

Lobbying influence in international trade: protection for sale.

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Major Paper presented to the
Department of Economics of the University of Ottawa
in partial fulfillment of the requirements of the M.A. Degree

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Ottawa, Ontario

December 2013

Abstract

Lobbying contributions affect international trade policies. This paper presents theoretical and empirical analysis of lobbying contributions in international trade. The main focus is on the seminal protection for sale model by Grossman and Helpman (1994). This model predicts the relationships between the level of protection and the import penetration ratio. Protection is positively related to import penetration for politically unorganized sectors and negatively related for the organized ones.

We suggest that the model should include other factors that influence international trade policies to make the analysis more accurate. We analyze the inclusion of nontariff barriers, contributions to influence domestic policies, endogenous lobby formation, endogenous protection, non-political factors, asymmetric information and lobbying competition.

In most cases, the empirical tests of the model demonstrate a negative parameter for the level of protection for unorganized sectors and a positive parameter for organized sectors. We suggest new methods and instruments to identify the effect of lobbying influence in international trade. New instruments can be used in order to obtain unbiased and robust parameters.

Keywords: Lobbying influence, International trade, Protection for sale, Endogenous protection.

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Introduction

A seminal paper by Grossman and Helpman (1994) developed a general equilibrium model of international trade: the protection for sale. The model explains the level of protection based on microeconomic foundations.¹ Maximization of consumers' utility functions, industries profits and government payoff leads to the elegant first-order conditions which describe the equilibrium. In this equilibrium the tariffs are explained by elasticities, ratio of domestic output to imports, percentage of the population that owns specific factor production and the weight the government attaches to lobbying groups. A modified Ramsey rule explains why industries with high import demand or export supply elasticities will have smaller ad valorem deviations from free trade.

Protection for sale is a two-stage model where interests of organized industries are represented by lobbies. In the first stage, these lobbies make implicit offers to incumbent authorities that represent contributions related to the trade policies. In the second stage, the authorities set the policy, including import and export taxes and subsidies, maximizing the social welfare of all voters and the contributions from lobbies.

The difference between this model and the previous literature on political competition is that the contributions do not influence the political outcome. Instead contributions influence trade policy. This new approach made the protection for sale model a workhorse in international trade.

The main advantage of the model is that it can predict the relationship between the level of protection and the import penetration ratio. The formula obtained in the model relates an industry's equilibrium protection to the state of its political organization, the ratio of domestic output in the industry to net trade, and the elasticity of import demand or export supply. There is

¹ They use the seminal model of Bernheim and Whinston (1986). This model was initially designed for the purposes of industrial organization.

a positive relation between protection and the import penetration for politically organized industries but a negative relationship for industries not politically organized (Grossman & Helpman, 1994).

The first goal of this paper is to suggest theoretical modifications to the model. These modifications serve to improve empirical testing of the model and add realism. We suggest to substitute nontariff barriers for tariffs to facilitate empirical analysis, make the distinction between contributions to influence domestic and trade policy and correct the negative protection for unorganized industries that is never reported. In addition, we include a quantile-based approach that does not need explicit political contributions, add endogenous lobby formation and endogenous protection, include the analysis of other types of political variables that influence government decisions that do not include money, and finally incorporate the case of asymmetric information and competition between lobbies.

Secondly, we suggest different empirical approaches to test the protection for sale model. The model has received extensive empirical treatments. To prove if there is a different level of protection based on political contributions, these treatments include an organizational dummy variable. The variable is one if the sector is organized and zero if the sector is unorganized. The empirical studies established a positive parameter of protection for organized sectors and a negative parameter of protection for unorganized sectors. The challenge involves the interpretation of the Grossman and Helpman results, the decision of whether or not a sector is organized, the derivation of the econometric model to be tested, the method to estimate the parameters, the control for endogeneity, the difficulty to find standardized data on the subject and the measurement errors in the estimation. Even though the methods and techniques change from one model to another the majority of these extensions confirmed the original predictions of

the model. The protection provided to all politically organized industries increases with the relative weight the government attaches to campaign contributions and falls with the fraction of voters that belong to an unorganized lobby group.

However, all these modifications create concerns with respect to the instruments used and the method of estimation. Empirical models include instrumental variables to avoid the endogeneity problem². Most models do not analyze the problem of weak instruments. Our conclusion is that in many cases the instruments fail to correct the endogeneity problem. Therefore, we analyze approaches for more reliable instruments. We also suggest and discuss a new method of estimation, the limited information maximum likelihood (LIML) which can replace the traditional two stage least squares (TSLS). The main empirical contribution of this paper is the importance of the analysis of the methods used to validate the results of the model. Without this analysis, the impact of contributions on protection tariffs is incomplete.

The structure of the paper is as follows. Section 1 gives a brief theoretical review behind the protection for sale model. Section 2 develops the mathematical insight to reach the testable result of the model. Section 3 presents considerable theoretical modifications to the original model and other approaches to test variables that influence trade. Section 4 gathers the empirical efforts to prove the protection for sale final result. Section 5 analyzes the main econometric instruments to test the model. Finally Section 6 concludes the paper with some directions for future research.

