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# Costly Revenue-Raising and the Case for Favoring Import-Competing Industries

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## Abstract

A standard finding in the political economy of trade policy literature is that we should expect export-oriented industries to attract more assistance than import-competing industries. In reality, however, trade policy is heavily biased toward supporting import industries. This paper shows within a standard protection for sale framework, how the costliness of raising revenue via taxation may make export subsidies less desirable and import tariffs more desirable. The model is then estimated and its predictions are tested using U.S. tariff data. An empirical estimate of the costliness of revenue-raising is also obtained.

**Journal of Economic Literature Classification:** F13, F16

**Keywords:** Protection for sale, tariffs, trade protection

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## 1. Introduction

Trade policy is mainly import protection, whether we look at industrialized or developing countries. While economists have come up with many reasons to explain departure from free trade, most of these reasons, such as the optimal tariff argument or strategic trade policy arguments, cannot explain the occurrence of trade protection across a great variety of countries and industry structures. The only theoretical branch with a potential to explain why almost every country tries to influence trade flows in a vast array of different industries is the political economy of trade policy literature. The problem with this literature, however, is that it usually comes to the conclusion (Rodrik 1995) that export promotion should be more pronounced than import protection, a result very much at odds with empirical facts.

It has been argued that the costliness of tax collection compared to tariff collection (from now on called costly revenue-raising) may explain why import tariffs are more prevalent than export subsidies.[1] In this paper, I investigate this possibility in a protection for sale framework. The protection for sale model (Grossman and Helpman 1994) has by now become the new paradigm in the political economy of trade policy literature, and it is thus a natural choice to view the problem of costly revenue-raising in this setting.

The protection for sale model has been tested for the United States and other countries and has been found to fit the data well. Studies for the U.S. (e.g., Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000), and Eicher and Osang (2002) to name the most influential) typically use non-tariff barrier (NTB) coverage ratios as protection measures, despite the fact that the theoretical protection for sale model was developed for tariffs. The cited reason for this digression from theory is that tariff levels are set in multilateral negotiations, whereas the protection for sale model assumes that trade policy can be set unilaterally by the domestic government.

In order to investigate the importance of costly revenue-raising in this paper, I break with the tradition of using NTB coverage ratios, and use tariff data instead. The main reason is, of course, that many NTB measures do not create governmental revenue. Moreover, it is common knowledge that NTB coverage ratios, by the very manner in which they

[1]For example, Riezman and Slemrod (1987) document that tariff rates are increasing in proxies of relative tax collection costs for a cross-section of countries in 1977.

are constructed, can only provide very imperfect measures of how strongly protected an industry is. For example, compare two industries that both only produce one product. For one product, a technical standard applies which could be considered a trade impediment, but in practice may have very little influence on imports. For the other product, an import ban prevents the import of this good from abroad. Yet, when we compare trade policy restrictiveness based on NTB coverage ratios, we find that both industries are equally protected, with an NTB coverage ratio of 100%. Hence, we have to question whether using NTB coverage ratios in lieu of tariffs when testing the protection for sale model yields reliable results.

Yet, the problem remains that tariffs are set in multilateral negotiations. This problem may not be as big as it may seem at first glance, though. Trade liberalization negotiations start from the status quo of unilaterally-set tariffs and then seek to lower tariffs from this start level. Oftentimes, the goal of negotiations is to achieve a percentage tariff cut that applies equally to all industries (e.g., the proposed tariff cut in the GATT Kennedy Round was 50%). If such a tariff cut comes through, the structure of pre-negotiation tariffs will be preserved. Moreover, governments usually succeed in getting exemptions from tariff cuts for industries for which trade policy intervention is deemed especially important. This then further preserves or even deepens existing inter-industry tariff variations.

In this paper, I show that the protection for sale model explains U.S. tariff data very well once costly revenue-raising is incorporated into the model. I obtain very precise estimates of how costly it is to raise revenue by means other than a tariff. It is further demonstrated that if costly revenue-raising is ignored, the protection for sale model performs poorly when confronted with U.S. tariff data. The conclusion is that costly revenue-raising can be considered a major determinant of the observed bias toward supporting import-competing industries.

The paper is organized as follows: in Section 2, it is shown how costly revenue-raising alters the equilibrium trade policy results of the protection for sale model. In Section 3, it is tested whether costly revenue-raising can account for part of the observed bias toward import protection, using data from U.S. manufacturing. Section 4 concludes.

## 2. Theoretical Model

2.1. **Basic setup.** In the following, I augment Grossman and Helpman's (1994) protection for sale model, from now on called GH model, to allow for costly revenue-raising.

