The Political Economy of Protectionism and Industrial Policy*

Hadi Salehi Esfahani  
University of Illinois at Urbana-Champaign  

Munir Mahmud  
Pennsylvania State University, Hazleton  

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Abstract

This paper develops a model of joint determination of trade and industrial policy where the politicians in charge of the government can direct the rents generated by their policies toward their political or economic objectives through different channels. We show that taking account of the value of all rents that can be controlled by the politicians, including tariffs and non-tariff barrier premia, and endogenizing specific asset formation can help explain a host of empirical regularities while offering new hypotheses to be tested. Under reasonable conditions, these features induce a positive relationship between the restrictiveness of policies toward domestic and foreign competition that help shed light on puzzles such as the positive association of protection with import penetration and output-capital ratio. The model also offers a guide for empirical research on the role of factors that shape the effectiveness of lobbying and other rent appropriation mechanisms in policy-making.

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Please address all correspondence concerning this paper to:

Hadi Salehi Esfahani  
Department of Economics  
University of Illinois  
Urbana, IL 61801, USA  
Phone: (217) 333-2681; Fax (217) 333-1398; E-mail: Esfahani@uiuc.edu

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1. Introduction

Political economy models of trade policy typically focus on the role of lobbying by politically-organized interest groups that seek to increase the returns to their specific factors. In these models, the government responds to lobbying because interest groups spend part of their rents in ways that further the private objectives of the politicians in charge of policy making.¹ In this sense, lobbying shapes policy because politicians share in the interest group rents. But, to the extent that benefiting from rents drives policy, politicians have access to other channels of extracting the rents generated by their policies that should affect their actions as well. For example, politicians can control and redistribute the rents of protected industries through taxation and regulatory policies. They can also allocate trade taxes and quota premia to further their goals.

There are a number of reasons why it is important to analyze alternate means of rent extraction jointly with the role of lobbying. To begin with, some of the implications of the lobbying models do not conform to empirical regularities. For example, import penetration has been repeatedly found to be positively related to the rate of protection, while political economy models generally predict the opposite (Helpman, 1995; Rodrik, 1995). On the other hand, the existing models do not offer any explanation for the negative relationship between protection and capital intensity found empirically across industries and countries. Nor do the models provide an explanation for the prevalence of protection for import competing industries and rareness of subsidies for exports (Rodrik, 1995). Moreover, there is a great deal of variation in lobbying activity across industries that remains unexplained. Finally, focusing only on lobbying gives rise to the implausibly high estimates of the value of campaign contributions vis-à-vis aggregate welfare for the politicians (Gawande and Bandyopadhyay, 1997).

The presence of multiple conduits of rent extraction and joint determination of policies offers a perspective that can resolve many of these puzzles. Treating tax revenues and regulatory redistributions as resources that can be directed by the politicians to further their goals allows one to see that political contributions may be a small part of the politicians' benefits from policy-induced rents. If tariff proceeds and non-tariff barrier (NTB) premia are viewed in the same light, one can further see that although import penetration reduces the domestic industry's rents, it may do the exact opposite for the total market rents that the politicians can control because it reduces the deadweight losses of domestic production. As a result, rather than discouraging a higher tariff, increased import penetration can end up being positively

¹ For surveys of the literature on the political economy of trade policy, see Hillman (1989), Magee (1994), and Rodrik (1995).
associated with protection. The opportunity cost of tariffs and NTB premia also explains the bias against subsidization of trade. Furthermore, industrial policy can become a means of restricting investment to diminish the supply-side deadweight losses induced by trade barriers. This effect in turn induces a more intensive utilization of capacity as barriers rise and generates an inverse relationship between capital intensity and protection. Finally, differences in the effectiveness of alternative rent extraction channels across industries and institutional settings can be an important determinant of the role of lobbying in rent extraction. Naturally, politicians may ignore an industry's lobby if they can control rents in that industry more effectively through other channels.

In this paper, we demonstrate the above effects and derive further results by developing a model where the policymakers choose trade and industrial policies jointly to benefit from market rents via all possible conduits. In particular, unlike most other models of trade policy, we consider tariff proceeds and NTB premia (due to quotas, voluntary export restraints, anti-dumping opportunities and injury payments, etc.) as sources of rent that the politicians do not ignore. We show that this assumption plays a key role in generating results that conform to a broad range of stylized facts. This factor has been underplayed in the political economy literature because in more developed countries, trade taxes are a small part of the government budget. However, in many cases, NTBs have replaced tariffs and the premia that they induce are much larger than the budgetary tariff proceeds. Certainly, the total of tariffs and other trade restriction premia by far exceeds the trade-policy-related political contributions that have attracted so much attention in the literature.

To make the choice of industrial policy meaningful, we endogenize the formation of industry-specific assets. This is a departure from the common practice in the literature on the political economy of trade policy, where industry-specific assets are assumed to be fixed and the goal of industry lobbies is to increase the rents accrued to those assets. That setting is not very plausible because it is not clear what factors prevent entry and investment in the specific assets. More disquieting is that fact that relaxing the fixed asset assumption weakens those models because build up of specific assets erodes rents generated by protectionist policies and, thus, eliminates the incentive to lobby for protection. In this sense, the existing models mostly apply to the case of declining industries. But, trade restrictions are more broadly applied. Indeed, in most of the developing world, protection has mainly been initiated for "infant" and growing industries, rather than for declining ones. Incorporation of industrial policy in the model introduces a mechanism that can maintain rents despite endogenous specific asset formation. This is
another key feature of our model that helps generate realistic implications. It also offers new insights about interactions among trade and industrial policies. For example, the model allows one to examine how trade policy responds to variations in rules and constraints that structure regulatory policies. Conversely, one can explore how a foreign trade agreement that constrains protectionism affects domestic industrial policies. As we show below, such exercises yield a correlation between trade liberalization and domestic market deregulation, which is a common observation among reforming countries.

We are not the first to recognize the role of endogenous industry size in trade policy (see, for example, Hillman, 1989; Brainard and Verdier, 1994). However, endogenizing asset formation in conjunction with regulatory and trade policies that generate, sustain, and allocate rents is new. Brainard and Verdier (1994) consider endogenous adjustment in industry assets in a lobbying model à la Grossman and Helpman (1994), but they focus on trade policy and ignore the role of regulatory policies in that adjustment.

An interesting outcome of the exercises we conduct in this paper is that although the politicians may be using different mechanisms to benefit from industry rents, many characteristics of the equilibrium transcend the specific mechanisms that prevail. For example, the relationship of trade policy with import penetration is structurally the same whether politicians end up controlling rents through lobbying or through industrial policy. Of course, the parameters that represent the effectiveness of rent transfer through various channels play a mediating role, which is specified in the equilibrium relationships derived from the model. This latter feature can serve as a guide for empirical research on the role of lobbying and other rent extraction mechanisms in policy-making.

In the tradition of the political economy literature, we interpret the premia that the politicians attach to tax and tariff revenues as the value of being able to redistribute rents toward their political goals. However, nothing fundamental changes in the model if those goals are interpreted as effecting public good and the premium as the cost of raising public funds. The two interpretation may be distinguishable based on the size of the premium and the use of the funds. But, the relationships that they induce between industry characteristics and government policies are structurally similar. This may help

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2 A further benefit of endogenizing entry is that it allows one to model lobbies more realistically as organizations representing industries rather than fixed factors, as commonly assumed in the literature.
explain the persistence of policies despite changes in the political objectives and the players in cases such
as the sugar industry in the US (Krueger, 1990).

We begin our analysis in the next section by developing a basic model of trade and industrial
policy that focuses on the distinction between industry profits on the one hand and tariffs and quota
premia on the other hand as sources of rents. The basic model treats all rents from all sources uniformly
and does not explicitly deal with lobbying. This simplifies the analysis and focuses attention on the
fundamental effects. The model is further simplified by casting it in a partial equilibrium framework.
Extensions to a general equilibrium framework should not change the main results. In section 3, we
examine the consequence of having pre-existing firms in the industry, which is ruled out in the basic
model. The analysis in this section offers insights about differences between rising and declining
industries. In section 4, we deal with complications that arise when politicians find it easier to extract
some rents than others and attach different premia to them. We show that the results of section 2 survive
under a reasonable assumption. Further complications concerning lobby activity and endogeneity of
premia assigned to rent transfers are dealt with in the Appendix to keep the body of the paper short and
focused. Section 5 concludes the paper.