² The problem of endogeneity occurs when the independent variable is correlated with the error term in a regression model. Political organized groups look for an increase in protection but also an increase in protection will lead to an increase in political organized sectors. This implies that the regression coefficient is biased leading to a misinterpretation of the parameters obtained.

1. Literature review

The first approach in the trade literature explains competition between political groups in order to obtain benefits through trade policies (Hillman & Ursprung, 1988). This framework was developed when protection in industrialized countries changed from unilateral import restrictions to bilateral negotiated voluntary export restraints (VERs). Using this mechanism a country could avoid some restrictions imposed by international trade regulators and protect its export sector. Under this scheme firms will choose to support the candidate who maximizes their expected profits taking into account the rival candidates and the policy to which they had committed.

The second approach, the political-support approach, suggests that authorities choose protective levels on the basis of political support (Hillman, 1982). With this premise, incumbent authorities maximize their goal of being re-elected. In this approach contributions do not enter explicitly; instead they reflect the support by special interests.

Both approaches conclude that the political organization plays an important role in trade policy. Grossman and Helpman (1994) adapt this conclusion into the determination of trade protection. The structure of trade protection includes the groups of interest represented by lobbies and incumbent politicians. The second approach of political support is the one that suits better the Grossman and Helpman protection for sale model.

In the literature several concerns have been raised with respect to the protection for sale model. Facchini (2006) introduced a formal use of nontariff barriers with imperfect rent capturing. The model also distinguishes between contributions to influence domestic and trade policy and the unusual result of getting positive protection without contributing (Ederington & Minier, 2008).

Imai et al. (2013) proposed a model where there is no necessity to make a subjective decision to distinguish which sector contributed to politicians.

We also studied the lobby formation process and endogenous protection (Mitra, 1999). The lobby formation process and endogenous protection are not explicitly related to contributions. Instead they are linked to government's reputation, people's opinions and emotions (Oljemark, 2009). Martimort and Semenov (2007; 2008) proposed that any model that includes two agents must be analyzed under asymmetric information and allowing competition among lobbies.

The protection for sale model has received empirical support. Several studies have estimated the equation derived by the protection for sale model and found that the parameter estimates follow the pattern predicted by the model (Eicher & Osang, 2002; Evans & Sherlund, 2011; Gawande & Bandyopadhyay, 2000; Gawande, Krishna, & Robbins, 2006; Goldberg & Maggi, 1999; McCalman, 2004). These approaches differ in methods and instruments. We include an analysis of the instruments used in the empirical studies (Gawande & Li, 2009).

In the next section we will develop the main structure of the Grossman and Helpman model.

2. The model

The model developed by Grossman and Helpman (1994) starts with the description of a small economy with individuals who have the same preferences but different endowments. Each individual maximizes his utility given by

$$u = x_o + \sum_{i=1}^n u_i(x_i), \quad (1)$$

where x_o is the consumption of good 0 and x_i is the consumption of good i , $i = 1, 2, \dots, n$. The utility functions $u_i(\cdot)$ are differentiable, increasing, and strictly concave. Good 0 is the numeraire

good with an international and domestic price of one. The demand of good i is $d_i(p_i)$ which is the inverse of $u'_i(x_i)$.³ The indirect utility of an individual with endowment E is given by

$$V(\mathbf{p}, E) = E + s(\mathbf{p}), \quad (2)$$

where $\mathbf{p} = (p_1, p_2, \dots, p_n)$ is the vector of prices and $S(\mathbf{p})$ is consumer surplus

$$S(\mathbf{p}) = \sum_{n=i}^{\infty} u_i[d_i(p_i)] - \sum_{n=i}^{\infty} p_i d_i(p_i). \quad (3)$$

There are $n + 1$ inputs; good 0 is manufactured with labor only while the non-numeraire goods require labor and a sector specific input. Good 0 has an input output technology equal to one. Since the wage rate is one, the aggregate reward for firms to the specific factor used in producing good i depends only on the domestic price (Grossman & Helpman, 1994, p. 837). We denote this reward by $\pi_i(p_i)$.

The government obtains revenue from trade taxes. A higher domestic price compared to the international price represents an import tariff for a good that is imported, while a lower domestic price represents an export subsidy for the one that is exported. The net revenue obtained by the government on a per capita basis is given by

$$r(\mathbf{p}) = \sum_{n=i}^{\infty} (p_i - p_i^*) \left[d_i(p_i) - \frac{1}{N} y_i(p_i) \right], \quad (4)$$

where p_i is the domestic price while p_i^* is the exogenous world price. N measures the total voting population and $y_i(p_i) = \pi'_i(x_i)$ is the domestic output of good i derived by Hotelling's Lemma. We assume that $r(\mathbf{p})$ is transferred to each individual.

In addition, individuals obtain income from three sources: wages, government transfers and ownership of a sector input. The earnings of the individuals who have ownership in different sectors will be affected by the domestic price of the good. These individuals have the possibility

³ We use quasi-linearity of utility functions.

to join forces for political activity. We denote L as the specific factor sector who organized themselves into lobby groups. These lobbies organize campaign giving decisions and inform the political offers to the incumbent authorities. The rest of individuals will free ride from these lobbies if they are involved in the same input factor activities but do not contribute to the campaigns.

