n\alpha(z)}{(1+n)} dz + \frac{1}{2b} \int_{\widetilde{z}^*}^{\widetilde{z}^x} \frac{[a + n\alpha(z)]^2}{(1+n)^2} dz - \end{aligned}$$

[7] Note that the hat notation stands for "first best".

$$\frac{a}{b}\int_{\widetilde{z}^x}^{\widetilde{z}} \frac{a+n\alpha(z)+n\tau^{m,HF}(z)+n\alpha^*(z)}{(1+2n)}dz+$$
$$\frac{1}{2b}\int_{\widetilde{z}^x}^{\widetilde{z}} \frac{[a+n\alpha(z)+n\tau^{m,HF}(z)+n\alpha^*(z)]^2}{(1+2n)^2}dz-$$
$$\frac{a}{b}\int_{\widetilde{z}}^{1} \frac{[a+n\tau^{m,F}(z)+n\alpha^*(z)]}{(1+n)}dz+\frac{1}{2b}\int_{\widetilde{z}}^{1} \frac{[a+n\tau^{m,F}(z)+n\alpha^*(z)]^2}{(1+n)^2}dz\}+$$
$$\int_0^{\widetilde{z}^*} C(z)dz+\int_{\widetilde{z}^*}^{\widetilde{z}^x} C(z)dz+\int_{\widetilde{z}^x}^{\widetilde{z}} C(z)dz \tag{5}$$

Setting $\int_0^{\widetilde{z}^*} C(z)dz+\int_{\widetilde{z}^*}^{\widetilde{z}^x} C(z)dz+\int_{\widetilde{z}^x}^{\widetilde{z}} C(z)dz$ to zero, and taking the First Order Condition of G with respects to $\tau^{x,H}(z)$; $\tau^{x,HF}(z)$; $\tau^{m,HF}(z)$; and $\tau^{m,F}(z)$ gives us the First Best level of policy for each of the four different ranges of sectors:

$$\widehat{\tau}^{x,H}(z)=-\frac{(n-1)[a-\alpha(z)]}{2n}<0 \tag{6}$$

$$\widehat{\tau}^{x,HF}(z)=\frac{a-(1+n)\alpha(z)+n\alpha^*(z)}{2n(1+n)}>0 \tag{7}$$

$$\widehat{\tau}^{m,HF}(z)=\frac{a-\alpha^*(z)}{2+n}>0 \tag{8}$$

$$\widehat{\tau}^{m,F}(z)=\frac{a-\alpha^*(z)}{(2+n)}>0 \tag{9}$$

All of the above satisfy the second order neccessary condition for the policies to maximize the government's objective function.

Proposition 1. Unlike the case of perfect competition—as was assumed in the original Protection For Sale model—, Free Trade does not prevail under the First Best. When firms have market power within their own sectors, the First Best level of policy is such that the most productive sectors under Free Trade $z\in[0,\widetilde{z}^x)$ receive an export tax, while all other sectors $z\in[\widetilde{z}^x,1)$ receive (positive) protection.

Please see A.1 in the appendix for the proof.

Proposition 2. The imposition of the First Best tariff leads to a higher survival of sectors (as compared to under Free Trade); and the imposition of the First Best export subsidy makes it possible for all Free Trade import-competing sectors to become exporting sectors.

The proof is as follows. Recall that under Free Trade, Home firms can only be profitable in the (import-competing) domestic market when $\alpha(z)<\frac{a+n^*\alpha^*(z)}{n^*+1}$); and they can only afford to export when $\alpha(z)<\alpha^*(z)$. When the government implements the First Best trade policy, the condition for a Home firm to be profitable in the (import-competing) domestic market becomes: $\alpha(z)<\frac{2a+n\alpha^*(z)}{2+n}$;[8] and that

8 $\frac{2a+n\alpha^*(z)}{2+n}$ is the level of productivity that sets the output (and hence profit) level of an import-competing domestic firm or sector to zero in the presence of a tariff.

for a Home firm to export becomes $\alpha(z) < \frac{a+n\alpha^*(z)}{n+1}$.[9]

First, it is straightforward to show that when the government implements the First Best policy, the unit labor requirements of both the threshold producing and exporting sectors are raised ex post.[10] This means that the government's trade policy makes it possible for less productive sectors—those with higher unit labor requirements than the previous cutoff levels—to produce and export. Second, since $n = n^*$ by assumption, the cutoff level for producing under Free Trade is exactly equal to the cutoff level for exporting under the First Best. In other words, the imposition of a tariff on import-competing sectors makes it possible for all Free Trade import-competing sectors to become exporting sectors. Finally, it is also easy to check that the First Best policy has no effect on the cutoff level of productivity for sectors in Regime H, with respects to both producing and exporting.[11] Q.E.D.