2. A Basic Model of Trade and Industrial Policy

2.1. The Setting

Our analysis of trade and industrial policies is based on a one-period model in which the
politicians in charge of the government use various policy instruments to influence the resource and rent
allocation in an industry that produces a tradable product. The industry faces a given world price, $p_w$, for
the product. The domestic price of the product, $p$, may differ from $p_w$ due to government intervention in
foreign trade. Specifically, if $t$ is the subsidy- or tariff-equivalent of the intervention, $p = p_w + t$. If the
country is an importer of the product, $t$ will be a tariff or a quota premium charged on imports, and if the
country is an exporter of the product, $t$ will be a subsidy paid by the government on exports. A negative
value of $t$ represents an import subsidy or an export tax. In either case, $t/p_w$ is the industry's rate of
protection, which measures the government's trade policy for the industry. We will refer to $t$ as a "tariff,"
although it may be a tax, a subsidy, a quota premium, an anti-dumping "injury payment," or a bribe or
political contribution paid by traders to the politicians in charge of the government. To keep things as
simple as possible, we abstract from the choice between various forms of transfer between the traders and
the government and assume that all tariff dollars have the same composition. This composition, of course, may vary according to the characteristics of the industry or country, but we do not model such effects here.

In addition to intervening in trade, the government follows industrial policies (through regulatory and tax or subsidy interventions) that may impose a cost on (or offer a benefit to) each firm in the industry. We denote such costs or benefits by $c$, where $c < 0$ when the firms receive a benefit and $c > 0$ when they firms incur a cost. We will refer to $c$ as "tax," although it represents the net effect of all regulatory rent redistribution, implicit or explicit taxes or subsidies, and other rent transfers such as political contributions and bribes. We do not explicitly model lobbying activity here and assume that lobby payments are part of "taxes" paid by the industry. In the Appendix, we develop an explicit model of lobbying and show that the outcome is analytically similar to what we find under our simplifying assumption. As in the case of tariffs, we let the composition of all tax dollars extracted from the industry to be the same.

Production in the industry is carried out by identical firms that employ two factors: a specific one and a general one. The specific factor comprises of all forms of (physical and human) capital that are productive only in the industry under consideration. The general factor consists of mobile forms of labor and other inputs that can be productive outside the industry. The distinction between general and specific factors is made to highlight the role of entry into the industry and contrast the situations with different entry possibilities. For simplicity, we assume that each firm entering the industry requires one unit of the specific factor and that the unit of the specific factor is sufficiently small so that we can practically treat the number of firms (or industry size), $N \geq 0$, as a continuous variable. Also, each firm takes the prices of the output and the two factors as given. There is an unlimited supply of potential entrants and their reservation profit is normalized to zero. If the unit cost of investing in the specific factor is $s > 0$ and $\pi$ is the profits of a firm operating in the market, new firms continue to enter as long as:

\begin{equation}
\pi - s - c \geq 0.
\end{equation}

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Maggi and Rodrígues-Clare (1997) consider the choice between quotas and tariffs. The result is that the government either collects tariffs or imposes quotas, depending on which offers a higher premium to the politicians. We take that type of optimization as given.
We assume \( s \) is a fixed parameter. Allowing \( s \) to be variable with reasonable characteristics does not affect the results qualitatively. We return to this issue in the last section of the paper. Also, to simplify the analysis in this section, we assume that initially there are no established firms in the industry.

Let \( \hat{x}(\ell) \) denote the production function of a typical firm, where \( \ell \) is the amount of general factor employed in the firm. We assume that \( \hat{x}(\ell) \) is concave—\( \hat{x}' > 0 \) and \( \hat{x}'' < 0 \)—and that it satisfies the Inada conditions: \( \hat{x}(\ell) \rightarrow 0 \) and \( \hat{x}'(\ell) \rightarrow \infty \) as \( \ell \rightarrow 0 \) and \( \hat{x}(\ell) \rightarrow \infty \) and \( \hat{x}'(\ell) \rightarrow 0 \) as \( \ell \rightarrow \infty \). If \( w \) is the price of the general factor, the profit function of the firm can be written as \( \pi = p\hat{x}(\ell) - w\ell \). Given \( p \) and \( w \), this function has a unique maximum at \( \ell^* \), where \( \hat{x}'(\ell^*) = w/p \). For ease of analysis, we assume \( \hat{x}(\ell) = A\ell^\alpha \), where \( 0<\alpha<1 \) and \( A > 0 \) is a productivity factor. In that case, the supply function can be written as \( x(p/w) = A^{1/(1-\alpha)}(p/w)^{\alpha/(1-\alpha)} \), with a constant price elasticity, \( \alpha/(1-\alpha) \). The maximum profit becomes

\[
(2.2) \quad \pi(p,w) = (1-\alpha)p\pi(p/w).
\]

The industry as a whole is subject to diminishing returns that erode rents and ultimately constrain production. To model this effect, we assume that the price of the general factor rises for all firms as the total demand for that factor increases. That is, \( w = w(N\ell) \), where \( w(.) \) represents the marginal cost of the general factor and \( w' > 0 \) and \( w'' \geq 0 \). To keep the calculations simple, we let \( w(N\ell) = \omega(N\ell)^\gamma \), where \( \omega \) is a positive parameter and \( \gamma > 0 \) represents the elasticity of the general factor cost with respect to the quantity demanded. Diminishing returns and rent erosion may have other sources as well; e.g., a negative production externality effect or a decline in output price as a result of a supply increase (in a differentiated product situation). The consequences of these effects are quite similar to that of the factor price increase and, to keep the paper manageable, we do not focus on them.

The domestic demand for the product, \( D(p) \), is unbounded at \( p = 0 \), remains bounded and continuously declines with \( p \) in the range \((0, t_0 + p_w)\), and equals zero for all \( p \geq t_0 + p_w \). The difference between the domestic demand and the total domestic supply is imports, \( M = D - Nx \) (exports if \( M < 0 \)). The surpluses of consumers and the general factor suppliers together with tariff and tax revenues and after-tax industry profits (net of investment costs) comprise the aggregate social welfare:

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4 When the domestic product is differentiated from the foreign one, entry of new firms lowers the domestic price and benefits the consumers at a diminishing rate at the expense of incumbent firms.

6
The first two terms on the right hand side of (2.3) are the surpluses of the general factor suppliers and the consumers. The third and fourth terms are the government’s revenues, and the last term is the after-tax profits of firms net of entry costs.

The politicians are partly interested in aggregate social welfare because it brings them broad political support. However, rent transfers effected through their policies are more valuable to them because any resource that comes under their control can be directed toward more specific goals that offer them additional political or economic benefits. The benefits of personal transfers and political contributions are obvious. Tax and tariff revenues augment budgetary resources that can be allocated to further the interests of the politicians or can substitute for other taxes that are more costly to collect (due to collection costs or induced distortions). In the case of regulations and NTBs, politicians may find the redistribution of rents (e.g., quota premia) a useful tool for political or economic gain. Therefore, if we normalize the politicians’ utility unit to one dollar of aggregate welfare, their valuation of one dollar of rent transfer through policy, \( \theta \), should exceed 1. This means that the politicians place a premium, \( \theta - 1 > 0 \), on rent transfers, which adds up to \( (\theta-1)cN \) for taxes and to \( (\theta-1)tM \) for tariffs. These values are, of course, negative when the government pays out subsidies, \( cN < 0 \) and \( tM < 0 \). As a first-order approximation, we assume that \( \theta \) is constant. We are also assuming that the premia on taxes and tariffs are the same in order to establish a benchmark that highlights the main features of the model more vividly. We will relax this assumption in section 4 and examine the consequences.

After adding the premia on rent transfers, the government’s objective function can be written as

\[
G = \int_0^{\pi} \left[ w(tN) - w(h) \right] dh + \int_p^{\infty} D(u)du + \theta tM + \theta cN + N(\pi - s - c). \quad (2.4)
\]

To avoid some discontinuities in the maximization of \( G \) that make the analysis unduly cumbersome, we adopt the reasonable assumption that the government’s valuation of consumer surplus and tariff payments—\( \int_p^{\infty} D(u)du + \theta tD(p) \)—has a unique maximum at \( \bar{t}, 0 < \bar{t} < t_0 \). That is, \( \bar{t} \) and \( \bar{p} = p_w + \bar{t} \) solve

\[\]
and the second-order condition,

\[
S(p) = \theta tD''(p) + (2\theta - 1)D' < 0,
\]
holds for all \( t \in [-p_w, t_0] \). Condition (2.5) is a monopoly-pricing rule for a monopolist who places a weight, \( 1/\theta \), on consumer surplus. We will refer to \( \overline{p} \) as the "modified monopoly price."

The sequence of events is as follows. First the government sets the trade and industrial policies (\( t \) and \( c \)). Then firms decide to invest or not and how much to produce if they invest. Finally, domestic and foreign trade occur and tariffs and taxes are paid.