The lobby from the organized sector will offer a contribution related to the trade policy vector of the government. This contribution schedule is denoted $C_i(\mathbf{p})$. This schedule will maximize the total welfare of its members (total welfare = income + consumer surplus – contributions). The joint welfare of the members of the lobby group i is $V_i = W_i - C_i$ where W_i is their gross-of-contributions welfare:

$$W_i(\mathbf{p}) = \ell_i + \pi_i(p_i) + \alpha_i N [r(\mathbf{p}) + s(\mathbf{p})], \quad (5)$$

where ℓ_i is the total labor supply and labor income of the owners and α_i is the fraction of the voting population that owns some of this factor.

The government's objective function, G , is composed of incumbent authorities that maximize their wealth related to contributions and aggregate welfare:

$$G = \sum_{i \in L} C_i(\mathbf{p}) + aW(\mathbf{p}) \quad a \geq 0, \quad (6)$$

where W represents the aggregate gross-of-contributions welfare.

In the first stage lobbies choose simultaneously political contributions. In the second stage the government sets policy. The equilibrium is given by the contribution function $\{C_i^\circ(p)\}$ for each organized lobby group given the schedules set by the other groups and the anticipated political optimization by the government. \mathbf{p}° is the domestic price vector that maximizes the objective function of the government given the contributions schedules.

2.1 The structure of protection

In order to characterize the equilibrium in the trade-policy game the contribution function and the price vector must satisfy the following conditions⁴:

$(\{C_i^\circ\}_{i \in L}, \mathbf{p}^\circ)$ is a subgame-perfect Nash equilibrium of the trade-policy game if and only if:

- (a) C_i° is feasible for all $i \in L$;
- (b) \mathbf{p}° maximizes $\sum_{i \in L} C_i(\mathbf{p}) + aW(\mathbf{p})$;
- (c) \mathbf{p}° maximizes $W_j(\mathbf{p}) - C_j(\mathbf{p}) + \sum_{i \in L} C_i^\circ(\mathbf{p}) + aW(\mathbf{p})$ for every $j \in L$;
- (d) for every $j \in L$ there exists a $\mathbf{p}^j \in L$ that maximizes $\sum_{i \in L} C_i^\circ(\mathbf{p}) + aW(\mathbf{p})$ such that $C_j^\circ(\mathbf{p}^j) = 0$.

Condition (a) establishes that the contribution schedule chosen by the lobby groups is feasible. Condition (b) assures that the government maximizes its welfare given the contribution by the lobbies. Condition (c) states that for every lobby j the equilibrium price vector must maximize the joint welfare of that lobby and the government, taking into account the contributions of the other lobbies. This forbids a lobby to change its contribution, knowing the others contributions, in order to obtain the entire surplus from this policy switch.

The model assumes that political contributions are differentiable at least around the equilibrium point \mathbf{p}° . Thus, we have the first-order condition:

$$\nabla W_j^\circ(\mathbf{p}^\circ) - \nabla C_j^\circ(\mathbf{p}^\circ) + \sum_{i \in L} \nabla C_i^\circ(\mathbf{p}^\circ) + a \nabla W(\mathbf{p}^\circ) = 0 \text{ for all } j \in L. \quad (7)$$

The government maximization of G requires the first-order condition to be:

$$\sum_{i \in L} \nabla C_i^\circ(\mathbf{p}^\circ) + a \nabla W(\mathbf{p}^\circ) = 0. \quad (8)$$

Therefore, combining equation (7) and (8) we obtain,

⁴ To define the equilibrium structure of the lobbying game, Grossman and Helpman (1994) use the model by Bernheim and Whiston (1986).

$$\nabla C_i^\circ(\mathbf{p}^\circ) = \nabla W_i(\mathbf{p}^\circ) \text{ for all } i \in L. \quad (9)$$

Equation (9) represents that the contribution is locally truthful around \mathbf{p}° . Intuitively local truthfulness states that,

Each lobby sets its contribution schedule so that the marginal change in the contribution for a small change in policy matches the effect of the policy change on the lobby's gross welfare. In other words, the shapes of the schedules reveal the lobbies' true preferences in the neighborhood of the equilibrium. (Grossman & Helpman, 1994, p. 840)

Adding over i equation (9) and substituting the result into equation (8) we obtain,

$$\sum_{i \in L} \nabla W_i(\mathbf{p}^\circ) + a \nabla W(\mathbf{p}^\circ) = 0. \quad (10)$$

Equation (10) characterizes the equilibrium domestic prices.

According to Bernheim and Whinston (1986), individuals bear no cost from playing these strategies because the set of best responses to any strategies played by the opponents include a strategy that is truthful⁵. There is an equilibrium in truthful strategies which is the truthful Nash equilibrium (TNE). The equilibrium price of any TNE satisfies

$$\mathbf{p}^\circ = \operatorname{argmax}_{\mathbf{p} \in P} [\sum_{j \in L} W_j(\mathbf{p}) + aW(\mathbf{p})]. \quad (11)$$

The importance of equation (11) is that, given the truthful contribution schedule, the government will maximize the social-welfare function differently for individuals represented by a group lobby and those who are not. The weight for the individuals with a lobby is $1 + a$ while the weight for groups without a lobby is a .