4.5 The Political Economy Equilibrium

Now that we have derived the First Best policy which maximizes the government's objective function in the absence of lobbying, our next task is to derive the trade policy which the government would implement when it is subject to lobbying. This is achieved by replacing $C(z)$ in the government's objective function with $\Pi(z) - B(z)\ \forall z \in Z_O$; and $C(z)$with $0\ \forall z \in Z_U$; and taking the First Order Condition of G with respects to $\{\tau_O^{x,H}, \tau_O^{x,HF}, \tau_O^{m,HF}, \tau_U^{x,H}, \tau_U^{x,HF}, \tau_U^{m,HF}$ and $\tau^{m,F}\}$. The equilibrium policies are

$$\overline{\tau}_O^{x,H}(z) = \frac{[a-\alpha(z)][(n-1)\xi-2]}{2(1-n\xi)} \begin{cases} >0, & if \quad (n-1)\xi < 2 \\ <0. & if \quad (n-1)\xi > 2 \end{cases} \tag{10}$$

with indeterminate sign, because $n\xi > 1$ must hold in order for the Second Order necessary condition to be satisfied, and ξ could be larger than or smaller than 1.

$$\overline{\tau}_O^{x,HF}(z) = \frac{[a-(n+1)\alpha(z)+n\alpha^*(z)][2+2n+\xi]}{2(n+1)[-1+n(-1+\xi)]} > 0 \tag{11}$$

with positive sign, because we know from Table 2 that in order for Foreign's imports to be positive, $[[a-(n+1)\alpha(z)+n\alpha^*(z)]]$ in the numerator must be positive; and $\xi > \frac{(n+1)}{n}$ must hold in order for the Second Order necessary condition to be satisfied.

$$\overline{\tau}_O^{m,HF} = \frac{2n[a-(n+1)\alpha(z)+n\alpha^*(z)]+[(1+2n)(a-\alpha^*(z))]\xi}{2n^2(\xi-1)+2\xi+5n\xi} > 0 \tag{12}$$

with positive sign, because we know from Table 3 that in order for ny_i^H and $n^*y_i^{*F}$ to be positive, the numerator must be positive; and because $\xi > \frac{2n^2}{2(n+1)^2+n}$ must hold in order for the Second Order necessary

9 $\frac{a+n\alpha^*(z)}{1+n}$ is the level of productivity that sets the export level of a domestic firm or sector under Regime HF to zero in the presence of an export subsidy.

10 In other words, $\frac{2a+n\alpha^*(z)}{2+n} > \frac{a+n^*\alpha^*(z)}{n^*+1}$ and $\frac{a+n\alpha^*(z)}{n+1} > \alpha^*(z)$.

11 For sectors under Regime H, the cutoff level of productivity remains $\alpha(z) = a$, regardless of whether Free Trade prevails or whether the government implements the First Best level of export subsidies.

condition to be satisfied.

$$\overline{\tau}_U^{x,H}(z) = \widehat{\tau}^{x,H}(z) = -\frac{(n-1)[a-\alpha(z)]}{2n} < 0$$

$$\overline{\tau}_U^{x,HF}(z) = \widehat{\tau}^{x,HF}(z) = \frac{a-(1+n)\alpha(z)+n\alpha^*(z)}{2n(1+n)} > 0$$

$$\overline{\tau}_U^{m,HF}(z) = \widehat{\tau}^{m,HF}(z) = \frac{a-\alpha^*(z)}{2+n} > 0$$

$$\overline{\tau}^{m,F}(z) = \widehat{\tau}^{m,F}(z) = \frac{a-\alpha^*(z)}{(2+n)} > 0$$

Proposition 3. As compared to the First Best, lobbying always increases the degree of protection granted to a politically-organized sector. Also, the degree of protection is increasing in the level of productivity of an organized sector, and decreasing in the government's preference for national welfare.

Please see A.2 in the appendix for the proof.

Proposition 4. Lobbying makes the entry of sectors which would not have been able to survive in the domestic import-competing market under the First Best possible. Also, lobbying makes it possible for sectors which would not have been able to export under the First Best, to do so.

Please see A.3 in the appendix for the proof.

Proposition 5. The lobbying of threshold sectors—which causes domestically produced goods which would not be exported at all in the absence of an export subsidy to become exported; or which causes goods which would not be produced domestically to become produced—enhances Home's national welfare. On the contrary, the lobbying of non-threshold sectors serves to dampen Home's national welfare.

Please see A.4 in the appendix for the proof. Table 5 summarizes the effects of moving away from the First Best to the political equilibrium, for threshold and non-threshold sectors. The total effect on national welfare is the sum of the change in sectoral profits; tariff revenue; and consumer surplus resulting from the change in policy. First, we find that the lobbying of a threshold import-competing sector—which moves the sector from $z \in [\widetilde{z}, 1]$ to $z \in [\widetilde{z}^x, \widetilde{z})$—enhances national welfare, because it leads to a gain in profit income, an rise in tariff revenue, and a gain in consumer surplus. The gain in consumer surplus stems from the fact that in moving from Regime F to Regime HF, the sector experiences a rise in the number of firms serving the Home market. This depresses the price of the good in the Home market and benefits domestic consumers. Second, the lobbying of a non-threshold import-competing sector also increases profit income and tariff revenue. However, by raising the price of the good, the political equilibrium tariff leads to a decrease in consumer surplus which overwhelms the rise in profits and tariff revenue. Third, the lobbying of a threshold exporting sector—which moves the sector from

$z \in [\widetilde{z}^x, \widetilde{z})$ to $z \in [\widetilde{z}^*, \widetilde{z}^x)$—leads to a fall in tariff revenue, because the government has to subsidize the sector's exports; and a fall in consumer surplus, because it reduces the number of firms serving the domestic market and raises the price of the good in Home. However, as we find in A.4 of the appendix - provided the government's preference for welfare (ξ) is higher than some exogenous value[12]—the gain in profits to the threshold sector could very possibly overwhelm the fall in tariff revenue and consumer surplus. In order to understand the implication behind this finding, it is helpful to recall from Proposition 3 that the amount of export subsidies granted to the politically-organized threshold exporting sector is decreasing in ξ. Hence, our findings imply that when the level of export subsidy is not too high, granting an export subsidy to promote the sales of a threshold exporting sector in the Foreign market may be welfare-enhancing for the Home country. Finally, the lobbying of a non-threshold exporting sector leads to a gain in sectoral profits, but this gain is never high enough to compensate for the loss in national welfare stemming from the taxation levied on Home's consumers to finance the export subsidy for the protected sector.