2.2. The Equilibrium

The equilibrium of this model is a combination of a tariff, a tax, and an industry size, \((t, c, N)\), that maximizes \( G \) subject to \( N \geq 0 \), while yielding zero profits for the entrants:

\[
\pi[p, w(\ell N)] - s - c = 0.
\]

The equilibrium entry condition, (2.7), determines \( N \) as a function of \( t \) and \( c \), which are under the control of the government. However, for deriving and analyzing the equilibrium conditions, it is easier to substitute \( c \) with \( N \) as a control variable and use (2.7) to determine \( c \). For this reason, we substitute \( c \) from (2.7) into (2.4) and make \( G \) a function of \( t \) and \( N \):

\[
G = G(t, N) = \int_{x_0}^{\infty} \left[ w(\ell N) - w(h) \right] dh + \int_{p}^{\infty} D(u) du + \theta [D(p) - Nx] + \theta N(\pi - s).
\]

The first-order conditions for the maximization of \( G(t, N) \) with respect to \( t \) and \( N \) subject to \( N \geq 0 \) are:

\[
G_t = (\theta - 1)[D(p) - \alpha \epsilon_{wp} N x] - \theta [\beta(p) D(p) + \epsilon_{wp}Nx] t/p = 0, \quad \text{and}
\]

\[
G_N + \mu_N = -(\theta - 1)\alpha \epsilon_{wp} N x - \theta (1 + \epsilon_{wp}) tx + \theta (\pi - s) + \mu_N = 0,
\]

where \( \beta(p) = -pD'/D \) is the elasticity of demand, \( \epsilon_{wp} = \gamma(1-\alpha + \gamma) \), \( 0 < \epsilon_{wp} < 1 \), is the partial elasticity of \( w \) with respect to \( p \) when \( N \) is held constant and \( \ell \) adjusts, \( \epsilon_{wN} = \gamma(1-\alpha)/(1 - \alpha + \gamma) \), \( 0 < \epsilon_{wN} < 1 \), is the

\[\text{Note that a negative } tM \text{ means that trade is subsidized and the government pays the absolute value of } tM \text{ to the traders.}\]
partial elasticity of $w$ with respect to $N$ for a given $p$, and $\varepsilon_{xp} = \frac{\alpha}{1-\alpha+\gamma}$, $0 < \varepsilon_{xp} < 1$, and $\varepsilon_{xN} = -\frac{\alpha \gamma}{1-\alpha+\gamma}$, $-1 < \varepsilon_{xN} < 0$, are the partial elasticities of $x$ with respect to $p$ and $N$, respectively. $\mu_N$ is the Lagrangian multiplier associated with $N \geq 0$.

To interpret condition (2.9), first note that given the number of firms, $N$, a dollar of increase in $t$ raises $M$ dollars of tariff revenue for the government. It also allows the government to extract additional rents from the industry, but by less than one dollar for each unit of output because part of the rents accrued to domestic production is captured by the supplier of the general factor. These effects on $G$ are captured by the first term in the $G_t$ expression, which applies the premium $\theta - 1$ to the marginal increase in government revenue. The marginal costs of tariff increase are the consumer and producer deadweight losses represented by the second term in the $G_t$ expression. Condition (2.9) indicates that in equilibrium, the government balances the marginal benefits of the tariff increase with its marginal costs.

Condition (2.10) can be interpreted by noting that the entry of an additional firm provides more profits that can be extracted through industrial policy, yielding a value of $\theta(\pi - s)$ to the politicians. At the same time, the factor demand generated by the additional firm redistributes some of the industry's rents to the general factor suppliers and reduces the resources under the control of the government. This is reflected in the first term of the $G_N$ expression. Finally, as indicated by the second term of the $G_N$ expression, the output of the additional firm substitutes imports with domestic production and reduces tariff revenues— which would be costly if $t > 0$ and beneficial if $t < 0$. The choice of $N$ must balance these marginal costs and benefits.

Three characteristics of the equilibrium can be immediately derived from (2.9) and (2.10), as we do in Proposition 1 below. First, $c$ and $tM$ cannot be both negative. That is, trade and domestic production are not subsidized at the same time. The reason is simple: Politicians are interested in controlling rents and even if they offer subsidies through one channel, their aim is to facilitate rent extraction from some other channel. Second, imports are not subsidized in equilibrium. The reason is that while being costly itself, such a subsidy lowers the rents that the government can collect from the industry. Import subsidies can be an equilibrium outcome only if $\theta < 1$; that is, the government values consumer surplus more than rents under its own control. This is unlikely because it requires highly influential consumers who cannot be easily satisfied in ways other than import subsidization. Indeed, import subsidies are rare, except in some developing countries where, in the absence of better means to buy legitimacy, the government's survival comes to depend on subsiding key staple items (primarily food.
and energy).\(^7\) Third, domestic production may be subsidized, but only in situations where the industry pays a duty to export its products. In this case, subsidization is again costly, but it helps minimize the production inefficiency caused by the trade policy disincentive. It covers part of the investment cost and encourages firms to participate in the industry despite the export charges. Trade policy is conditioned on how much the product is traded and cannot perform the same function. This explains the simultaneous subsidization of agricultural inputs in many developing countries while agricultural exports are heavily taxed.

**Proposition 1.** In equilibrium, (i) imports are not subsidized: \( t > 0 \) whenever \( M > 0 \); (ii) \( cN \) and \( tM \) cannot be both negative; and (iii) when \( cN < 0 \) only when the product is exported, \( M < 0 \).

**Proof.** First, note that \( N\gamma \rightarrow 0 \) as \( N \rightarrow 0 \). Therefore, when \( \mu_N > 0 \) and \( N = 0 \), (2.9) implies \( (\theta - 1)M = \theta \beta(p)D(p)t/p \), which in turn implies \( tM > 0 \). Moreover, since no output is produced by domestic firms, we must have \( M > 0 \) and \( t > 0 \). Now consider the case where \( \mu_N = 0 \). When \( M > 0 \), the first terms in the \( G_t \) expression in (2.9) is positive because \( D(p) - \alpha \epsilon w N\gamma > M > 0 \). Thus, (2.9) can hold only if \( t > 0 \); hence (i). To prove (ii), note that \( tM > 0 \) whenever \( M > 0 \) or \( \mu_N > 0 \). Therefore, \( tM < 0 \) only if \( M < 0 \), \( t > 0 \), and \( \mu_N = 0 \). But, in that case, the first two terms in the \( G_N \) expression would be negative and that condition can hold only if \( c = \pi - s > 0 \). Part (iii) holds because according to (2.10), \( t \) must be negative when domestic firms receive a subsidy and produce. This implies \( M < 0 \) because in this case \( tM > 0 \).

To examine further characteristics of the equilibrium, we inspect the relationships between \( t \) and \( N \) specified by (2.9) and (2.10) in more detail. Condition (2.9) determines \( t \) as a function of \( N \) for given values of the parameters. Let this relationship be summarized by \( t = f(N) \). Under our assumptions, \( f(N) \) is a continuous mapping of \([0, \infty]\) into \([\underline{t}, \bar{t}]\), where \( \bar{t} \) is determined by (2.5) and \( \underline{t} \) by

\[
(2.11) \quad \frac{\underline{t}}{p} \equiv -(1-\frac{1}{\theta})\gamma < 0, \quad \text{with} \quad \underline{p} = \underline{t} + p_w.
\]

When \( N = 0 \), there is no domestic production and the government sets \( t = \bar{t} \) to maximize its valuation of consumer surplus and tariff payments. As \( N \) increases, the government finds it optimal to lower

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\(^7\) Subsidization of imported food and fuel in some developing countries is often explained by the political influence of urban population that receives the subsidy (Lipton, 1977). Attempts at the removal of these types of subsidy in countries such as Egypt and Jordan have caused serious political disturbances and riots.
protection and $t$ asymptotically approaches $\bar{t}$ as $N \to \infty$ (see Figure 1). This is because an increase in $N$ raises the responsiveness of supply with respect to the output price and adds to the marginal inefficiencies and rent losses to the government caused by a tariff increase; i.e., $\theta \varepsilon x p N x t / p$ and $(\theta - 1) \alpha \varepsilon x p N x$ terms, respectively, in the $G_i$ expression in (2.9). More formally, we have $f'(N) = -G_{iN} / G_N < 0$ for $t \in (\underline{t}, \bar{t})$ because:

(2.12) $\quad G_N = S(p) - \theta (t / p - 1 / p) (\varepsilon x p) \gamma (N x / p) - \theta [\beta D / p + \varepsilon x p N x / p] (1 - t / p) < 0,$

(2.13) $\quad G_{iN} = - \theta \varepsilon x p (1 + \varepsilon x p) (t / p - 1 / \bar{p}) x < 0.$

Figure 1. Equilibrium Trade and Industrial Policies

Condition (2.10) determines the optimal choice of $N$ given $t$ and can be denoted by $N = g(t)$. The function $g(t)$ maps $[\underline{t}, \bar{t}]$ onto $[0, N]$, where $N = g(t)$ and $t = (t + p_w) (1 + \gamma) / (\alpha - p_w) > \bar{t}$. For all $t > t_1$, we have $G_N < 0$, which means that the politicians prefer to drive $N$ to zero. In the range $(\underline{t}, t_1)$, $g(t)$ is downward-sloping because as $t$ rises, the impact of the marginal firm on the redistribution of rents toward the general factor and on the supply distortion increases (when $t < 0$, the benefit of reduced distortion declines). Although the profits of the marginal firm also rises, this effect does not overcome the first two

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8 Also, note that $f(N)$ is tangent to the $t$ axis at $(\bar{t}, 0)$ because as $N \to 0$, $x \to \infty$ and $N x \to 0$. 