Now we study three effects of a marginal price change. These cases are: the effect on various groups, the effect on the gross welfare of the entire groups of individuals and finally the effect on aggregate welfare.

⁵ Truthful strategy: in which players truthfully reveal their type at the beginning of each period.

The effect of a price change on the various groups is expressed by,

$$\frac{\partial w_i}{\partial p_j} = (\delta_{ij} - \alpha_i)(y_j(p_j)) + \alpha_i(p_j - p_j^*)m_j'(p_j), \quad (12)$$

where $m_j(p_j) \equiv Nd_j(p_j) - y_j(p_j)$ is the net import demand function and δ_{ij} is an indicator variable that is equal to one when $i = j$ and zero otherwise. An increase in the domestic price above the free-trade level represents gains to lobby i . In addition, lobby i benefits when there is a decrease of price of any other good as m_j' is negative.

Now we analyze the effect on the gross welfare of organized groups. We add up this equation for $i \in L$,

$$\sum_{i \in L} \frac{\partial w_i}{\partial p_j} = (I_j - \alpha_L)y_j(p_j) + \alpha_L(p_j - p_j^*)m_j'(p_j), \quad (13)$$

where $I_j \equiv \sum_{i \in L} \delta_{ij}$ is an indicator that equals one if the industry is organized and zero otherwise. $\alpha_L \equiv \sum_{i \in L} \alpha_i$ is the fraction of total population who is represented by a lobby. Equation (13) reveals that, starting from free-trade prices, individuals of an organized industry benefit from an increase in the domestic price of any good and also from a decrease in the price of any good produced by an unorganized industry.

The third effect is on aggregate welfare,

$$\frac{\partial W}{\partial p_j} = (p_j - p_j^*)m_j'(p_j), \quad (14)$$

which demonstrates that the deadweight loss grows as the economy deviates from free trade. Substituting equation (13) and (14) into (10) leads to the political equilibrium expressed in terms of the equilibrium trade taxes and subsidies,

$$t_i^\circ \equiv (p_i^\circ - p_i^*)/p_i^*. \quad (15)$$

With equation (15) we reach our final equilibrium which allows us to interpret the exact relation between lobby contributions and trade policies:

$$\frac{t_i^\circ}{1 + t_i^\circ} = \frac{I_i - \alpha_L}{a + \alpha_L} \left(\frac{z_i^\circ}{e_i^\circ} \right) \text{ for } i = 1, 2, \dots, n, \quad (16)$$

where $z_i^\circ = y_i(p_i^\circ)/m_i(p_i^\circ)$ is the ratio of domestic output to imports and $e_i^\circ = -m_i^\circ(p_i^\circ)p_i^\circ/m_i(p_i^\circ)$ is the elasticity of import demand or elasticity of export supply. Industries that have high import demand or export supply elasticities will have less ad valorem deviations from free trade. Another consideration related to the deadweight loss is that all organized sectors receive protection by import tariffs or export subsidies in the political equilibrium. However, trade policies are applied to all sectors including the unorganized ones. Therefore, organized lobbies will look for an increase in price of domestic goods from which they receive benefits and a reduction in price from goods that they only consume.

What determines the political power of an organized sector is the ratio of domestic output to imports. The intuition of this result is that if domestic output is larger, specific-factor owners have more to gain from an increase in the domestic price, while the economy has less to lose from protection if the volume of imports is lower (Goldberg & Maggi, 1999).

Equation (16) is the main result derived in the model by Grossman and Helpman (1994) and is the base for the theoretical and empirical studies presented in this paper.

3. Theoretical extensions

In this section we examine theoretical modifications to the protection for sale model in order to improve its predictions.

3.1 Tariffs vs. Nontariff barriers with imperfect rent capturing

One of the main criticisms of the protection for sale model is that it uses protection tariffs while in recent years these tariffs have declined. Tariffs have been replaced by nontariff barriers (NTB). These nontariff barriers are measures that alter the price and quantities of trade flows, such as import quotas, health and safety standards, biased government procedures, lax antitrust enforcement and customs procedures. The main difference with a tariff is that the government does not capture the entire revenues with a nontariff barrier (Facchini et al., 2006).

Facchini et al. (2006) include the nontariff barriers with imperfect rent capturing. The authors tested the model and compared the results using NTB and tariffs. The model has similar characteristics as the original model of Grossman and Helpman.

Domestic price equals exogenous world market price plus import tariff or shadow value of quantity restriction represented by $p_i = p_i^* + t_i$. The quasi-linear additively separable utility function is $u = x_0 + \sum_{i=1}^n u_i(x_i)$. Individual demands are $x_i = d_i(p_i) \equiv (u_i')(p_i)$ for goods i and for the numéraire good is $x_0 = E - \sum_{i=1}^n u_i(x_i) p_i d_i(p_i)$. Domestic demand can be satisfied by domestic production or imports, $m_i = \phi_i(t_i) \equiv N d_i(p_i^* + t_i) - y_i(p_i^* + t_i)$ and it can be expressed as a quota q_i as, $t_i = \phi_i^{-1}(q_i)$. The respective payoffs received by each sector are given by equations (17) and (18),

$$W_i(t, q) = l_i + \pi_i(p_i^* + t_i) + \alpha_i N(r + s) \quad \forall_i \in T \quad (17)$$

$$W_i(t, q) = l_i + \pi_i(p_i^* + \phi_i^{-1}(q_i)) + \alpha_i N(r + s) \quad \forall_i \in Q, \quad (18)$$

where l_i is labor income, the second term is the reward of the specific factor and the third term is the share of sector i in total fiscal share revenue and total consumer surplus.