As in the original GH model, I assume a small country with $n+1$ industries facing an exogenous vector of world prices. The country owns fixed amounts of industry-specific capital $K_i$, where $i = 1, \ldots, n$. Labor is supplied inelastically by the country's population. The population size is fixed at $L$. While labor cannot leave or enter the country, it is perfectly mobile between all domestic industries $i$, where $i = 0, \ldots, n$. Industries $i = 1, \ldots, n$ are the industries of interest; i.e., the industries which may be subject to trade policy. Each of them produces a single, tradable good using labor and sector-specific capital according to a linearly homogeneous and weakly concave production function $F_i$. Industry 0 produces a numeraire good from labor with a one-to-one technology, $F_0 = L_0$. Good 0 is traded freely; i.e., its trade is never subject to any trade policy intervention. Clearly, the world market price of good 0, which is normalized to 1, fixes the wage rate. Production in the numeraire industry thus provides a buffer for the other industries: Any labor set free in the non-numeraire industries can find employment in sector 0, and any additional labor needs in other sectors can be met by withdrawing labor from the numeraire sector without affecting wages.

On the consumption side, it is assumed that all individuals have identical quasilinear preferences. The utility function for any individual is the sum of his good 0 consumption and strictly concave and increasing transformations of the consumption of each of the non-numeraire goods 1 to $n$.[2] Quasilinearity of preferences implies that the indirect utility function of any individual is additively separable into an income and a price component. Specifically, indirect utility can be written as the sum of income and consumer surplus $V_i$ from consumption of good $i$ where $i$ goes from 1 to $n$.

Costly revenue-raising is modelled as follows: the domestic government raises a certain revenue amount from a per-capita tax, import tariffs, and export taxes. Raising the per-capita tax is costly, i.e., in order to have a certain amount $X$ available from the per-capita tax, the government has to raise an amount $L_f(X)$ which exceeds $X$. Here, we can

[2] It is assumed that each individual has enough income to consume all goods; i.e., corner solutions are excluded.

think of the difference $L_f(X) - X$ as some additional labor input requirement for raising the tax which the government formally pays, but whose cost is covered by raising the tax amount accordingly. In the end, the costliness of taxation reduces the labor input available in the numeraire sector 0. For simplicity, the function $L_f(X)$ is assumed to be linear in $X$, namely $L_f(X) = cX$, where $c > 1$. The government uses the tax revenue to finance export and import subsidies as well as provide a service to the population. Here, this service is treated as if it were a simple hand-out of available funds, distributed evenly among the population.

In some of the industries, but not the numeraire industry 0, capital owners are active lobbyists that solicit trade protection from the domestic government. Each lobby offers the government a schedule that lists its contributions as a function of the domestic price vector $p$. The domestic price vector $p$ may differ from the world price vector $p^*$ if the domestic government imposes a vector $t$ of specific import or export tariffs or subsidies. Hence, if $p_i^*$ denotes the world market price of good $i$, then the domestic price is $p_i = p_i^* + t_i$. Suppose good $i$ is an import good. Then $t_i > 0$ ($t_i < 0$) means that an import tariff (import subsidy) is imposed. In contrast, if good $i$ is an export good, then $t_i > 0$ ($t_i < 0$) implies an export subsidy (export tax). The lobbies' goal is to maximize their members' income. The part of income that depends on the chosen price vector consists of profits, consumer surplus, and per-capita tax. Notice that imposing an export tax or an import tariff reduces the necessary poll tax amount whose raising is costly. The government maximizes the weighted sum of total contributions and aggregate welfare by choice of the trade policy vector. Here, the weight on aggregate welfare is denoted by $a$. Contributions $C$ receive a weight of 1. I assume that contributions do not form part of the funds which the government uses for providing services to the citizens, so contributions cannot be used directly to decrease the costly poll tax.

The solution to the lobbying game follows the findings in GH. The equilibrium tariff vector is described by the following conditions: It maximizes the government's utility function, and it maximizes the sum of governmental utility and the utility of any lobby. The number of conditions is thus equal to the number of lobbies plus one. A corollary of this result, as pointed out by GH, is that the equilibrium tariff can alternatively be calculated by maximizing the weighted sum of domestic welfare and the welfare of the different active lobby groups.[3] It is easy to show that the corresponding weights are $a$ for domestic welfare and 1 for the welfare of each lobby, or put differently, the weights are $a$ for the welfare of population groups not represented by lobbies and $1 + a$ for the welfare of lobbies.