5. Conclusion

This paper is especially relevant to governments that are interested in curbing the influence of special interest groups vis-à-vis the trade-policy-making process. It exemplifies that—when the market structure is oligopolistic and firms compete à la Cournot competition—being more responsive to the voice of threshold sectors and less so to that of non-threshold sectors could be welfare-enhancing for a country. Threshold sectors are defined as sectors whose goods would be not be produced at all in the absence of a tariff; or whose goods would not be exported at all in the absence of an export subsidy. The above result stems from the fact that protection—that is, an export subsidy aimed at promoting domestic exports abroad; or a tariff aimed at promoting the sales of import-competing sectors domestically—has opposite welfare effects on the Home country when it is extended to threshold and non-threshold sectors. The latter simply allows goods which would be produced even in the absence of protection to be produced in larger amounts. When this is the case, welfare is transferred from domestic consumers to producers, and the gain in producer surplus is never large enough to compensate for the loss in consumer surplus. In contrast, the former expands the range of goods produced or exported by the Home country. Under such a situation, the gain in producer surplus could possibly overwhelm the loss in consumer surplus and tariff revenue—provided that the subsidy is not too large.

Appendix

A.1 Proof of Proposition 1.

The proof is as follows. First, taking the First Order Condition of G with respects to $\tau^{x,HF}(z)$, we find that $\widehat{\tau}^{x,HF}(z) = -\frac{(n-1)[a-\alpha(z)]}{2n} < 0$. We know that the policy is negative, because we can ascertain from

[12] The value which ξ must be larger than depends on the values assumed by the other parameters of the model.

Table 1 that in order for the total supply to the Home market $y^H = ny_i^H$ to be positive, $a > \alpha(z)$ must hold. This, coupled with the fact that $n > 1$ and the negative sign attached to the expression for the policy together imply that $\widehat{\tau}^{x,H}(z) = p_s^F - p_c^* < 0$. Second, taking the First Order Condition of G with respects to $\tau^{x,HF}(z)$, we find that $\widehat{\tau}^{x,HF}(z) = \frac{a-(1+n)\alpha(z)+n\alpha^*(z)}{2n(1+n)} > 0$. We can check that the sign of $\widehat{\tau}^{x,HF}$ is positive, by taking the following procedure. From Table 2, we know that the total supply of good $z \in [\widetilde{z}^*, \widetilde{z}^x)$ to the Foreign market by domestic suppliers is $y^F = ny_i^F = n\{\frac{a-(n+1)\alpha(z)+(n+1)\tau^{x,HF}(z)+n\alpha^*(z)}{b(1+2n)}\}$, where we have made use of the assumption of symmetry in the number of firms in Home and Foreign to write n^* as n. Replacing $\tau^{x,HF}(z)$ with $\widehat{\tau}^{x,HF}(z) = \frac{a-(1+n)\alpha(z)+n\alpha^*(z)}{2n(1+n)}$ gives us the total supply of the good to the Foreign market by domestic suppliers, under the First Best. This is: $\widehat{y}^F = \frac{1}{2b(1+2n)}(1+2n)[a - (n+1)\alpha(z) + n\alpha^*(z)]$. It is evident that in order for $\widehat{y}^F$ to be positive, $a - (n+1)\alpha(z) + n\alpha^*(z) > 0$ must hold. This ensures that the numerator of the expression for $\widehat{\tau}^{x,HF}(z)$ is positive. Third, taking the First Order Condition of G with respects to $\tau^{m,HF}(z)$ yields $\widehat{\tau}^{m,HF}(z) = \frac{a-\alpha^*(z)}{2+n} > 0$. We know that this must be positive, because from Table 3, we calculated the total supply of good $z \in [\widetilde{z}^x, \widetilde{z})$ to the Foreign market by Foreign firms to be equal to $y^{*F} = n^* y_i^{*F} = \frac{n^*[a-\alpha^*(z)]}{b(1+n^*)}$. Since this must be positive, $[a-\alpha^*(z)]$ in the numerator of the expression for $\widehat{\tau}^{m,HF}(z)$ must also be positive. Finally, taking the First Order Condition of G with respects to $\tau^{m,F}(z)$ yields $\widehat{\tau}^{m,F}(z) = \frac{a-\alpha^*(z)}{(2+n)} > 0$, which must be positive due to the same reasoning as above. Q.E.D.

A.2 Proof of Proposition 3.