The government maximizes the following objective function:

$$G = \beta \sum_{i=1}^n W_i(t, q) + (1 - \beta) \sum_{i \in L} C_i(t, q). \quad (19)$$

The government chooses a policy vector that satisfies,

$$\frac{t_i}{1 + t_i} = \frac{I_i - \alpha_L}{\frac{\beta}{1 - \beta} + \alpha_L} \times \frac{z_i}{e_i} \quad \forall_i \in T \quad (20)$$

$$\frac{\Phi_i^{-1}(q_i)}{1 + \Phi_i^{-1}(q_i)} = \frac{1}{\gamma_i} \times \frac{I_i - \alpha_L}{\frac{\beta}{1 - \beta} + \alpha_L} \times \frac{z_i}{e_i} + \frac{1 - \gamma_i}{\gamma_i} \times \frac{z_i}{e_i} \quad \forall_i \in Q, \quad (21)$$

where I_i is a dummy variable that takes a value of one if the sector is organized, $\alpha_L = \sum_{i \in L} \alpha_i$ describes the fraction of population that is organized, the inverse of the import penetration ratio is $z_i = \frac{y_i}{m_i}$ and $e_i = -\frac{m_i' p_i}{m_i}$ is the absolute value of the elasticity of import demand.

Equations (22) and (23) are the econometric modifications to test this model,

$$\frac{t_i}{1 + t_i} e_i = \theta I_i \frac{y_i}{m_i} + \Psi \frac{y_i}{m_i} + \epsilon_{1i} \quad \forall_i \in T \quad (22)$$

$$\frac{\Phi_i^{-1}(q_i)}{1 + \Phi_i^{-1}(q_i)} e_i = \theta' I_i \frac{y_i}{m_i} + \Psi' \frac{y_i}{m_i} + \lambda + \epsilon_{2i} \quad \forall_i \in Q, \quad (23)$$

where $\theta = (1 - \beta)/[\beta + \alpha_L(1 - \beta)]$ and $\Psi = -[\alpha_L(1 - \beta)]/[\beta + \alpha_L(1 - \beta)]$ and correspondingly $\theta' = (1/\gamma) \theta$, $\Psi' = (1/\gamma) \Psi$ and $\lambda = -(1 - \gamma)/\gamma$. γ is the degree of rent capturing which is 72% of the potential rents that are actually appropriated by the U.S. government (Facchini et al., 2006).

The data for t_i and I_i were obtained from Gawande and Bandyopadhyay (2000). The NTB_i proxy for $\phi_i^{-1}(q_i)$ and (m_i/y_i) was obtained from Trefler (1993). Finally, the elasticities e_i were obtained from Goldberg and Maggi (1999).

Parameters $\frac{y_i}{m_i}$ and I_i are considered endogenous and they are corrected using instrumental variables. These instruments are: 12 production factors used as proxies for comparative advantage, proxies for the concentration in the upstream and downstream industries, proxies for the geographic and ownership concentration and proxies for the organization workforce (Facchini et al., 2006).

The results use maximum likelihood (ML) and minimum distance estimator (MDE) for equation (24):

Table 1				
Estimation of the augmented Grossman-Helpman model				
Dependent variable: $\frac{NTB}{1+NTB} \times e$				
VARIABLE	ML (1)	ML (2)	MDE (3)	MDE (4)
(y/m)	-0.0081** (0.0043)	-0.0053 (0.0055)	-0.0026** (0.0013)	-0.0022 (0.0027)
$(y/m) \times I$	0.0166*** (0.0045)	0.0157*** (0.0054)	0.0173*** (0.0018)	0.0190*** (0.0017)
β	0.983 (0.004)	0.988 (0.004)	0.982 (0.002)	0.985 (0.003)
α_L	0.489 (0.134)	0.338 (0.244)	0.149 (0.086)	0.117 (0.152)

** Values are statistically significant at 5% level while values with *** are statistically significant at 1% level. Standard errors are in parentheses.

Source: Facchini et al. (2006)

Columns (1) and (3) present the special case in which rent capturing is complete. Both methods of estimation for NTB's present a negative value for the first coefficient and a positive value for the second coefficient. The negative values of the first coefficient for columns (2) and (4) for the

incomplete rent capturing case are not statistically significant. The weight on aggregate welfare in the government's objective function β is 0.98 in all cases which is an average value compared to similar studies. The ML method estimates a 33.8% - 48.9% of population involved in trade-related lobby while the MDE method ranges between 11.7% to 14.9%. All these values are more consistent with the real share of the workforce employed in organized sectors which is slightly below 50% (Facchini et al., 2006).