2.2. **Equilibrium trade policy.** Before investigating the case with lobbying, it seems worthwhile to look at the equilibrium trade policy which emerges when the domestic government simply maximizes domestic welfare. Given quasilinear utility, domestic welfare is the sum of consumer surplus $V_j$ from consuming the non-numeraire goods $j = 1, \ldots, n$ and domestic income. Income consists of the value of production $p_j F_j$ in industries $j = 0, \ldots, n$ and trade policy revenue $t_j M_j$ for goods $j = 1, \ldots, n$; i.e., the government maximizes

$$\sum_{j=1}^{n} V_j + \sum_{j=0}^{n} p_j F_j + \sum_{j=1}^{n} t_j M_j.$$

Here, $M_j > 0$ denotes imports and $M_j < 0$ exports of good $j$. To see that costly revenue-raising has an impact on domestic welfare, write out the production value in the numeraire industry 0, noting that this industry produces one unit of output from one unit of labor and that its price is normalized to 1, and further noting that costly revenue-raising reduces the amount of labor used in industry 0. Domestic welfare is given by

$$\sum_{j=1}^{n} V_j + \sum_{j=1}^{n} p_j F_j + [L - \sum_{j=1}^{n} L_j - (c-1)(T - \sum_{j=1}^{n} t_j M_j)] + \sum_{j=1}^{n} t_j M_j.$$

The term in brackets is the production value in the numeraire industry, and $T$ stands for the revenue amount the government would have to raise if no trade taxes (subsidies) were levied (granted); i.e., $T$ is the amount necessary to provide the public service. Rearranging slightly, domestic welfare equals

$$\sum_{j=1}^{n} V_j + \sum_{j=1}^{n} \Pi_j + (1-c)T + c \sum_{j=1}^{n} t_j M_j,$$

where $\Pi_j$ stands for profits in industry $j$. The above expression shows that the costliness of raising revenue via taxes puts an additional weight $c$ on tariff revenue. Simplifying and omitting all components that do not depend on $t_i$, the government chooses $t_i$ (where $i = 1, \ldots, n$) to maximize

$$W_G = V_i + \Pi_i + c t_i M_i.$$

[3] The GH model thus provides micro foundations for the political support function approach where the welfares of different groups in society receive differing weights in the governmental objective function.

The welfare maximizing trade policy for sector $i$ is hence

$$t_i^G = -\frac{(c-1)M_i}{cM_i'}. \tag{2.1}$$

To sign this expression, I make use of the standard assumption $M_i' < 0$. If revenue-raising were not costly, then $c = 1$ and free trade would emerge, the usual result for small countries that free trade is optimal. However, since income from trade policy can be used to lower the necessary tax amount, the government will impose an import tariff ($t_i^G > 0$) on import goods ($M_i > 0$), whereas for export goods ($M_i < 0$) an export tax ($t_i^G < 0$) is optimal. This means that even for the simple case of domestic welfare maximization, introducing costly revenue-raising induces incentives to favor import-competing industries and to hurt exporting industries.

To better understand the outcome of the protection for sale lobbying game, it is reasonable to look at the trade policy measures that lobby groups would set if they could unilaterally do so. It has been shown elsewhere (Matschke 2004) that the equilibrium trade policy vector of the protection for sale model can be viewed as a weighted average of the unilaterally optimal tariffs of the players of the lobbying game. Viewing these tariffs separately provides a better understanding of the forces that finally determine the equilibrium trade policy.

If capital owners of industry $k$, where $k \neq i$, could set the trade policy instrument for sector $i$, they would do so to maximize[4]

$$W_k = \theta_k c t_i M_i + \theta_k V_i,$$

where $\theta_k$ is the population share of capital owners in industry $k$. The solution to this maximization problem is

$$t_i^k = -\frac{M_i}{M_i'} + \frac{D_i}{cM_i'}, \tag{2.2}$$

where $D_i$ stands for demand of good $i$. When $c = 1$, we see that other industries desire an import subsidy or export tax for industry $i$ depending on whether $i$ is an import-competing or exporting industry. This changes, however, once the case of costly revenue-raising $c > 1$ is considered. It is easy to see that (2.2) is negative for $M_i < 0$; i.e., exporting industries would be left with an export tax if the other lobbies could decide trade policy for sector $i$.

[4]Here and in the following, I leave out all welfare components that do not depend on $t_i$.

However, due to the additional costs of subsidies, it is no longer clear whether the outcome would be an import subsidy for import-competing industries.

Turning to the interests of capital owners in industry $i$ itself, note that

$$W_i = \Pi_i + \theta_i c t_i M_i + \theta_i V_i,$$

which is maximized by

$$t_i^i = -\frac{1-\theta_i}{\theta_i c}\frac{F_i}{M_i'} - \frac{c-1}{c}\frac{M_i}{M_i'}. \tag{2.3}$$

If revenue-raising were not costly, capital owners in $i$ would want an import tariff (for $M_i > 0$) or export subsidy (for $M_i < 0$). Costly revenue-raising reinforces the case for an import tariff, whereas it is no longer clear whether industry $i$ would want an export subsidy for its own good.