The political equilibrium policy for an organized exporting sector under Regime H

First, let us compare the degree of protection granted to an organized exporting sector under Regime H, with the degree of protection that the sector would have received under the First Best. The difference between the political equilibrium policy $\overline{\tau}_O^{x,H}(z)$ and the First Best policy $\widehat{\tau}^{x,H}(z)$ is $\frac{(n+1)[a-\alpha(z)]}{2n(n\xi-1)}$. We know that this is strictly positive, because of the following reasons. First, the numerator must be strictly positive, since we know from Table 1 that in order for the total supply to the Home market $y^H = ny_i^H$ to be positive, $a > \alpha(z)$ must hold. Second, the denominator must be strictly positive, because in order for the Second Order necessary condition to be satisfied, $n\xi > 1$ must hold. This means that $\overline{\tau}_O^{x,H}(z) > \widehat{\tau}^{x,H}(z)$. Recall that in Proposition 1, we found the sign of $\widehat{\tau}^{x,H}(z)$ to be negative; and that in section 5.5, we found the sign of $\overline{\tau}_O^{x,H}(z)$ to be indeterminate. This implies that when the latter is positive, the lobbying of the sector serves to turn the policy from negative protection (i.e. an export tax) to positive protection (i.e. an export subsidy). Further, even if the latter were negative, we know for sure that it is less negative than the First Best policy, implying that through its lobbying, the sector manages to demand a smaller incidence of tax on its exports. Next, turning to the question of how $\overline{\tau}^{x,H}(z)$ changes with the productivity of a sector, let us differentiate the policy once with respects to its unit labor requirement. $\frac{\partial\overline{\tau}^{x,H}(z)}{\partial\alpha(z)} = -\frac{-2+(n-1)\xi}{2-2n\xi}$. Recalling that $\overline{\tau}^{x,H}(z)$ is positive when $\xi < \frac{2}{(n-1)}$ and negative when $\xi > \frac{2}{(n-1)}$, we find that for a positive incidence of $\overline{\tau}^{x,H}(z)$, $\frac{\partial\overline{\tau}^{x,H}(z)}{\partial\alpha(z)} < 0$; and that for a negative incidence of $\overline{\tau}^{x,H}(z)$, $\frac{\partial\overline{\tau}^{x,H}(z)}{\partial\alpha(z)} > 0$. This implies that positive protection is increasing in tandem with the sector's productivity level—since a lower unit labor requirement means a higher productivity level—; and negative protection is decreasing in tandem with the sector's productivity level. Finally, with regards to how the policy changes with the government's preference for social welfare, consider that $\frac{\partial\overline{\tau}^{x,H}(z)}{\partial\xi} = -\frac{-(1+n)[a-\alpha(z)]}{2(n\xi-1)^2}$ is strictly negative. This means that the more the government cares for social welfare, the less positive (or more negative) protection it will grant to the sector.

The political equilibrium policy for an organized exporting sector under Regime HF

It is straightforward to show that lobbying increases the degree of protection granted to an organized exporting sector under Regime HF, since $\overline{\tau}_O^{x,HF}(z) - \widehat{\tau}^{x,HF}(z) = \frac{(1+2n)[a-(n+1)\alpha(z)+n\alpha^*(z)]}{2n[-1+n(\xi-1)]}$ is strictly positive, as the numerator must be positive in order for domestic supply under Free Trade and Regime HF to be positive, and the denominator must be positive since the Second Order necessary condition requires that $\xi > \frac{1+n}{n}$. Further, by the fact that $\xi > \frac{1+n}{n}$, we know that $\frac{\partial\overline{\tau}_O^{x,HF}(z)}{\partial\alpha(z)} = \frac{2+2n+\xi}{2+2n-2n\xi} < 0$, implying that the level of protection is increasing in tandem with the sector's productivity. Finally, we find that $\frac{\partial\overline{\tau}_O^{x,HF}(z)}{\partial\xi} = -\frac{[a-(n+1)\alpha(z)+n\alpha^*(z)]}{2(1+n-n\xi)} < 0$, implying that the level of protection is decreasing in the government's preference for national welfare.

The political equilibrium policy for an organized import-competing sector under Regime HF

We know that $\overline{\tau}_O^{m,HF}(z) - \widehat{\tau}^{m,HF}(z) = \frac{2n(n+1)[2a-(2+n)\alpha(z)+n\alpha^*(z)]}{(2+n)[2n^2(-1+\xi)+2\xi+5n\xi]}$ is strictly positive, because from Table 3, the total output of the sector (that is, ny_i^H,) is $\frac{n(n+1)[2a-(2+n)\alpha(z)+n\alpha^*(z)]}{b(2+n)(1+2n)}$. Since this must be positive, the term $[2a-(2+n)\alpha(z)+n\alpha^*(z)]$ in the numerator of $\frac{2n(n+1)[2a-(2+n)\alpha(z)+n\alpha^*(z)]}{(2+n)[2n^2(-1+\xi)+2\xi+5n\xi]}$ must be positive. We also know that the denominator $(2+n)[2n^2(-1+\xi)+2\xi+5n\xi]$ is positive, because the Second Order necessary condition requires that $\xi > \frac{2n^2}{2(n+1)^2+n}$. Next, $\frac{\partial\overline{\tau}_O^{m,HF}(z)}{\partial\alpha(z)} = -\frac{2n(1+n)}{2n^2(-1+\xi)+2\xi+5n\xi}$ is strictly negative, since $[2n^2(-1+\xi)+2\xi+5n\xi]$ in the denominator is positive. This means that the level of protection is increasing in tandem with the sector's productivity. Finally, $\frac{\partial\overline{\tau}_O^{m,HF}(z)}{\partial\xi} = -\frac{2n(1+n)(1+2n)[2a-(2+n)\alpha(z)+n\alpha^*(z)]}{[2n^2(-1+\xi)+2\xi+5n\xi]^2}$ is strictly negative, implying that the level of protection is decreasing in the government's preference for national welfare. Q.E.D.