The model developed by Facchini et al. (2006) extends the model by Grossman and Helpman by allowing imperfect rent capturing. The main predictions remained the same relative to the signs of coefficients and the high value of weight on aggregate welfare. The inclusion of NTB's explicitly in the model and the imperfect rent capturing decreased the percentage of people that own specific factors of production.

3.2 Domestic policies and positive protection for unorganized groups

In the protection for sale model there is no distinction between contributions to influence domestic policy and trade policy. Not all contributions are meant to affect tariffs and non-barrier tariffs. Secondly, the empirical studies prove that unorganized sectors receive positive trade protection while the theoretical prediction suggests that it should be negative. Ederington and Minier (2008) proposed theoretical modifications of the model that capture these problems.

The original model explains that any positive contribution from a sector will be given a value of one in the I_i dummy variable. This means, from data, that all sectors are organized and there is no distinction among them. However, contributions are made not exclusively for trade policy but also domestic policy. Ederington and Minier (2008) constructed a framework to differentiate between these two contributions based on two prices. First, the domestic consumer price of good

x_i is given by $p_i = p_i^w + \tau_i$ where p_i^w is the exogenous world price and τ_i is a trade tax/subsidy. Second, the producer price is given by $p_i^s = p_i^w + t_i + \tau_i$ where t_i is a production tax/subsidy. The net revenue for all taxes and subsidies is given by equation (24),

$$r(t, \tau) = \sum_i \{ \tau_i [D_i(p_i) - X_i(p_i^s)] - t_i [X_i(p_i^s)] \}. \quad (24)$$

Then, the lobbies maximize the joint welfare of their members. The joint welfare is a function of the rents to their input and their share of government transfers and consumer surplus,

$$\Omega_i(t, \tau) = \pi_i(p_i^s) + \alpha_i [r(t, \tau) + \delta(p)], \quad (25)$$

where α_i is the fraction of population that owns the input used to produce good i . Given the contribution C_i to the government, the lobby maximizes welfare $v_i = \Omega_i(t, \tau) - C_i(t, \tau)$. Then the government maximizes its welfare depending on voter welfare and contributions from organized lobbies,

$$v_G = \sum_{i \in L} C_i(t, \tau) + a \sum_i \Omega(t, \tau), \quad (26)$$

where L is the set of organized industries and a is the weight that the government places on aggregate welfare relative to political contributions (Ederington & Minier, 2008).

To simplify the analysis, Ederington and Minier (2008) followed Goldberg and Maggi (1999) and assumed that equilibrium policies are the outcome of a Nash bargaining equilibrium in that the joint surplus of all parties involved is maximized,

$$\Omega = \sum_{i \in L} \Omega_i(t, \tau) + a \sum_i \Omega(t, \tau). \quad (27)$$

Taking the derivative with respect to domestic policy yields the first order condition for domestic policy,

$$t_i = \frac{I_i - \alpha_L}{\alpha_L + a} \frac{X_i(p_i^S)}{X_i'(p_i^S)} - \tau_i, \quad (28)$$

where $\alpha_L = \sum_{i \in L} \alpha_i$ is the share of the population that is member of some lobby and I_i is a dummy variable that determines whether an industry is organized. Taking the derivative with respect to trade policy τ_i we obtain,

$$t_i = \frac{I_i - \alpha_L}{\alpha_L + a} \frac{X_i(p_i^S)}{-M_i'(p_i, p_i^S)} + t_i \frac{X_i'(p_i^S)}{-M_i'(p_i, p_i^S)}, \quad (29)$$

where $M_i(p_i, p_i^S) = D_i(p_i) - X_i(p_i^S)$ represents net import demand. Equation (29) expressed in ad-valorem terms provides the prediction tested in previous empirical literature,

$$\frac{\tau_i^\circ}{1 + \tau_i^\circ} = \frac{I_i - \alpha_L}{\alpha_L + a} \frac{z_i}{e_i} + t_i^\circ \frac{X_i'(p_i^S)}{M_i'(p_i, p_i^S)}, \quad (30)$$

where τ_i° is the ad-valorem tariff on good i , t_i° is the ad-valorem subsidy/tax, the inverse import penetration is $z_i = X_i/M_i$ and e_i is the absolute elasticity of import demand.

Equation (30) introduces a formal framework of domestic policy that was included before by other approaches in the error term. Therefore, in order to have valid estimates, cross sectional predictions need to include contributions to influence domestic policy. Then the main conclusion of the protection for sale model, where trade policy is a function of import penetration ratios and import elasticities, evolves to be conditional on the amount of domestic policy support. Nonetheless, the inclusion of domestic protection contributions generates an endogeneity problem and the data are not available in most of the cases. These problems should be solved in order to have a valid empirical approach.

There is also a puzzle that unorganized sectors receive positive protection while the model predicts that they should receive import subsidies and export taxes. This was solved by

introducing a constant term and/or adding an additive error term into the protection trade equation (Ederington & Minier, 2008). The trade protection equation is derived from the maximization of the joint welfare of the lobbies and the government. The simple addition is technically equivalent to assume deviations from the welfare-maximization behaviour. As a result, if additional political factors are to be introduced in the model they should be added into the welfare functions.