I now address the solution of the lobbying game itself. Denote by $\Theta$ the percentage of all lobbies in the population. I begin with the case that industry $i$ lobbies. As was stated earlier, the equilibrium trade policy instrument $t_i^*$ maximizes $a$ times domestic welfare plus the sum of all lobby welfares, i.e.

$$a(V_i + \Pi_i + ct_iM_i) + \Pi_i + c\theta_i t_i M_i + \theta_i V_i + (\Theta - \theta_i)ct_iM_i + (\Theta - \theta_i)V_i. \tag{2.4}$$

The equilibrium trade policy instrument when industry $i$ lobbies is thus implicitly given by

$$t_i^* = -\frac{1-\Theta}{a+\Theta}\frac{F_i(t_i^*)}{M_i'(t_i^*)c} - \frac{c-1}{c}\frac{M_i(t_i^*)}{M_i'(t_i^*)} \tag{2.5}$$

or equivalently

$$t_i^* = -\frac{1-\Theta}{a+\Theta}\frac{F_i(t_i^*)}{M_i'(t_i^*)} + \frac{c-1}{c}\left[\frac{1+a}{a+\Theta}\frac{F_i(t_i^*)}{M_i'(t_i^*)} - \frac{D_i(t_i^*)}{M_i'(t_i^*)}\right].$$

If $c = 1$, import-competing lobbies would receive an import tariff and exporting industries would receive an export subsidy. But for $c > 1$, import-competing industries always receive an import tariff, whereas it is not clear whether exporting industries will end up with an export subsidy. It is also easy to show that the optimal trade policy is increasing in demand $D_i$ if industry size (as measured by output $F_i$) and the slope of the import demand curve are held constant. Notice that the derivative with respect to $D_i$ of the first-order maximization condition for (2.4) is

$$(a + \Theta)(c - 1) > 0$$

and has the same sign as $\frac{dt_i^*}{dD_i}$ as long as the second-order condition of maximization holds.[5] In particular, this means that any potential export subsidy would not match the import tariff in size for two otherwise equal industries, one import-competing and one exporting.

It remains to analyze the case where capital owners of industry $i$ do not lobby. In this case, the equilibrium trade policy instrument maximizes

$$a(V_i + \Pi_i + ct_iM_i) + \Theta ct_iM_i + \Theta V_i. \tag{2.6}$$

The equilibrium trade policy instrument for sector $i$ when its capital owners do not lobby is thus given by

$$t_i^* = \frac{\Theta}{a+\Theta}\frac{F_i(t_i^*)}{cM_i'(t_i^*)} - \frac{c-1}{c}\frac{M_i(t_i^*)}{M_i'(t_i^*)}, \tag{2.7}$$

or, equivalently, by

$$t_i^* = \frac{\Theta}{a+\Theta}\frac{F_i(t_i^*)}{M_i'(t_i^*)} + \frac{c-1}{c}\left[\frac{a}{a+\Theta}\frac{F_i(t_i^*)}{M_i'(t_i^*)} - \frac{D_i(t_i^*)}{M_i'(t_i^*)}\right].$$

If $c = 1$, import-competing lobbies would receive an import subsidy and exporting industries would receive an export tax. For $c > 1$, the case for an export tax is reinforced, but it is no longer clear whether import-competing industries will have to bear an import subsidy. It is once again easy to show that the optimal trade policy is increasing in demand $D_i$, holding $F_i$ and $M_i'$ fixed; i.e., industries of the same size (as measured by their output $F_i$) receive higher $t_i^*$ as demand increases.[6] In particular, any export tax put on goods of an exporting industry will exceed the corresponding import subsidy (if any) for an import-competing industry of equal size; i.e., import-competing industries will be favored over exporting industries.

## 3. Econometrics

To estimate the model and test its predictions, I use data for U.S. manufacturing industries in 1983 described in Matschke and Sherlund (2005). The tariff rates and political action committee (PAC) contributions were provided by Kishore Gawande and are described in Gawande (1995). Data on imports and exports were taken from the NBER trade and immigration data base, shipments and value-added from the NBER productivity data base

[5]Notice that with costly revenue-raising, it is no longer clear that $\frac{dt_i^*}{dF_i} > 0$, holding $D_i$ and $M_i'$ constant; i.e., bigger industries in terms of output do not necessarily receive more protection.