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for the relevant range of \( t \), as equation (2.13) verifies. Formally, \( g'(t) = -\frac{G_{\infty}}{G_{NN}} < 0 \) for \( t \in (t_1, t_1) \) because \( G_{\infty} < 0 \) by (2.13) and\(^9\)

\[
(2.14) \quad G_{NN} = \varepsilon_{NN} \theta s/N < 0.
\]

Proposition 2 below shows that \( f \) and \( g \) curves may not cross if investment in the industry is too costly and \( t_1 \leq \tilde{t} \) (which can happen if \( \gamma \) is relatively small and \( \alpha \) and \( \theta \) are relatively large). In that case, the politicians may not find much benefit in domestic production and may make it prohibitively costly for firms to enter, while imposing the tariff \( \tilde{t} \). That is, the model will have a corner solution, \((\tilde{t},0)\). Even if \( f \) and \( g \) cross, as long as \( s \) is large the industry may not yield sufficient benefits to the politicians to change this solution. However, for sufficiently small values of \( s \) there will be a crossing point, \((t^*, N^*)\), that dominates \((\tilde{t},0)\); that is, \( G(t^*, N^*) \geq G(\tilde{t},0) \).

**PROPOSITION 2.** When \( \tilde{t} < t_1 \), an equilibrium, \((t^*, N^*)\), always exists and \( t_1 < t^* < \tilde{t} \) and \( N^* > 0 \). When \( \tilde{t} \geq t_1 \), there exists an investment cost, \( s^* \), such that for \( s \geq s^* \), there is an equilibrium \((t^*, N^*)\), where \( t_1 < t^* < \tilde{t} \) and \( N^* > 0 \) and for \( s < s^* \), the equilibrium is \((\tilde{t},0)\).

**PROOF.** Note that \( f(g(t)) > t \). When \( \tilde{t} < t_1 \), then \( g(\tilde{t}) < 0 \) and, thus, \( f(g(\tilde{t})) < \tilde{t} \). Therefore, \( f(g(t)) \) has a fixed point in \((t, \tilde{t})\) where \( g(t) \) cuts \( f(N) \) from below. Such a fixed point can serve as a solution to the government's maximization problem and it is in the interior of the relevant range of \((t,N)\). When \( \tilde{t} \geq t_1 \), we have \( f(g(t)) > t_1 \), but at any \( t \in (t_1, t_1) \), there exists an \( s(t) \) such that for \( s \geq s(t) \) we have \( f(g(t)) \geq t \) because \( g(t) \) grows from 0 to \( \infty \) with \( 1/s; \partial g/\partial s = -G_{\infty}/G_{NN} = N/(\gamma s \varepsilon_{NN}) < 0 \). Therefore, a fixed point, \((t^*, N^*)\), where \( g(t) \) cuts \( f(N) \) from below exists if \( s < \max_{t \in (t_1, t_1)} s(t) \). At such a fixed point, the government's payoff grows monotonically without bound as \( s \) declines toward 0 because \( G_{\infty} = -\theta N^* \) and \( N^* \to \infty \) as \( s \to 0 \). As a result, there must exist \( s^* < \max_{t \in (t_1, t_1)} s(t) \) such that for \( s \leq s^* \), \( G(t^*, N^*) \geq G(\tilde{t},0) \) while for \( s^* < s \leq \max_{t \in (t_1, t_1)} s(t) \), \((\tilde{t}, 0)\) serves as the equilibrium: \( G(t^*, N^*) < G(\tilde{t},0) \). When \( s > \max_{t \in (t_1, t_1)} s(t) \), \( g \) lies entirely below \( f \) and the point with the highest payoff is \((\tilde{t},0)\). \( \blacksquare \)

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\(^9\) As depicted in Figure 1, at \((t_1,0)\) and \((t_1, N)\) the \( g \) curve is horizontal.
2.3. Discussion

Equation (2.9) is similar to the tariff determination equations in many other political economy models of trade policy in that it implies an inverse relationship between protection rate and import demand elasticity (see Helpman, 1995). This can be seen by rewriting (2.9) as:

\[
(2.15) \quad \frac{t}{p} = \frac{(\theta - 1)(1 - (1 - m)\alpha \epsilon_{wp})}{\theta[\beta(p) + (1 - m)\epsilon_{wp}]}.
\]

where \(m = M/D\) is the import penetration ratio, and by noting that the elasticity of import demand is \(\mu = [\beta(p) + (1 - m)\epsilon_{wp}]/m\). But, our result has two major differences with the earlier ones. First, our model does not depend on lobbying. It shows that other rent extraction mechanisms can induce the same type of relationships between protection rate and industry characteristics that lobbying does. Second, unlike other models that abstract from the politicians’ motive to control rents through tariffs and quotas, our model implies a positive relationship between import penetration and protection when one controls for demand and supply elasticities [see (2.15)].\(^{10}\) This result conforms well to the common observation in empirical studies of trade policy. Of course, both \(m\) and \(t/p\) are endogenous and their relationship is only induced by variations in parameters and exogenous variables. For example, an increase in \(s\)—which only rotates the \(g(t)\) curve counterclockwise around \((t_1,0)\)—raises \(t\) and \(m\) along the \(f(N)\) curve. The higher cost of investment discourages entry and raises the import penetration ratio. At the same time, with fewer firms in the industry, the loss of marginal rents to the general factor owners and to production inefficiency in response to protection declines and the government finds a higher tariff rate more attractive. Note that since \(f\) and \(g\) curves may have multiple crossing points, the equilibrium point may jump discontinuously in response to changes in \(s\). But, this does not affect the result because the inverse correlation between \(m\) and \(t\) depends on \(f(N)\) which does not shift. As we show in the comparative statics analysis below, similar results can be found based on other parameter changes.

Grossman and Helpman (1994) and Goldberg and Maggi (1997) suggest that the past empirical findings regarding import penetration may be biased because they do not control for import demand elasticity as required by equations such as (2.15). Yet, the frequency of the finding under a variety of

\(^{10}\) If no premium is attached to tariff revenue, the numerator of (2.15) becomes \(-(\theta - 1)(1 - \alpha \epsilon_{wp})(m - 1)\), which implies an inverse relationship between \(m\) and \(t/p\) if the elasticity of import demand is held constant or if the elasticity of output supply is not too large.
different specifications is not easy to dismiss (Baldwin, 1985; Lee and Swagel, 1997; Rodrik, 1995). Moreover, most empirical studies of protection do seem to partially control for demand and supply elasticities by including factor requirements and some buyer and seller characteristics in their regressions. This supports the view that the motive to control tariff and quota rents plays an important role in trade policy. Note that the same motive gives rise to the possibility that exports may be taxed or that imports may be restricted even when there is no domestic producer to be protected, $N = 0$. The fact that one observes actual cases of this type (and abundantly so in less developed countries) provides additional evidence for the presence of such a motive. Maggi and Rodrígues-Clare (1997) also arrive at similar conclusions. However, their model has less structure and yields this result for less specific ranges of parameters.

Our model also sheds light on the reasons why trade policies are generally biased toward restriction. Lobbying models of trade policy typically imply that export industries should be able to encourage politicians to grant subsidies at least as well as import-competing ones lobby for protection. Our model avoids this problem because it treats rents from different sources symmetrically: It shows that trade policies have generally restrictive characters because politicians are interested in controlling rents, whether these are domestic taxes and regulatory redistributions or tariffs and NTB premia. Subsidizing trade uses the rents under government control rather than generating them. As a result, as we have seen before, imports are never subsidized. Export subsidies ($t > 0$ when $m < 0$) are possible, but only if $\alpha \varepsilon_{wp}$ (the share rent loss to the general factor in each dollar of protection) is small (see equation (2.9)).