To integrate additional political factors into the protection for sale model we replace the assumption that governments maximize industry contributions and utilitarian social welfare by industry contributions and generalized utilitarian social welfare. The government welfare function that does not take into account domestic policies changes to equation (31),

$$v_G = \sum_{i \in L} C_i + \sum_i a_i \Omega_i, \quad (31)$$

where L is the set of organized industries and a_i is the weight that the government places on aggregate welfare on individuals in the i^{th} industry relative to political contributions. The original justification to include utilitarian social welfare in the government's objective function was to capture politician's attempt to maximize their re-election prospects (Grossman & Helpman, 1994).

We obtain the first order condition for trade policy maximizing the joint surplus of all parties:

$$\frac{\tau_i^\circ}{1 + \tau_i^\circ} = \frac{(I_i - \alpha_L) + (a_i - A)}{\alpha_L + A} \frac{z_i}{e_i}, i = 1, \dots, n, \quad (32)$$

where a_i is the weight the government places on the welfare of individuals in industry i and $A = \sum_i \alpha_i a_i$ is the average of the weight that the government places on societal welfare relative to industry contributions (Ederington & Minier, 2008). Deviations from free trade are positively

correlated with z_i/e_i . However, equation (32) does not predict that non-negative trade protection is decreasing in z_i/e_i for unorganized industries. Therefore, there is a distinction between the predictions when the political factors are introduced into the government welfare function and when they are appended to the equilibrium trade policy equation. Including this variable in the trade policy equation does not eliminate the endogeneity present in all the empirical approaches.

Both theoretical contributions of domestic policy instruments and political factors try to correct divergences between theory and empirical results. As suggested by Ederington and Minier (2008) the empirical evidence should consider including these adjustments.

3.3 A quantile-based test

Imai et al. (2013) proposed a modified approach of the protection for sale model. The main advantage of their modified model is that it does not require industries to be classified as organized or unorganized. This avoids endogeneity and bias related to the method of deciding if a sector is organized or not. The objective is to prove that politically organized industries should get higher protection than unorganized ones given the inverse import penetration ratio and other control variables. Their proposition essentially states that in the quantile regression of $t/(1+t)$ on z/e , the coefficient on z/e should be close to $\beta_1 + \beta_2$ at the quantile close to one. The quantile equation used by Imai (2013) is

$$Q_T\left(\frac{\tau}{Z}\right) = \alpha(\tau) + \beta(\tau), \quad (33)$$

where τ denotes quantile, $T = t/(1+t)$, $Z = z/e$, and Q_T is the conditional τ -th quantile function of T . If the protection for sale model is correct, it is expected that $\beta(\tau)$ converges to $\beta_1 + \beta_2 > 0$ as t approaches to one from below.

To test this prediction in the presence of possible endogeneity of Z , Imai et al. (2013) estimated equation (34) by using an IV quantile regression that includes the variables considered exogenous as instruments from Gawande and Bandyopadhyay (GB) (2000)

$$P(T \leq \tau) + b(\tau)Z|W = \tau, \quad (34)$$

where W is the set of instrumental variables.

The data used was obtained from Gawande and Bandyopadhyay (2000). t is measured by the nontariff barrier (NTB) coverage ratio, z is measured as the inverse of the ratio of total imports to consumption scaled by 10,000 and e is obtained from Shiells (1986).

The results obtained are summarized in Table 2. The results of the first column do not represent evidence to confirm the protection for sale model. The null hypothesis of $\beta(\tau) \leq 0$ cannot be rejected at high quantiles in favor of the one-sided alternatives. In fact as the quantile continues to increase, $\beta(\tau)$ is decreasing. The second column is a modification suggested by Gawande and Bandyopadhyay (2000) where they control for tariffs on intermediate goods (INTERMTAR) and NTB coverage of intermediate goods (INTERMNTB). The results do not change as all the values of $\beta(\tau)$ are less or equal to zero except for the last quantile (0.95). Columns (3) and (4) of Table 2 present the estimation results of equation (34) with and without the GB controls. As in the quantile regression, we cannot reject the null hypothesis of $b(\tau) \leq 0$ in favor of the one-sided alternative at high quantiles. The point estimates are not favorable towards the original model as the estimates of b at the high quantiles are negative except for that of the 95th percentile in column (3). As presented in column (5), similar results are obtained when we control for the capital-labor ratio.