[6]Notice that for $t_i^* < 0$, an increase in $D_i$ implies a smaller export tax or smaller import subsidy.

by Bartelsman and Gray (1996). Elasticity estimates come from the study by Shiells, Stern, and Deardorff (1986). Data on instruments[7] were provided by Daniel Trefler; see Trefler (1993) and Matschke and Sherlund (2005). When merging the data from the different sources, 194 four-digit SIC manufacturing industries are left. Summary statistics for the key variables are reported in Table 1.

The econometric model follows directly from equations (2.5) and (2.7). Let indicator variable $I_i$ take on value 1 if industry $i$ capital owners lobby and value 0 otherwise. The protection equation can then be rewritten in a unified form as

$$t_i^* = [1 - \frac{a}{(a+\Theta)c}]\frac{F_i}{M_i'} - \frac{1}{(a+\Theta)c} I_i \frac{F_i}{M_i'} - \frac{c-1}{c}\frac{D_i}{M_i'}. \tag{3.1}$$

In order to rewrite (3.1) in terms of observables, transform the equation to

$$t_i^* \tilde{M}_i' = [\frac{a}{(a+\Theta)c} - 1]\tilde{F}_i + \frac{1}{(a+\Theta)c} I_i \tilde{F}_i + \frac{c-1}{c}\tilde{D}_i, \tag{3.2}$$

where $\tilde{F}_i$ denotes the value of shipments minus exports[8] and $\tilde{D}_i$ denotes the value of domestic consumption in industry $i$. The expression $t_i^* \tilde{M}_i'$ is calculated as $-t_i^* p_i M_i' = \frac{\tau_i^*}{1+\tau_i^*} e_i \tilde{M}_i$, where $\tau_i^*$ is the equilibrium ad valorem tariff rate, $e_i = -\frac{M_i' p_i}{M_i}$ is the absolute price elasticity of import demand, and $\tilde{M}_i$ is the value of imports. In the literature, the import demand elasticity is often included as part of the dependent variable to account for the fact that it is a generated (i.e. estimated) variable; see Goldberg and Maggi (1999) for a discussion. I follow a similar procedure here by including $\tilde{M}_i'$, which is calculated using the estimated import demand elasticity, on the left-hand side. The estimation equation thus becomes

$$t_i^* \tilde{M}_i' = \beta_1 \tilde{F}_i + \beta_2 I_i \tilde{F}_i + \beta_3 \tilde{D}_i + \epsilon_i, \tag{3.3}$$

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[7]The instrumental variables include factor shares (defined as factor revenues divided by production value) for physical capital, inventories, engineers and scientists, white-collar labor, skilled labor, semiskilled labor, unskilled labor, cropland, pasture, forest, coal, petroleum, and minerals. Other instruments include seller concentration, seller number of firms, buyer concentration, buyer number of firms, scale, capital stock, unionization, geographic concentration, and tenure.

[8]Subtracting exports to calculate $\tilde{F}_i$ is necessary since exports are not sold at the domestic, tariff-inclusive price.

where according to theory

$$\beta_1 = \frac{a}{(a+\Theta)c} - 1 < 0,$$
$$\beta_2 = \frac{1}{(a+\Theta)c} > 0,$$
$$\beta_3 = \frac{c-1}{c} > 0,$$
$$\beta_1 + \beta_2 + \beta_3 = \frac{1-\Theta}{(a+\Theta)c} \geq 0.$$

The basic GH specification without costly revenue-raising results when $c = 1$, so that $\beta_3 = 0$. Notice that all coefficient signs can be predicted, and moreover, we know that $\beta_1 + \beta_2 + \beta_3$ should be positive. All structural parameters are exactly identified; namely, $c = \frac{1}{1-\beta_3}$, $\Theta = -\frac{\beta_1+\beta_3}{\beta_2}$, and $a = \frac{1+\beta_1}{\beta_2}$.

I estimate and compare the basic GH specification with the cost-of-funds specification derived in this paper. Several complications arise in estimating these models. First, components of the explanatory variables are endogenously determined, thereby suggesting that instrumental variable techniques be used. A second complication arises because certain components of the explanatory variables are constructed; i.e., based on data, it must be decided which of the industries are politically organized and lobby for trade policy, which is always to a certain extent arbitrary. It is therefore necessary to explore the sensitivity of the results to different variable formulations.

Standard theory suggests that domestic production for the home market is increasing in a tariff and should therefore be treated as an endogenous explanatory variable in the econometric model. Moreover, domestic consumption is decreasing in a tariff, and the political organization variable is most likely also endogenous. Therefore, I use a two-stage least squares framework where the explanatory variables $\tilde{F}_i$, $I_i\tilde{F}_i$, and $\tilde{D}_i$ are instrumented in the first stage.