Another empirical puzzle that our model can help resolve is the very small size of lobbying contributions compared to the welfare losses caused by protection (Gawande and Bandyopadhyay, 1997). For example, the sugar lobby in the United States contributed $1m in 1983 (Stern, 1988) and received a protection that caused $550m welfare loss (Hufbauer et al., 1986). Similarly, the dairy industry's Political Action Committee contributed $3.3m and helped sustain a subsidy that entailed $1.6b welfare loss. If

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11 Trefler's (1993) noted study finds the direct impact of import penetration on protection to be negligible. However, he does find that an increase in import penetration raises the rate of protection. Gawande and Bandyopadhyay (1997) find that that import penetration has a negative impact on certain types of protection, which they call "price NTBs." But, other types of protection, which they refer to as "quantitative NTBs," show the opposite sign. They suggest that the existing models of trade policy apply only to price NTBs. But, as we argue in this paper, the difference between tariffs and quota premia is not essential for the results. Gawande and Bandyopadhyay (1997) do not assess the effect for all trade restrictions.
lobbying were the only means of rent extraction for the politicians, they should equate each dollar of
lobby contribution with \( \theta \) dollars of welfare loss. This implies a value of \( \theta \) exceeding 500, which does
not seem reasonable. Our model suggests that the lobbying cash transfers are only part of the rents that
come under the politicians’ control as a result of protectionism and various forms of taxation. Accounting
for all the tariffs, NTB premia, taxes, and regulatory redistributions can substantially bring down this
estimate. In addition, the substitutability of other rent extraction mechanisms for lobbying may explain
another finding by Gawande and Bandyopadhyay (1997) that the elasticity of lobbying expenditures with
respect to the deadweight losses caused by trade policy is quite low.

Equation (2.10) offers an additional means of deriving the implications of the model and testing
it. Rewriting (2.10) for equilibria with positive domestic production as

\[
\frac{s}{px} = \frac{(1 - \alpha) - \alpha \varepsilon_{wN} (\theta - 1)/\theta - (1 + \varepsilon_{wN} t/p}{1 + \varepsilon_{wN} t/p}
\]

for the case of an interior solution shows that, when one controls for production and factor supply
elasticities, the choice of industrial policy essentially induces an inverse relationship between the
protection rate and the ratio of specific capital to output, \( s/px \). Indeed, empirical studies using capital-
output ratio as an explanatory variable for the protection rate have systematically find a negative
association both across sectors and across countries and institutional contexts (Trefler, 1991; Rodrik,
1995). Interestingly, this finding has proven puzzling in the past, particularly because it does not
naturally appear in theoretical tariff determination equations such as (2.15).\(^{12}\) However, our model shows
that once industrial policy is endogenized, an explanation emerges: Any factor (such as a parametric
decline in the demand level) that induces a lower tariff rate at a given the industry size, \( N \), diminishes the
marginal deadweight loss and redistributive costs of additional firms for the government. As a result, the
government’s interest in restrictive industrial policies declines and more firms enter. The lower tariff and
larger number of firms induce a reduction in output per unit of the specific asset. Since specific assets
tend to be directly related to the capital stock, the model offers a consistent explanation for the inverse
association between capital-output ratio and protection rate.

\(^{12}\) For example, Trefler’s (1991) explanation for the negative relationship between protection and capital-output ratio
is that a large capital stock reduces the need for protection because it creates an entry barrier and controls the entry
of rivals. However, this view overlooks the fact that protection may be even more valuable to the existing firms in
the industry if they do not have to worry about rent erosion consequences of entry.
The inverse relation between $t/p$ and $s/px$ also suggests an explanation for another empirical regularity in trade policy. As Rodrik (1995) observes, many empirical studies have found a positive correlation between the rate of protection and an industry's intensity in low-skill labor. This is often explained based on concern of politicians about the vote or welfare of the low-income workers. Our model suggests a different possibility: Most factors that increase equilibrium $t/p$ prompt the government to restrict investment in the industry's specific capital in order to contain the induced inefficiency. This encourages the firms to expand production by means of general factors, which implies a decline in $s/px$. Low skill labor is a prominent part of the general factors, hence the association of its intensity with the rate of protection.

Finally, it should be noted that although we have modeled industrial policy as taxes and regulations that affect firms in an industry, the model can be easily reinterpreted to include entry regulations. This reinterpretation is useful because entry restrictions are a key mechanism for sustaining rents in an industry (Stigler, 1971; Rasmusen and Zupan, 1991). Many government policies explicitly or implicitly limit entry and capacity expansion. These include license fees, quotas, extraordinary requirements (on investment, technology, product characteristics, etc.), and other forms of regulation that are differentially or solely applied to entrants, as well as the tolerance of anti-competitive behavior by incumbent firms. All such policies entail rent redistributions that are in essence under the control of the politicians. If there are no pre-existing firms in the industry, the equilibrium conditions and the implications of the model remain intact if part of the cost $c$ is incurred up-front when firms enter the industry. When there are pre-existing firms, the government may prefer to use entry regulations if that is an easy way of extracting rent from entrants and provides an opportunity to capture the surplus of incumbent firms, which are naturally interested in supporting entry restrictions. In this case again, $c$ can represent the total being paid by each firm, one way or another.

2.4. Further Comparative Statics

In the political economy literature, it is often assumed that industries with smaller number of firms are more effective in obtaining higher rates of protection. Our model generates the same type of association between $t$ and $N$, but as an endogenous process induced by other parameter changes, rather than as a direct relationship (see examples given below). This observation is particularly important because it implies that distortions in trade and industrial policies tend to go together, which seems to be supported by casual observation across sectors and countries.
Since both $f(N)$ or $g(t)$ are downward sloping, the inverse movements in $t$ and $N$ are obviously true in the case of variations in parameters that shift only one of the two curves, such as changes in demand or investment costs. We have already discussed the impact of changes in $s$, which only affects $g(t)$. An interesting aspect of that effect is that the decline in the industry size in response to an increase in $s$ is not just because of reduced profits associated with higher costs. That effect on industry size is exacerbated by increased protectionism, which is then accompanied by tighter industrial policy to reduce the supply inefficiencies induced by the higher domestic prices. This can be seen by noting that as the $g(t)$ curve rotates down, its crossing point with $f(N)$ drops by more than its vertical decline for each $t$.

The factors that shift $f(N)$ alone are demand parameters. A fixed upward shift in the demand curve, which can be modeled by adding a constant parameter to $D(p)$, raises the marginal benefit of protection (the first term in the $G_t$ expression) and shifts $f(N)$ to the right. Once the politicians raise the tariff rate, they also finds it worthwhile to pursue more restrictive industrial policies, as the $g(t)$ relationship indicates. This result is interesting because it shows that domestic demand expansion may have a seemingly perverse impact on domestic investment in the industry. Parameter changes that lower the elasticity of demand also have a similar effect.

Variations in the productivity factor, $A$, and the politicians’ valuation of cash under their control, $\theta$, affect both $f$ and $g$ curves, but they still induce an inverse relationship between $t$ and $N$ because they shift the two curves in opposite directions. Focusing on equilibria with domestic production, for $A$ we have:

\[
G_tA = -\theta/(tp/tzp)\alpha Nx[(1-\alpha + \gamma(1-\alpha)A] < 0 \quad \text{and} \quad G_{tA} = \theta s[(1-\alpha)A] > 0.
\]

Therefore,

\[
\Delta dt/dA = G_{tA}G_{NN} - G_{IA}G_{NN} < 0 \quad \text{and} \quad \Delta dN/dA = G_{tA}G_{NN} - G_{NA}G_{NN} > 0,
\]

where $\Delta \equiv G_{tA}G_{NN} - (G_{IA})^2 > 0$ by the second-order condition, which must hold in interior equilibria. This result as well as the one concerning the investment cost, $s$, offer an explanation why the rate of protection in rising, high-productivity industries is often quite low, while it tends to be high in low-productivity infant industries. These findings are also supported by the empirical finding that protection is inversely related to an industry's relative productivity (e.g., Pack, 1994). In addition, the findings shed new light on why sunset industries are so effective in obtaining protection. Baldwin (1993) has noticed this pattern and Grossman and Helpman (1996) suggest that it must be due to the lower cost of organizing lobbies in declining industries where free-riding is less likely due to absence of entry. But if this were the case,
infant industries should have difficulty obtaining protection because entry does occur in those cases. The present model offers an alternative explanation: Less productive industries tend to be less responsive to price changes and allow the government to gain more from a tariff increase. At the same time, marginal firms generate less surplus to be captured. As a result, the government has an incentive to raise protection and limit entry into such industries. This may seem at odds with the situation in infant industries, where entry is supposed to be encouraged. Certainly, there have been cases of rapid expansion and prohibitive trade barriers where this explanation does not apply. But, there have also been many infant industries in developing countries that have failed to respond to the high rates of protection they have enjoyed partly due to excessive government regulations that have limited their access to credit and foreign exchange or have taxed away their rents.