A.3 Proof of Proposition 4.

In order to see that Proposition 4 is true, let us express the threshold levels of productivity for producing and exporting as functions of the government's trade policy. First, it is important to note that conducting the following analysis in terms of arbitrary domestic and Foreign productivity levels will not yield informative results, since what matters to the analysis is whether moving from the First Best to the political equilibrium changes the ratio of α/α^* which manages to break even in the domestic import-competing and exporting markets.[13] In what follows, we shall define a "threshold sector" as a sector that just manages to make zero profits (in either the domestic import-competing market or Foreign market). Since the level of productivity of a threshold sector's Foreign competitors does not change

[13] Recall that by assumption, α/α^* is increasing in z.

under the incidence of protection granted to the sector, it is helpful to normalize the Foreign level of productivity in the threshold sector so that we can focus on how the level of α that manages to break even changes under the two different levels of protection, while keeping the levels of α^* which each and every domestic sector competes against unchanged. With reference to Table 3, we can write the total output of the threshold import-competing sector ($z \in [\widetilde{z}^x, \widetilde{z})$) as $ny_i^H = \frac{an-n^2\alpha/\alpha^* - n\alpha/\alpha^* + n^2 + n^2\tau^{m,HF}}{(1+2n)}$, where we have normalized α^* to 1. The threshold *relative* level of productivity for domestic production is the level of α/α^* which sets ny_i^H to zero. This is $(\alpha/\alpha*)^{threshold,production} = \frac{a+n+n\tau^{m,HF}}{1+n}$. Considering the case where the threshold sector is politically organized, it is clear that $(\alpha/\alpha^*)^{threshold,production}$ is higher under the political equilibrium than under the First Best, because in Proposition 3 we proved that $\overline{\tau}_O^{m,HF} > \widehat{\tau}^{m,HF}$. Similarly, (with reference to Table 2), the volume of exports of the threshold exporting sector can be written as $-M = \frac{n[a-\alpha/\alpha^* + \tau^{x,HF}] + n^2[1+\tau^{x,HF} - \alpha/\alpha^*]}{b(1+2n)}$, where we have again normalized the threshold sector's α^* to 1. The threshold *relative* level of productivity, $(\alpha/\alpha^*)^{threshold,exporting}$ sets $-M$ to zero. This is equal to $\frac{a+n+(1+n)\tau^{x,HF}}{1+n}$. By Proposition 3, we know that $\overline{\tau}_O^{x,HF} > \widehat{\tau}^{x,HF}$, and this implies that $(\alpha/\alpha^*)^{threshold,exporting}$ is higher under the political equilibrium than under the First Best. Q.E.D.

A.4 Proof of Proposition 5.

Recalling that Home's national welfare is defined as the sum of total national income and consumer surplus, we can compute the effect on national welfare of moving a sector away from the First Best to the political equilibrium. We shall carry out the analysis for the case of a threshold import-competing sector; a non-threshold import-competing sector; a threshold exporting sector; and a non-threshold exporting sector. A threshold import-competing sector is a sector which would belong to $z \in [\widetilde{z}, 1]$ under the First Best, but which manages to enter Regime HF as an import-competing sector ($z \in [\widetilde{z}^x, \widetilde{z})$) under the political equilibrium. On the other hand, a threshold exporting sector is a sector which would belong to $z \in [\widetilde{z}^x, \widetilde{z})$ under the First Best, but which manages to enter the range $z \in [\widetilde{z}^*, \widetilde{z}^x)$ under the political equilibrium. Non-threshold sectors are those which remain import-competing ($z \in [\widetilde{z}^x, \widetilde{z})$) or exporting ($z \in [\widetilde{z}^*, \widetilde{z}^x)$) throughout. For ease of notation, we shall drop all sectoral subscripts in what follows. Instead, we will add a superscipt to all endogenous variables, which indicates the export status and trade regime which the variable belongs to. For example, $x^{m,HF}$ will refer to the demand for an import-competing good under Regime HF.