In the second-stage regression, the model is estimated without a constant because theory predicts that there should not be a constant term. Including a constant creates a problem since the model estimated with $t_i^*\tilde{M}_i'$ as the dependent variable is no longer equivalent to the model with $\frac{\tau_i^*}{1+\tau_i^*}$ (which is equal to $\frac{t_i^*}{p_i}$) as the dependent variable. This then puts into question the validity of the obtained structural parameter estimates. The omission of a constant term is also in line with the procedure in Goldberg and Maggi (1999) and Eicher and Osang (2002). In any case, in the sensitivity analysis I also report results where a constant term is included in the second-stage regression.

Table 2 reports two-stage least squares estimation results for the cost-of-funds specification and the simple GH specification. All explanatory variables were instrumented for, using essentially the same instruments as Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000), and Matschke and Sherlund (2005): a constant, unionization, factor shares, concentration ratios, scale, capital stock, tenure, capital-labor ratio, and geographic concentration.[9] To infer which industries are organized, I regress political action committee contributions divided by value-added on a constant and calculated deadweight losses[10] from protection divided by value-added interacted with 2-digit SIC dummy variables. If the parameter estimate for a 2-digit SIC interaction variable is positive, I assume that all industries within this 2-digit SIC classification lobby. This is supported by theory since in the protection for sale model, contributions of lobbies should be higher the higher the deadweight loss that results from an industry's lobbying.

As shown in table 2, the results are highly supportive of the cost-of-funds specification: All reduced-form parameter estimates have the right signs and are statistically significant at the 1% level. The point estimates add up to a positive number, which is in line with $\beta_1 + \beta_2 + \beta_3 \geq 0$. The null that $\beta_3 = 0$ is strongly rejected. The structural parameter estimates look very good as well.[11] As with other studies, I find that the estimate of the weight on domestic welfare in the governmental welfare function is high: The point estimate of 112.26 is very close to the estimate reported in Goldberg and Maggi (1999), where NTB coverage ratios were used to measure trade protection. At 38.75%, the point estimate for the percentage of the population represented by lobbies $\Theta$ seems quite reasonable and lies between the estimates reported in Eicher and Osang (2002) on the low side and Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000) on the high side. The cost parameter $c$ is very precisely estimated at 1.04: This result suggests that raising one dollar of governmental revenue via alternative taxes costs 4 cents more than raising one dollar by

[9] $F$-statistics for the first-stage regressions were all significant at the 1% level. Hence, we do not have to worry about weak instruments.

[10] I use the formula $\frac{1}{2}\tilde{M}_i e_i(\frac{\tau_i^*}{1+\tau_i^*})^2$, given, e.g., in Vousden (1990), p. 49, for linear demand and supply to approximate the deadweight loss.

[11] Standard errors for the structural parameters were calculated using the delta method.

means of a tariff. The 95% confidence interval for $c$ stretches from 1.01 to 1.07; i.e., the results indeed suggest a positive cost of revenue-raising. That the estimate is quite close to 1 is not surprising, either. We would expect the marginal cost estimate of fund-raising to be substantially larger when looking at developing countries that heavily depend on income from trade restrictions (Kubota 2005). Yet, the results indicate that even in the U.S., the cost of raising funds still has a significant effect on trade protection.

Results for the simple GH specification show that the tariff data do not support the basic protection for sale model.[12] Whereas both coefficients are significantly different from 0 at the 5% level, the estimate of $\beta_1$ has the wrong sign. As a consequence, the point estimate of $\Theta$ is negative. The results for the simple GH specification, contrary to the cost-of-funds specification, thus do not provide strong support for the protection for sale model when tariff data are used as protection measure.

As a check on the robustness of the results, I first consider two alternative ways of creating the capital lobby indicator variable. In one specification, I follow the procedure in Gawande and Bandyopadhyay (2000). To determine which industries are organized, I regress political action committee contributions divided by value-added on a constant and import penetration ratios interacted with 2-digit SIC dummy variables. If the parameter estimate for a 2-digit SIC interaction variable is positive, I assume that all industries within this 2-digit SIC classification lobby. In another specification, I divide PAC contributions by value-added and then use a simple cutoff of 0.001: Industries where PAC contributions divided by value-added exceed this cutoff value are considered to be organized lobbies. This procedure is somewhat similar to the procedure in Goldberg and Maggi (1999) except that they use gross contributions to determine the cutoff value. Columns 2 and 3 in Table 3 report the results when the alternative indicator variables are used. These results are very similar to the original specification. All parameter estimates have the right signs and are statistically significant. Both the point estimates of $\Theta$ and $a$ are somewhat higher than the original estimates when the Gawande-Bandyopadhyay-like indicator is used and somewhat lower when the Goldberg-Maggi-like estimator is used, whereas the cost estimate of revenue-raising remains at a level of 4–5 cents per dollar.