The politicians' valuation of rent transfers, $\theta$, may differ among industries, over time, or across countries because the composition of rent extraction modes (budgetary revenues vs. bribes or campaign contributions, etc.) may vary, with each mode yielding different benefits to the politicians. For example, the politicians may value personal transfers more than budgetary ones and assign a higher $\theta$ to industries where transfers can be mostly accomplished in that form. Differentiation of the first-order conditions with respect to $\theta$ for equilibria with positive $N$ yield

$G_{\theta} = \frac{\theta}{(1 - \theta)}(\beta D + \varepsilon_{sp} N_x)(t/p)$

and

$G_{N\theta} = -\alpha\varepsilon_{wN}px/\theta < 0,$

which imply that $dt/d\theta > 0$ and $dN/d\theta < 0$ unless the industry is subject to a high export tax, $t < 0$. For import-competing and most export industries where $t$ is not a large negative number, a rise in $\theta$ makes the politicians more eager to bring rents under their control. This induces them to set a higher $t$ for every given industry size, $N$. This shifts $f(N)$ to the right. The politicians also become keener to recuperate rents lost to production inefficiency and to the general factor suppliers. They achieve this by reducing $N$ for every level of $t$. This shifts $g(t)$ down. The two effects reinforce each other and yield a smaller industry with a higher protection rate. In industries with an export tax, the higher $\theta$ raises the politicians' interest in raising the tax, which means a lower $t$ and a higher or lower $N$ depending on other parameters. Thus, in either situation, a rise in $\theta$ increases the extent of trade distortion and, quite often, domestic production distortion. An implication of this finding is that in countries with higher corruption where extracting rents is easier, both trade and industrial policies are likely to be more restrictive. In the presence of widespread corruption, politicians can enjoy personal transfers in exchange for policy favors with greater impunity. This allows them to place a greater value on their cash receipts vis-à-vis general welfare. The
correlation of high degrees of industrial concentration with protectionism in some developing countries may be a manifestation of this effect.

Finally, it is worthwhile to note that our model provides a framework for analyzing the impact of foreign trade agreements or exogenous liberalization on industrial policies. This exercise can be carried out by viewing an external agreement as a restriction on \( t \). When the agreement binds and keeps \( t \) below the unconstrained equilibrium, the government finds it optimal to let the industry size rise along the \( g \) curve. That is, foreign trade liberalization induces relaxation of industrial policies. On the other hand, an exogenous liberalization in domestic markets that allows expansion of domestic production capacity beyond the unconstrained equilibrium induces a decline in \( t \) along the \( f \) curve. These observations help explain the coincidence of various forms of liberalization around the world.

The new results obtained in this section are essentially due to the two features that we have added to the existing models of trade policy: First, industrial policy is endogenized and jointly determined with trade policy. Second, the premium attached to the rents that come under the politicians' control is extended to cover tariff revenues as well. To focus on these two elements, we made a number of simplifying assumptions. In the following sections, we examine the sensitivity of the results with respect to those assumptions. We show that the main messages of this section's basic model survive these modifications. However, there are new insights and modeling issues that are worth addressing.

3. Pre-Existing Firms and Sunset Industries

In section 2 we assumed that there are no pre-existing firms in the industry and investment costs are positive for all firms that want to operate. But, in actuality, industrial and trade policies change over time after some firms have invested in specific assets. To examine this situation, we extend the model of section 2 to allow for a given number of pre-existing firms, say \( N \), that have already incurred the costs of entry and specific assets. In this situation, the equilibrium conditions (2.9) remains applicable, but (2.10) is valid only for \( N > N_c \). (See Figure 2.) For \( N \leq N_c \), investment costs are zero and \( G_N > 0 \) for all \( t < t_1 \). This raises the possibility that \((t, N)\), where \( t = f(N) \), may serve as equilibrium, with \( c = \pi \) evaluated at \((t, N)\). This can happen if \((t, N)\) dominates \((\tilde{t}, 0)\)—i.e., closing down of all existing firms—and any interior solution, \((\tilde{t}^*, N^*)\), with \( N^* \geq N \). This requires:

\[
G(t, N) + \theta s N \geq \max \{ G(\tilde{t}, 0), G(\tilde{t}^*, N^*) + \theta s N \},
\]
When the equilibrium industry size is constrained by the number of pre-existing firms, the government would have preferred a smaller $N$ if all the firms had to invest in the specific asset after trade and industrial policies were made. This is the situation in sunset industries that have lost their comparative advantage and would have been allowed to shrink if it were not for their pre-existing specific assets. Interestingly, the protection offered to such industries is inversely related to their size because $t = f(N)$ and $f$ is a declining function of $N$. This implies that sunset industries would have been protected even more if their initial sizes were closer to the level that would have prevailed if they were to be developed anew. In fact, the protection rates of declining industries should rise as their specific assets depreciate. This may make them appear as particularly effective in lobbying, as Baldwin (1993) has observed. However, our model suggests that increased protection may be due to shrinkage of the industry’s assets, which reduces the marginal inefficiency and rent losses in response to tariff increases.

![Figure 2. Constrained Equilibrium with Pre-existing Firms](image)

**4. Differential Premia on Rents Extracted from Different Sources**

In this section, we examine the consequences of applying differential premia to tariff and tax revenues. The composition of revenues from these two sources may be different and the politicians may find one source easier to capture than the other. Indeed, this is the underlying assumption of lobbying models that attach a premium only to political contributions. The extension of our basic model here offers a generalized version of those models and provides further insights about the conditions under which our results to hold. In addition, the generalized model shows how the institutional and technological factors that affect the political value of rents extracted from various sources enter the trade
and industrial policy equations. This is useful for empirical studies that examine the role of industries' political and economic characteristics in policy formation. An important issue in this respect is our finding that in the determination of protection rates, such characteristics interact with the import penetration ratio rather than entering the equation linearly, as commonly specified in empirical studies.

Let \( \theta \) continue to represent the value that the politicians attach to a dollar of tariffs. But, let their valuation of a dollar of taxes be \( \tau > 1 \), which may differ from \( \theta \) because the ease with which it is extracted or can be used for political purposes may be different. In that case, the government’s objective function, (2.8), must be revised as

\[
G(t, N) = \int_0^{\ell(N)} [w(\ell N) - w(h)] dh + \int_0^\infty D(u)du + \theta [D(p) - Nx] + \tau N(\pi - s).
\]

This yields the first-order conditions as

\[
\frac{t}{p} = \frac{(\theta - 1)m + (\tau - 1) (1 - \alpha \epsilon_{wp}) (1 - m)}{\theta [\beta (p) + (1 - m) \epsilon_{wp}]}
\]

\[
\frac{s}{px} = (1 - \alpha) - \frac{1}{\tau} \alpha \epsilon_{wN} - \frac{\theta}{\tau} (1 + \epsilon_{xN}) \frac{t}{p},
\]

which are comparable with (2.15) and (2.16). However, the numerator of on the right-hand side of (4.2) shows that in determining the protection rate, the institutional characteristics that affect the value of rents extracted through tariffs and taxes—reflected in \( \theta \) and \( \tau \), respectively—are weighted by the share of those sources in total domestic demand. The tax and regulatory premium is further weighted by \( 1 - \alpha \epsilon_{wp} \) because part of the industry rents go to the general factor owners. The new feature of equation (4.3) is that the relative value of tariffs vs. taxes mediates the relationship between protection and capital intensity as an interactive term.

The new formulation of the model changes the lower boundary of \( t = f(N) \). We now have

\[
\frac{t}{p} = \frac{-(\theta - 1) + (\tau - 1)(1 - \alpha \epsilon_{wp})}{\theta \epsilon_{wp}}
\]

The shape and other general characteristics of \( g(t) \) and \( f(N) \) remain essentially the same as before as long as

\[
(\theta - 1)[1 + \epsilon_{wp}/\beta(\bar{p})] > (\tau - 1)(1 - \alpha \epsilon_{wp}).
\]
This condition ensures that $t < \tilde{t}$ and that $f'(N) = -G_{in}/G_{i} < 0$ for $t \in (t, \tilde{t})$ and $g'(t) = -G_{in}/G_{NN} < 0$ for $t \in (t, t_{1})$. Condition (4.5) automatically holds if $\theta = \tau$ as in section 2. It also remains valid as long as the politicians do not find controlling tariff and NTB rents much more difficult than controlling firm rents through taxes, regulations, and lobbying. However, if $\theta$ is sufficiently smaller than $\tau$, the characteristics of the equilibrium may change. When (4.5) is reversed, the order of $\tilde{t}$ and $t$ changes, $t > \tilde{t} > 0$, and $G_{in} = -\theta\varepsilon_{xp}(1 + \varepsilon_{xN})(t/p - t/p)x > 0$ for all $t \in (\tilde{t}, t)$, making the $f(N)$ and $g(t)$ curves both slope upward in that range, as shown in Figure 3. The reason is as follows. A parametric increase in $N$ makes the domestic production more responsive to tariff increases and prompts the politicians to raise $t$ and shift rents to the domestic firms, which in this situation yield more value to the politicians even after accounting for inefficiencies and rent losses to the general. At the same time, a parametric rise in $t$ encourages the government to induce more entry to capture the rents in the form of taxes rather than tariffs.