<u>Impact of lobbying of a threshold import-competing sector</u>

The lobbying of a threshold import-competing sector, which moves the sector from Regime F to Regime HF, has the following effect on consumer surplus.

$$\begin{aligned}\triangle CS =& \{u[x^{m,HF}] - p^{m,HF}x^{m,HF}\} - \{u[x^{m,F}] - p^{m,F}x^{m,F}\}\\ =& \{a[(\frac{1}{b})(a-p^{m,HF})] - \frac{b}{2}[(\frac{1}{b})(a-p^{m,HF})]^2 - [p^{m,HF}[(\frac{1}{b})(a-p^{m,HF})]\} -\end{aligned}$$

$$\{a[(\frac{1}{b})(a-p^{m,F})]-\frac{b}{2}[(\frac{1}{b})(a-p^{m,F})]^2-[p^{m,F}[(\frac{1}{b})(a-p^{m,F})]\},$$

where we can find the relevant expressions for $p^{m,HF}$ and $p^{m,F}$ from Tables 3 and 4, respectively. Plugging $\overline{\tau}_O^{m,HF} = \frac{2n[a-(n+1)\alpha(z)+n\alpha^*(z)]+[(1+2n)(a-\alpha^*(z))]\xi}{2n^2(\xi-1)+2\xi+5n\xi}$ into the expression for $p^{m,HF}$, and $\widehat{\tau}^{m,F} = \frac{a-\alpha^*(z)}{(2+n)}$ into the expression for $p^{m,F}$ yields

$$\begin{aligned}\triangle CS =& \frac{1}{2b(2+n)^2[2n^2(\xi-1)+2\xi+5n\xi]^2}\\ &\{n^2[2a-(2+n)\alpha+n\alpha^*][n(\xi-2)+2\xi][2n(-2a(1+n)+(2+n)\alpha+n\alpha^*]\}+\\ &\{(2+n)[4a(1+n)-2(\alpha+\alpha^*)-n(\alpha+3\alpha^*)]\}\end{aligned}$$

The change in sectoral profits ($\triangle\Pi$) is simply equal to $\Pi^{m,HF}$, since the threshold sector would have been earning zero profits under the First Best. Finally, the change in government revenue from the policy is

$$\begin{aligned}\triangle(\tau\times M) =& \overline{\tau}_O^{m,HF}\{\frac{an-n\alpha^*-n\overline{\tau}_O^{m,HF}+n^2\alpha-n^2\alpha^*-n^2\overline{\tau}_O^{m,HF}}{b(1+2n)}\}-\\ &\widehat{\tau}^{m,F}\{\frac{an-n\widehat{\tau}^{m,F}-n\alpha^*}{b(1+n)}\}\end{aligned}$$

Hence, the total impact of the lobbying of a threshold import-competing sector on national welfare is

$$\begin{aligned}\triangle CS+\triangle\Pi+\triangle(\tau\times M) =& \frac{1}{2b(2+n)^2[2n^2(\xi-1)+2\xi+5n\xi]^2}\\ &\{n^2\{2n[2a-(2+n)\alpha+n\alpha^*]+(2+n)[-2a+(2+n)\alpha-n\alpha^*]\xi\}\\ &\{-2n[(2+n)\alpha+n\alpha^*]+(2+n)[(2+n)\alpha+2\alpha^*+3n\alpha^*]\xi-\\ &4a(1+n)[n(\xi-1)+2\xi]\}\}\end{aligned}$$

We know that the following restrictions must hold.

1. $a>\alpha$ and $a>\alpha^*$. (Please refer to section 3.1).
2. $a,b>0$.
3. $n\geq 2$. (This is because the number of firms in each sector has to be at least equal to 2, in order for the market structure to be oligopolistic).
4. $\xi>\frac{2n^2}{2(n+1)^2+n}$, $\xi>\frac{1+n}{n}$, and $\xi>\frac{2}{n-1}$. (These are the necessary Second Order Conditions from the government's optimization problem).

By plugging in values for the model's parameters that satisfy the above restrictions, and ensuring that $\alpha>\alpha^*$, it is clear that $\triangle CS+\triangle\Pi+\triangle(\tau\times M)$ is positive. Hence, the lobbying of a threshold producing sector serves to enhance national welfare.

<u>Impact of lobbying of a non-threshold import-competing sector</u>

The lobbying of a non-threshold sector within $z\in[\widetilde{z}^x,\widetilde{z})$ has the following effect on national welfare:

$$\triangle CS+\triangle\Pi+\triangle(\tau\times M) = \frac{-2n^3(1+n)^2[2a-(2+n)\alpha+n\alpha^*]^2}{b(2+n)(1+2n)[2n^2(\xi-1)+2\xi+5n\xi]^2},$$

where it is easy to check that the above expression is strictly negative, by plugging in values for the model's parameters that satisfy the restrictions, and ensuring that $\alpha > \alpha^*$.

Impact of lobbying of a threshold exporting sector

The lobbying of a threshold exporting sector has the following effect on consumer surplus:

$$\begin{aligned}\triangle CS =& \{u[x^{x,HF}] - p^{x,HF}x^{x,HF}\} - \{u[x^{m,HF}] - p^{m,HF}x^{m,HF}\}\\ =& -\frac{1}{2b(1+n)^2(2+n)^2(1+2n)^2}\\ & \{n^2[a+n(2+n)\alpha-(1+n)^2\alpha^*][a(5+2n(5+2n))-\\ & [(2+n)(2+3n)\alpha-(1+n)^2\alpha^*]\},\end{aligned}$$

the following effect on sectoral profits:

$$\begin{aligned}\triangle\Pi =& \{p^{x,HF}-\alpha\}y^{x,HF} - \{p^{m,HF}-\alpha\}y^{m,HF}\\ =& \frac{n}{9b}\{(a-\alpha)^2 - \frac{9(1+n)^2[2a-(2+n)\alpha+n\alpha^*]^2}{(2+5n+2n^2)^2}+\\ & \frac{9[a-(1+n)\alpha+n\alpha^*]^2\xi^2}{4(1+n-n\xi)^2}\},\end{aligned}$$

and the following effect on government revenue from the policy:

$$\begin{aligned}\triangle(\tau\times M) =& \frac{1}{2(b+2bn)}\{\frac{2n[a-\alpha^*][-a-n(2+n)(\alpha-\alpha^*)+\alpha^*]}{(2+n)^2}-\\ & \frac{n(1+2n)[a-(1+n)\alpha+n\alpha^*]^2\xi[2+2n+\xi]}{2(1+n)(1+n-n\xi)^2}.\end{aligned}$$