[12]This is contrary to the results with NTB coverage ratio data for the U.S. in 1983 which support the basic protection for sale model, as shown by Goldberg and Maggi (1999), Gawande and Bandyopadhyay (2000), Eicher and Osang (2002), and Matschke and Sherlund (2005).

Using all three alternative lobby indicator specifications, I then consider an alternative protection measure; namely, the tariff levels from the tariff data set assembled by Chris Magee, which was downloaded from `http://www.internationaldata.org`. The estimates obtained with these data (columns 4 to 6 of Table 3) are also very similar to the original results and provide very strong support for the cost-of-funds specification. They also show how robust the cost estimates of revenue-raising are. Compared to the results obtained when using the Gawande tariff data, the cost estimates increase slightly to 5–6 cents per dollar.

As a final robustness test, I consider all three capital indicator specifications, but now estimate the model with a constant. The results are reported in columns 7 to 9 of Table 3. In two of the three specifications, the estimate of $\beta_0$ is significantly different from 0. The estimates of $\beta_1$, $\beta_2$, and $\beta_3$ all have the right signs; however, $\beta_2$ is no longer significant at standard significance levels except for one specification. Whereas the structural parameter point estimates are comparable to the ones obtained earlier, almost all estimates for $\Theta$ and $a$ lose statistical significance. The estimate of $c$, however, remains highly statistically significant in all specifications, and the point estimates are almost identical to those obtained in the estimation without a constant. This underlines the importance of accounting for costly revenue-raising in the estimation.

## 4. Conclusion

This paper shows how introducing costly revenue-raising (i.e., the marginal cost of raising additional revenue exceeds unity) into a standard protection for sale model may explain why, in general, import-competing industries receive more trade policy support than exporting industries. This cost-of-funds specification of the protection for sale model, when tested using 1983 U.S. tariff data, finds strong empirical support, quite in contrast to the basic Grossman-Helpman model which is not supported by the tariff data. The point estimate of the additional cost of raising one dollar in taxes as compared to raising one dollar in tariffs lies between 4 and 5 cents, with the lower boundary of 95% confidence intervals for this cost always exceeding 0. Costly revenue-raising has a significant effect on tariff levels, all else being equal. The policy implication is that part of the bias toward import protection can be explained by the fact that import tariffs raise governmental revenue and as such reduce the need for costly revenue-raising via taxes.

TABLE 1. Summary Statistics

| Variable | Unit | Mean | Median | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|---|
| import tariff Gawande | fraction | 0.058 | 0.052 | 0.049 | 0.000 | 0.419 |
| import tariff Magee | fraction | 0.053 | 0.052 | 0.042 | 0.000 | 0.419 |
| shipments | $ million | 5258.1 | 14266.0 | 2414.3 | 73.1 | 182591.8 |
| imports | $ million | 557.1 | 1595.4 | 167.5 | 0.2 | 17482.5 |
| exports | $ million | 493.1 | 1534.1 | 141.5 | 0.0 | 18779.5 |
| import demand elasticity | absolute value | 1.590 | 1.421 | 1.053 | 0.042 | 8.028 |
| PACCORP | $ million per contributing firm | 0.0264 | 0.0135 | 0.0273 | 0.0032 | 0.1551 |

Table 2. Estimation Results

| Parameter | Grossman-Helpman Specification | Cost-of-Funds Specification |
|---|---|---|
| $\beta_1$ | .0007** | −.0441*** |
| | (.0003) | (.0159) |
| $\beta_2$ | .0098*** | .0085*** |
| | (.0026) | (.0024) |
| $\beta_3$ | – | .0408*** |
| | | (.0145) |
| $\Theta$ | −.0677* | .3875* |
| | (.0408) | (.2037) |
| $a$ | 101.68*** | 112.26*** |
| | (26.67) | (32.21) |
| $c$ | – | 1.0426*** |
| | | (.0157) |

Heteroscedasticity robust standard errors in parentheses.

Superscripts $^{***}, ^{**}, ^{*}$ indicate significance at 1%, 5%, and 10% levels, respectively.