![Figure 3. Equilibrium Trade and Industrial Policies When Condition (4.5) is Reversed](image)

The situation where (4.5) is reversed represents the generalized version of the assumption in the past studies that the politicians place a negligible premium on tariff proceeds. The consequence is that unlike the results obtained in section 2, most parameter changes induce a direct correlation between $t$ and $N$, which reverses the comparative statics results of section 2. We believe that the reversal of (4.5) is not

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13 With differentiated premia, at the crossing point of $g(t)$ and $f(N)$, the expressions for $G_{i}$ and $G_{in}$ are the same as those in (2.12) and (2.13), but $G_{NN} = -\varepsilon_{xN} \tau \varepsilon_{s}/N < 0$. 

22
very plausible for three reasons. First, the characteristics of the equilibrium contradict the stylized facts discussed in section 2. Second, with (4.5) reversed, the equilibrium domestic price is always greater than the modified monopoly price, \( \bar{r} > 0 \). If the value of \( \theta \) is even two orders of magnitude smaller than the estimates for the politicians' valuation of campaign contributions vis-à-vis welfare dollars (which is about 500), the implied prices for all tradable goods would be close to monopoly ones, which seems unrealistic. Moreover, in such equilibria export duties are ruled out. Third, there is no obvious reason why appropriation of trade rents should be more difficult than that of domestic industry rents. Indeed, historically the opposite seems to have been true. Until the second half of the twentieth century, governments typically used to generate a large part of their revenues through control of trade at the border rather than taxation and regulation of domestic production. Indeed, this continues to be the case in most of the developing world. A factor that helps appropriation of trade rents is that they can be easily made specific to each item, while normal profit and value added taxes are often uniform across industries and tailor-made redistribution of industry-specific rents typically requires less efficient regulatory interventions.\(^{14}\) Note that even under trade agreements, tariffs can vary a great deal across industries, often much more than domestic taxes. Trade restrictions are also partly created through regulatory processes, especially when trade agreements or other factors limit the use of conventional tariffs. But, this only puts them at the same footing as their counterparts in the domestic policy, not in a substantially inferior position.

To sum up, differentiation of premia on tariff and tax revenues does not change the basic results of section 2 as long as condition (4.5) holds. This condition is a plausible assumption in most situations. The equilibrium conditions further show that institutional characteristics of the country should enter the trade and industrial policy equation weighted by the share of imports or domestic production in total demand, depending on whether those characteristics affect tariff collection or regulatory and tax policies, respectively.

\(^{14}\) A reflection of the various constraints on the use of targeted cash transfers is the significant rent redistribution that governments effect through regulation of various industrial variables (such as location, environmental standards, product quality, financial and labor relations, extent of competition, access to government services and resources, etc.). For specific examples and a review of evidence, see Noll (1989) and Rasmusen and Zupan (1991). Stigler's (1971) seminal article on the politics of regulation also contains numerous examples.
We end this section with a comparative statics exercise for variations in $\tau$. The issue is interesting because it shows how efforts such as regulatory or campaign finance reforms that reduce the politicians' payoff from industry rents affect trade and industrial policies. Note that

\begin{equation}
G_{N\tau} = [\theta(1 + \epsilon_{xN})u/p - \alpha \epsilon_{xN}]px/\tau \quad \text{and} \quad G_{\tau} = (1 - \alpha \epsilon_{xN})\theta Nx > 0,
\end{equation}

For industries with low protection rates such that $G_{N\tau} < 0$, we have $\Delta tt/d\tau > 0$ and $\Delta dN/d\tau < 0$. That is, a reduction in the politicians' gains from rent extraction through tax and regulatory mechanisms induces liberalization in both trade and domestic industry. When an industry lobby transfers the rents, the same applies if the effectiveness of the lobby in yielding benefits to the politicians declines. This is an intuitive outcome but, interestingly, it does not always arise. If the industry is already highly protected, it is possible that a reduction in $\tau$ may prompt the government to restrict the domestic industry size in order to encourage imports and increase tariff revenues. Since this diminishes the negative marginal impact of tariffs on industry efficiency and rent loss to the general factor, the government ends up raising $t$ as well. Note that a reduction in $\tau$ always intensifies trade distortion in industries subject to export tax as well.

These possibilities do not arise in other political economy models that link rent transfer effectiveness to trade policy—such as Grossman and Helpman's (1996) model of free riding in lobbies—because in those models lobbying is the only means through which rents influence policy.

5. Conclusion

The models developed in this paper suggest relationships between protection, industrial policy, and industry characteristics that shed new light on a number of empirical regularities and offer new hypotheses. The exercise offers three general results. First, the premium placed by policy-makers on tariffs and NTB premia is likely to be playing an important role in shaping trade and industrial policies. In particular, under plausible assumptions, it induces a positive association between policy restrictions on domestic and foreign competition that helps explain a variety of stylized facts. Second, the general role of many industry characteristics in the formation of trade and industrial does not depend on the presence of industry lobbies, as long as politicians can find other means of benefiting from the rents that they can generate through their policies. This helps explain why studies of trade policy find similar empirical correlations regardless of whether they distinguish the politically organized industries or not (Gawande and Bandyopadhyay, 1997). Third, endogenizing industrial policy and specific asset formation does not change the general form of the equation that determines protection—e.g., equation (2.15). However, it shows that some of the regularities between protection and industry variables may be the result of the
industrial policy choice rather than trade policy per se. An important case is the negative relationship between protection and asset-output ratio, which is difficult to explicate based on the trade policy choice alone. The industrial policy choice equation enriches the political economy models of trade and provides an additional means of testing them.

The models also produce more specific results. In particular, our analysis helps explain the general bias of government policies against trade. The analysis also implies that a reduction in the politicians' valuation of a dollar of rent under their control relative to a dollar of aggregate welfare (e.g., because of reduced corruption) should result in trade liberalization and deregulation. Furthermore, trade liberalization as a result of external agreements should induce the adoption of less restrictive tax and regulatory policies toward domestic firms. Conversely, exogenous factors that bring about deregulation in domestic markets are likely to induce trade liberalization. However, some relationships that may seem intuitive do not necessarily hold. For example, enhanced ability of an industry's lobby to buy political influence with its resources may encourage the government to lower protection (in order to counteract with the increased inefficiency of that policy as the domestic production is allowed to expand).

Another implication of our exercise is that the factors that determine the benefits of lobbying and other transfer mechanisms for the politicians influence trade policy in proportion to the share of those mechanisms in total market rents. This means that such factors must enter the protection rate equation as interactions with the import penetration ratio. This is different from the common practice in empirical models that include import penetration and other factors in a linear fashion.

Our analysis yields three other important results, which can be summarized as follows. Under reasonable conditions, policy restrictions on domestic and foreign competition are positively related to the import penetration ratio, to output per unit of the industry's specific assets, to the inverse of the industry's productivity relative to its foreign competitors, and to the inverse of the price elasticity of domestic demand for the industry's product. The latter relationship is, of course, a well-established result in the literature.

In our attempt to keep things simple, we have ruled out lobbying by interest groups other than the organization that represents the firms operating in the industry. The presence of other interest groups (consumers and general factor suppliers) to organize and influence policy may be seen as additional channels of access to rents by policy makers. It is also possible to capture some aspects of such activities as parameters that influence rent extraction through the channels already modeled. Neither extension
seems to change our general results. Extension of the model to a general equilibrium situation and endogenizing some of the variables taken as exogenous here can add new insights.\textsuperscript{15}

\textsuperscript{15} Some extensions are straightforward and do not seem to have substantial effects on the result. For example, the assumption that the investment cost of the specific factor is constant does not play much of a role in the results, unless the investment cost declines sharply decline with industry size. To see this point, suppose that in the model of section 2 the investment cost for the marginal entrant depends on its order of entry, \( n \). That is, \( s = s(n) \). When entry causes congestion and raises investment costs, we have \( s'(n) > 0 \), while if entry causes positive external economies, we have \( s'(n) < 0 \). Under this formulation, in the equilibrium entry condition, \( s(N) \) replaces \( s \), and in the objective function (2.8), \( \int_0^N s(n)dn \) replaces \( Ns \). The sole consequence is that on the left-hand side of (2.10), \( s \) must be replaced by \( (1+\varepsilon)s(N) \), where \( \varepsilon = Ns'Ns \) is the elasticity of \( s \) with respect to \( n \). When \( s' > 0 \), the only impact is a flatter \( g \) curve because the increase in the marginal investment costs discourages the rise of the industry size in response to a parametric decline in \( t \). The opposite is true if \( s' < 0 \). Indeed, if \( s' \) is negative and sufficiently large, the positive externality effect may dominate and make the equilibrium industry size unbounded. But, in practice increasing costs ultimately set in and constrain the industry size.
Appendix
The Role of Industry Lobby