The total effect, which is the sum of the above, can be positive, provided that ξ is large enough. For example, setting $a = 50, \alpha = 10, \alpha^* = 9$ and $n = 5$, we find that the total effect is positive, if and only if $\xi \geq \frac{8}{5}$. This is slightly larger than the minimum value of ξ which is required by the second order necessary conditions (but not unrealistically high).

Impact of lobbying of a non-threshold exporting sector

The lobbying of a threshold exporting sector has no effect on consumer surplus, but it changes the level of sectoral profits and the amount of government revenue. The total effect on welfare is:

$$\triangle\Pi + \triangle(\tau\times M) = \frac{-(1+n)[a-(1+n)\alpha+n\alpha^*]^2}{4b(1+n-n\xi)^2}$$

It is easy to check that this is strictly negative, by plugging in values for the model's parameters that satisfy the restrictions, and ensuring that $\alpha < \alpha^*$. Q.E.D.

Tables and Figures

Figure 1. Home and Foreign's technological distributions

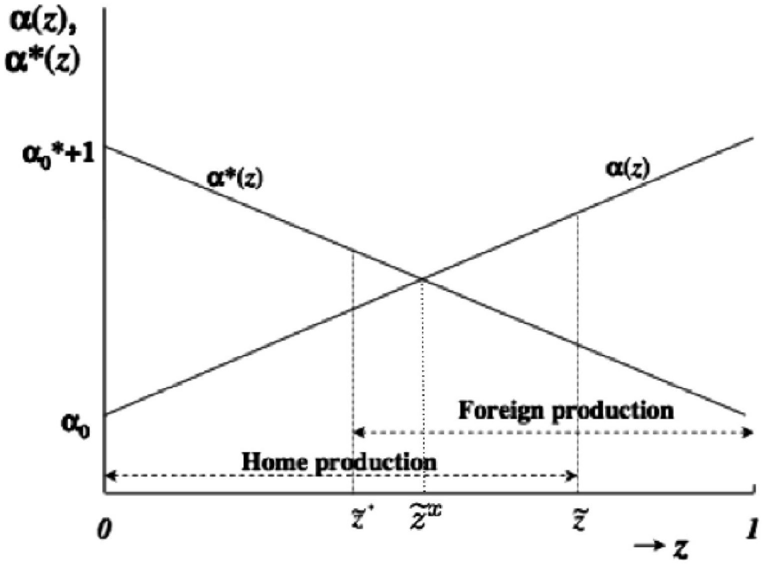

Table 1. Protectionist-trade-policy equilibrium in an exporting sector under regime H, with the imposition of an export subsidy

Regime	H$[n > 0, n^* = 0]$
Range of sectors	$z \in [0, \widetilde{z}^*)$
ny_i^H	$\frac{n(a-\alpha(z))}{b(1+n)}$
ny_i^F	$\frac{n(a+\tau^x-\alpha(z))}{b(1+n)}$
$n^* y_i^{*H}$	0
$n^* y_i^{*F}$	0
x^H	$\frac{n(a-\alpha(z))}{b(1+n)}$
x^F	$\frac{n(a+\tau^x-\alpha(z))}{b(1+n)}$
p_s^F	$\frac{a+n\alpha(z)+\tau^x}{(1+n)}$
p_c^*	$\frac{a-n\tau^x+n\alpha(z)}{(1+n)}$
$p_s^H = p_c$	$\frac{a+n\alpha(z)}{(1+n)}$
M	$-\frac{n[a+\tau^x-\alpha(z)]}{b(1+n)}$
M^*	$\frac{n[a+\tau^x-\alpha(z)]}{b(1+n)}$

y_i denotes the amount supplied by one domestic firm and y_i^* the amount supplied by one foreign firm. It follows that x is the aggregate sectoral demand; y is the aggregate sectoral supply; ny_i^H is the total quantity of good z supplied by domestic producers to the Home market; ny_i^F is the total quantity supplied by domestic producers to the Foreign market; $n^* y_i^{*H}$ is the total quantity supplied by Foreign producers to the Home market; $n^* y_i^{*F}$ is the total quantity supplied by Foreign producers to the Foreign market; x^H is Home's aggregate demand for the good; x^F is Foreign's aggregate demand; p_s^F is the price received by domestic producers from their exports to Foreign; p_c^* is the price paid for the good by Foreign consumers; p_s^H is the price received by domestic producers from their sales to Home; p_c is the price paid for the good by Home consumers; and M and M^* are Home and Foreign's aggregate import volumes respectively.