TABLE 3. Sensitivity analysis

| | Gawande tariff, no constant | | | Magee tariff, no constant | | | Gawande tariff, constant | | |
|---|---|---|---|---|---|---|---|---|---|
| parameter | $DWL/VA$ | $M/F$ | cutoff | $DWL/VA$ | $M/F$ | cutoff | $DWL/VA$ | $M/F$ | cutoff |
| $\beta_0$ | - | - | - | - | - | - | 15.21** | 11.50 | 20.69*** |
| | | | | | | | (6.81) | (7.49) | (7.64) |
| $\beta_1$ | -.0441*** | -.0501*** | -.0524** | -.0601*** | -.0655*** | -.0676*** | -.0421*** | -.0472*** | -.0469** |
| | (.0159) | (.0173) | (.0211) | (.0125) | (.0134) | (.0177) | (.0159) | (.0174) | (.0199) |
| $\beta_2$ | .0085*** | .0070*** | .0156*** | .0078*** | .0065*** | .0143*** | .0058 | .0052* | .0039 |
| | (.0024) | (.0019) | (.0042) | (.0025) | (.0019) | (.0040) | (.0036) | (.0029) | (.0059) |
| $\beta_3$ | .0408*** | .0461*** | .0483** | .0554*** | .0601*** | .0622*** | .0388*** | .0434*** | .0433** |
| | (.0145) | (.0158) | (.0192) | (.0113) | (.0122) | (.0162) | (.0145) | (.0159) | (.0182) |
| $\Theta$ | .3875* | .5819** | .2573* | .6101*** | .8388*** | .3779*** | .5735 | .7510 | .9436 |
| | (.2037) | (.2539) | (.1317) | (.2273) | (.2628) | (.1327) | (.4245) | (.4580) | (1.4042) |
| $a$ | 112.26*** | 136.25*** | 60.65*** | 120.96*** | 144.19*** | 65.25*** | 165.85 | 184.55* | 246.93 |
| | (32.21) | (37.50) | (16.43) | (39.72) | (43.70) | (18.50) | (102.59) | (105.59) | (380.94) |
| $c$ | 1.0426*** | 1.0483*** | 1.0508*** | 1.0586*** | 1.0639*** | 1.0663*** | 1.0404*** | 1.0453*** | 1.0452*** |
| | (.0157) | (.0173) | (.0212) | (.0161) | (.0138) | (.0184) | (.0156) | (.0174) | (.0199) |
| # org. industries | 108 | 150 | 141 | 108 | 150 | 141 | 108 | 150 | 141 |

Heteroscedasticity robust standard errors in parentheses.

Superscripts $^{***}$, $^{**}$, $^{*}$ indicate significance at 1%, 5%, and 10% levels, respectively.

## References


Bartelsman, E. J., and W. Gray (1996): "The NBER Manufacturing Productivity Database," NBER Technical Working Paper #205.

Eicher, T., and T. Osang (2002): "Protection for Sale: An Empirical Investigation: Comment," *American Economic Review*, 92, 1702–1710.

Gawande, K. (1995): "Are U.S. Nontariff Barriers Retaliatory? An Application of Extreme Bounds Analysis in the Tobit Model," *Review of Economics and Statistics*, 77, 677–688.

Gawande, K., and U. Bandyopadhyay (2000): "Is Protection for Sale? Evidence on the Grossman-Helpman Theory of Endogenous Protection," *Review of Economics and Statistics*, 82, 139–152.

Goldberg, P. K., and G. Maggi (1999): "Protection for Sale: An Empirical Investigation," *American Economic Review*, 89, 1135–1155.

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

Kubota, K. (2005): "Fiscal Constraints, Collection Costs, and Trade Policies, " *Economics and Politics*, 17, 129–150.

Matschke, X. (2004): "Labor Market Rigidities and the Political Economy of Trade Protection," Manuscript, University of California-Santa Cruz.

Matschke, X., and S. M. Sherlund (2005): "Do Labor Issues Matter in the Determination of U.S. Trade Policy? An Empirical Reevaluation," *American Economic Review*, forthcoming.

Riezman, R., and J. Slemrod (1987): "Tariffs and Collection Costs," *Weltwirtschaftliches Archiv*, 123, 545–549.

Rodrik, D. (1995): "Political Economy of Trade Policy," in *Handbook of International Economics*, ed. by G. Grossman, and K. Rogoff. North Holland, 1457–1494.

Shiells, C. R., R. M. Stern, and A. V. Deardorff (1986): "Estimates of the Elasticities of Substitution between Imports and Home Goods for the United States," *Weltwirtschaftliches Archiv*, 122, 497–519.

Trefler, D. (1993): "Trade Liberalization and the Theory of Endogenous Protection," *Journal of Political Economy*, 101, 138–160.

Vousden, N. (1990): *The Economics of Trade Protection*. Cambridge: Cambridge University Press.