In this appendix, we incorporate the role of an industry lobby into the model. We start from the model of section 4 and assume that in addition to the tax, $c$, transfers from domestic firms to the politicians may be made via a lobby that represents the firms. The lobby is an agent who can buy influence in the government. It may be an organization of firm owners, an outside entrepreneur, or a group organized by some politicians (as in some developing countries). The lobby's objective is to maximize the aggregate profits of the industry net of taxes and lobbying costs.\footnote{16}

We assume that the industry is a small part of the economy and its role in aggregate expenditure and revenues is not large enough for it to be concerned about the indirect impacts of the policies it advocates on the government budget or on the consumption of its members. Also, no other interest group finds it worthwhile to participate in the lobbying process for the industry and influence government policy towards it.\footnote{17} Indeed, final good consumers in many industries are quite diffuse and each one's stake in the trade policy of individual industries is too small to outweigh the costs of political organization. Similarly, suppliers of non-specific inputs also tend to be diverse groups of producers and contractors who have small stakes in individual industries.\footnote{18}

To elicit its favored policies, the industry lobby has to provide benefits for politicians in the form of political support, contribution to their electoral campaigns, or other direct or indirect payments to them. Let $B$ be the resources that the lobby gives up to transfer rents to the politicians to influence policy.

\footnote{16}{\textit{It may be argued that the lobby should be maximizing per firm profits net of lobbying costs. However, if the lobby can receive a share of profits earned by a new entrant, it can always make all firms inside the industry better off by allowing the entrant to join the industry. This implies the maximization of total profits net of lobbying costs.}}

\footnote{17}{\textit{Assuming that the industry's role in the economy in terms of share in expenditures and revenues is non-negligible complicates the presentation, but it does not change the main results. Grossman and Helpman (1994) allow for non-negligible population share of organized interest groups. They simplify their model by assuming that there is a good that uses only labor with constant returns and has a constant marginal utility for all households. The result is that the aggregate population share of lobbying groups enters the equation that determines the protection rate. A similar technique can be applied in our model.}}

\footnote{18}{\textit{We treat the interests of workers with specific human capital in an industry as part of the interests of the firms in that industry. As a result, in our model the constituency of each industry's lobby includes workers with a stake in that industry.}}
Let $\lambda$ represent the value that the politicians attach to the marginal dollar of lobby expenditures. Since increased transfer of resources may force the lobby to use less efficient means and to make its marginal contributions in ways that are less beneficial to the politicians, we let $\lambda$ be a function of $B$ with $\lambda' < 0$ and $\lambda'' < 0$. This assumption has the further advantage that it models the possibility that transfers via each channel may be subject to diminishing returns and that in equilibrium several channels may be used simultaneously.

Given the above specifications, the lobby's objective can be written as

$$L(t, c, N, B) = (\pi - c)N - B.$$  

(A.1)

For the politicians, the presence of the new channel for extracting the rents means that their objective function takes the form:

$$G = \int_0^N [w(tN) - w(h)]dh + \int_\mathbb{P} D(u)du + \theta(tD - Nx) + N(\pi - s) + (\tau - 1)cN + [\lambda(B) - 1]B.$$  

(A.2)

For simplicity, we assume that the lobby imposes its cost, $B$, evenly among all firms in the industry. This implies that, after entry, each firm earns a net profit of $\pi - c - B/N$. Therefore, the equilibrium industry size must satisfy

$$\pi - s - c - B/N = 0.$$  

(A.3)

We assume that in the game that the government plays with the lobby, it offers a menu of policy packages, $(t, c)$, to the lobby and requests a payment, $B(t, c)$, for each option. The lobby chooses among those options by maximizing $L$. Then the government implements the policy, firms enter and produce, and the lobby pays off the politicians. The equilibrium of the game is a lobbying cost function, $\hat{B}(t, c, N)$, a trade policy, $\hat{t}$, and a tax, $\hat{c}$, and an industry size, $\hat{N}$, that satisfy (A.3) and maximize $G$ subject to $N \geq 0$, with $(\hat{t}, \hat{c}, \hat{N})$ maximizing $L$ given $\hat{B}$. This formulation of the game allows the politicians to extract all the industry rents. Assuming, as in Grossman and Helpman (1994), that the lobby offers the menu shifts all the surplus of the game to the lobby. However, this only affects the distribution of rents, not the marginal tradeoffs that determine the trade and industrial policies.

It may be argued that the lobby should be maximizing per firm profits net of lobbying costs. However, if the lobby can receive a share of profits earned by a new entrant, it can always make all firms inside the industry better off by allowing the entrant to join the industry. This implies the maximization of total profits net of lobbying costs.
Solving (A.3) for $B$ and substituting it in (A.2) yields $G$ as function of $t$, $c$, and $N$, independent of the shape of $B$:

$$G(t, c, N) = \int_0^{\pi N} [w(h) - w(h)]dh + \int_p D(u)du + \theta t(D - N) + \lambda(\pi - s)N + (\tau - \lambda)cN.$$ 

The first-order condition of maximization with respect to $c$ yields:

$$\tau = (1 + \varepsilon_{\lambda B})\lambda,$$

where $\varepsilon_{\lambda B} = \frac{\lambda}{\lambda} < 0$ is the elasticity of $\lambda$ with respect to lobbying costs. The right hand side of (A.5) is the marginal increase in the politicians' objective as a result of a one dollar increase in lobbying contributions, taking into account the diminishing value of all the infra-marginal dollars. In this light, condition (A.5) states that in equilibrium, the politicians equalize the marginal benefits of a dollar of industry rent extracted through lobby with that of a dollar controlled via taxes. Obviously, if a dollar of lobby contribution has greater payoff than the same dollar captured via taxes, the politicians can do better by relying more on the lobby, until the marginal benefit of that channel declines to $\tau$. The final allocation of rent between the two mechanisms depends on how effective the lobby is in making its dollars valuable to the politicians; that is, the shape of $\lambda(B)$. This idea can be generalized by letting $\tau$ depend on $cN$ and by modeling other possible channels for extracting the industry's rent (e.g., entry regulation) in the same manner. Then, in equilibrium the politicians will be equalizing the marginal benefits of rent extraction across all channels. The effectiveness of various channels in making a dollar valuable to the politicians will determine the allocation of rent across various channels.

Given (A.5), equations (4.2) and (4.3) remain valid as the first-order conditions with respect to $t$ and $N$. All the results are, therefore, the same as in section 4. If we let $\tau$ be endogenous variable as described above, then its equilibrium value in (4.2) and (4.3) will depend on all the factors that shape the effectiveness of rent extraction via different channels.

As for the choice of $B$, all the government has to do is ensure that $t$ maximizes $L$ and $B(t, c, N) = (\hat{\tau} - s - \hat{c})\hat{N}$. This can be achieved by simply setting

$$B(t, c, N) = \pi N - s\hat{N} - \mu k(t, c, N),$$

where $k(t, c, N)$ is a single-peaked positive function that maximizes at $(\hat{t}, \hat{c}, \hat{N})$ and $\mu$ is a small positive number. Faced with this cost function, the lobby will see its objective as $L(t, c, N, B) = s\hat{N} + \mu k(t, c, N)$ and will choose $(\hat{t}, \hat{c}, \hat{N})$ as its preferred policy package. By reducing $\mu$, the politicians can drive $B(t)$
arbitrarily close to \((\hat{\pi} - s - \hat{c}) \hat{N}\) and induce \((\hat{t}, \hat{c}, \hat{N})\) as the equilibrium. \(\hat{B}\) is the limit of the right-hand side of (A.6) as \(\mu \to 0\).

The intuition behind this result is that since the government is in position to extract rents from the lobby, it offers a contribution menu that makes the lobbying cost equal to the industry's after-tax profits less some minimum to ensure firm entry and participation by the lobby, at least in the neighborhood of the policy package that the government finds optimal. This sets the marginal cost of lobbying for a trade policy equal to its marginal benefit for the lobby and allows the government to guide the lobby's contribution toward its own choice by making that option slightly more attractive for the lobby. This result is the same as the "local truthfulness" property that Grossman and Helpman (1994) find for political contribution schedule when the lobby chooses it. Whether it is the politicians or the lobby, the agent choosing the schedule can do best by ensuring that the politicians capture the marginal contribution of their policies to the industry rents.
References