Table 2. Protectionist-trade-policy equilibrium in an exporting sector under regime HF, with the imposition of an export subsidy

Regime	$\mathrm{HF}[n>0, n^*>0]$
Range of sectors	$z \in [\widetilde{z}^*, \widetilde{z}^x)$
ny_i^H	$\frac{n[a-\alpha(z)]}{b(1+n)}$
ny_i^F	$n\{\frac{a-(n^*+1)\alpha(z)+(n^*+1)\tau^x+n^*\alpha^*(z)}{b(1+n+n^*)}\}$
n^*y^{*H}	0
n^*y^{*F}	$n^*\{\frac{a-(n+1)\alpha^*(z)+n\alpha(z)-n\tau^x}{b(1+n+n^*)}\}$
x^H	$\frac{n(a-\alpha(z))}{b(1+n)}$
x^F	$\frac{a(n+n^*)+n\tau^x-[n\alpha(z)+n^*\alpha^*(z)]}{b(1+n+n^*)}$
p_s^F	$\frac{a+n\alpha(z)+n^*\alpha^*(z)+\tau^x+n^*\tau^x}{(1+n+n^*)}$
p_s^{*F}	$\frac{a-n\tau^x+n\alpha(z)+n^*\alpha^*(z)}{(1+n+n^*)}$
p_s^H	$\frac{a+n\alpha(z)}{(1+n)}$
p_c	$\frac{a+n\alpha(z)}{(1+n)}$
p_c^*	$\frac{a-n\tau^x+n\alpha(z)+n^*\alpha^*(z)}{(1+n+n^*)}$
M	$-n\{\frac{a-(n^*+1)\alpha(z)+(n^*+1)\tau^x+n^*\alpha^*(z)}{b(1+n+n^*)}\}$
M^*	$n\{\frac{a-(n^*+1)\alpha(z)+(n^*+1)\tau^x+n^*\alpha^*(z)}{b(1+n+n^*)}\}$

Table 3. Protectionist-trade-policy equilibrium in an import-competing sector under regime HF, with the imposition of an import tariff

Regime	HF$[n>0, n^*>0]$
Range of sectors	$z \in \widetilde{z}^x, \widetilde{z})$
ny_i^H	$\frac{an-nn^*\alpha(z)-n\alpha(z)+nn^*\alpha^*(z)+nn^*\tau^m}{b(1+n+n^*)}$
ny_i^F	0
$n^*y_i^{*H}$	$\frac{an^*-nn^*\alpha^*(z)-n^*\alpha^*(z)-nn^*\tau^m-n^*\tau^m+nn^*\alpha(z)}{b(1+n+n^*)}$
$n^*y_i^{*F}$	$\frac{n^*(a-\alpha^*(z))}{b(1+n^*)}$
x^H	$\frac{a(n+n^*)-n\alpha(z)-n^*\alpha^*(z)-n^*\tau^m}{b(1+n+n^*)}$
x^F	$\frac{n^*(a-\alpha^*(z))}{b(1+n^*)}$
p_s^H	$\frac{a+n\alpha(z)+n^*\tau^m+n^*\alpha^*(z)}{(1+n+n^*)}$
p_s^{*H}	$\frac{a+n\alpha(z)+n^*\alpha^*(z)-\tau^m-n\tau^m}{(1+n+n^*)}$
p_s^{*F}	$\frac{a+n^*\alpha^*(z)}{(1+n^*)}$
p_c	$\frac{a+n\alpha(z)+n^*\tau^m+n^*\alpha^*(z)}{(1+n+n^*)}$
p_c^*	$\frac{a+n^*\alpha^*(z)}{(1+n^*)}$
M	$\frac{n^*(a-\alpha^*(z)-\tau^m)+nn^*(\alpha(z)-\alpha^*(z)-\tau^m)}{b(1+n+n^*)}$
M^*	$-\frac{n^*(a-\alpha^*(z)-\tau^m)+nn^*(\alpha(z)-\alpha^*(z)-\tau^m)}{b(1+n+n^*)}$

Table 4. Protectionist-trade-policy equilibrium in an import-reliant sector under regime F, with the imposition of an import tariff

Regime	F$[n=0, n^*>0]$
Range of sectors	$z \in [\widetilde{z}, 1]$
ny_i^H	0
$n^*y_i^{*H}$	$\frac{n^*(a-\tau^m-\alpha^*(z))}{b(1+n^*)}$
x^H	$\frac{n^*(a-\tau^m-\alpha^*(z))}{b(1+n^*)}$
p_c	$\frac{a+n^*\tau^m+n^*\alpha^*(z)}{(1+n^*)}$
p_s^{*H}	$\frac{a+n^*\alpha^*(z)-\tau^m}{(1+n^*)}$
M	$\frac{n^*(a-\tau^m-\alpha^*(z))}{b(1+n^*)}$
M^*	$-\frac{n^*(a-\tau^m-\alpha^*(z))}{b(1+n^*)}$

Table 5. Effect of granting the political equilibrium policy instead of the First Best policy to threshold and non-threshold sectors

Net effect on:	Sectoral profits	Tariff revenue	Consumer surplus	National Welfare
Threshold import-competing sector	> 0	> 0	> 0	> 0
Non-threshold import-competing sector	> 0	> 0	< 0	< 0
Threshold exporting sector	> 0	< 0	< 0	> 0 (for sufficiently large ξ)
Non-threshold exporting sector	> 0	< 0	0	< 0

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