Table 2					
Quantile regression and IV quantile regression results of $b(\tau)$					
τ (quantile)	QR 1 (1)	QR 2 (2)	IVQR 1 (3)	IVQR 2 (4)	IVQR 3 (5)
0.05	0.000 (0.000)	0.000 (0.002)	0.000 (0.927)	0.000 (0.000)	0.000 (0.165)
0.1	0.000 (0.000)	0.000 (0.026)	0.000 (0.000)	0.000 (0.048)	0.000 (0.23)
0.15	0.000 (0.000)	0.000 (0.028)	0.000 (0.000)	0.000 (0.516)	0.000 (2.128)
0.2	0.000 (0.000)	0.000 (0.055)	0.000 (0.000)	0.000 (0.407)	0.000 (0.997)
0.25	0.000 (0.000)	-0.034 (0.075)	0.000 (0.000)	-0.072 (0.295)	-0.061 (0.830)
0.3	0.000 (0.000)	-0.099 (0.078)	0.000 (0.000)	-0.099 (0.432)	-0.132 (1.233)
0.35	0.000 (0.000)	-0.018 (0.086)	0.000 (0.005)	-0.132 (0.260)	-0.043 (0.812)
0.4	0.000 (0.006)	-0.020 (0.104)	0.000 (0.139)	-0.195 (0.343)	-0.109 (0.949)
0.45	0.000 (0.043)	-0.025 (0.170)	0.000 (0.261)	-0.276 (0.723)	-2.860 (0.762)
0.5	-0.003 (0.090)	-0.032 (0.247)	-0.030 (0.763)	-0.227 (1.195)	-0.055 (1.244)
0.55	-0.016 (0.216)	-0.046 (0.419)	-0.108 (1.577)	1.336 (1.722)	-0.384 (1.535)
0.6	-0.046 (0.448)	-0.082 (0.533)	-0.456 (3.329)	1.762 (2.843)	-0.635 (2.539)
0.65	-0.089 (0.650)	-0.113 (0.713)	-0.096 (4.410)	-0.113 (3.565)	-0.764 (4.243)
0.7	-0.126 (1.018)	-0.125 (0.980)	-0.130 (4.522)	-0.125 (3.251)	-0.109 (3.753)
0.75	-0.174 (1.550)	-0.135 (1.126)	-1.062 (4.901)	0.012 (3.372)	-0.133 (3.468)
0.8	-0.258 (1.657)	-0.145 (1.460)	-0.258 (4.678)	0.042 (3.837)	0.845 (5.577)
0.85	-0.381 (1.959)	-0.157 (1.864)	-0.382 (3.805)	-0.157 (4.436)	-0.155 (6.685)
0.9	-0.505 (1.994)	-0.225 (2.337)	-0.515 (5.912)	-0.261 (6.613)	-0.222 (7.476)
0.95	-0.734 (1.927)	2.971 (2.390)	0.190 (7.070)	-0.348 (7.982)	-0.334 (7.729)
GB Controls	No	Yes	No	Yes	Yes + k/L

Standard errors are in parentheses.

Source: Imai et al. (2013)

At the end, regardless of the instruments used and whether there is a control for capital-labor ratios, the null hypothesis at the high quantiles cannot be rejected. The point estimates of $b(\tau)$ are mostly negative at high quantiles (Imai et al., 2013).

The results obtained do not support the protection for sale model. This suggests that the original model needs to be further developed to address the empirical inconsistencies pointed out in this approach. Without the requisite of data on political organization, the model can be tested in different countries and not only the United States.

3.4 Endogenous lobby formation and endogenous protection

Mitra (1999) contributed to the protection for sale model by analysing the endogenous lobby formation and endogenous protection. An organized industry is a consequence of different aspects in an industry. The level of protection also depends on industry characteristics and other political and economic factors.

Mitra (1999) explained the formation of lobbies by adding a new stage to the protection for sale model in which agents with common interests will decide whether or not to incur the costs of getting organized. In this stage, agents measure the benefits of organizing and the costs of remaining unorganized. In the second stage, the government sets trade policy to maximize a weighted sum of political contributions and overall social welfare. The problem is solved by working backwards starting by the second stage.

Equations (35) and (36) solve the second stage problem,

$$\frac{t_o^0}{1 + t_o^0} = \frac{\left(\frac{N}{\theta} - n\right)}{\left(\frac{Na}{\theta}\right) + n} \left(\frac{1}{\mu_o^0 e_o^0} \right) \quad (35)$$

$$\frac{t_u^0}{1 + t_u^0} = \frac{-n}{\left(\frac{Na}{\theta}\right) + n} \left(\frac{1}{\mu_u^0 e_u^0} \right), \quad (36)$$

where a is the weight the government attaches to aggregate social welfare relative to political contributions, N is the non-numeraire good, θ is the proportion of the population that owns some factor of production besides labor, n is the number of lobbies, t_o^0 is the ad valorem trade subsidy for organized groups, t_u^0 is the ad valorem trade tax for unorganized groups, μ is the ratio of imports or exports to domestic output and e is the price elasticity of import demand or export supply (Mitra, 1999).

Equations (35) and (36) determine that each organized group gains from a higher price for its own product and lower prices for products produced by other industries. Therefore, the tariff or export subsidy declines as the number of organized groups increases. For the same reason, the tax on the organized groups keeps increasing.

Having this result we return to the first stage where the decision of creating a lobby has to be made. Using comparative statistics Mitra (1999) concluded that the equilibrium trade subsidy for an organized group is no longer always positively related to the governments' affinity for political contributions. In some cases, the level of ad valorem protection turns out to be decreasing in this affinity. In addition, larger groups benefit less than the smaller groups from organizing. The reason is that when groups get larger, they consume a significant portion of their own product and do not like to pay a high price for it.

The endogenous protection determined that depending on industry characteristics they will determine their level of organization. Industries that have large capital stocks, face inelastic

demand functions, have very few capital owners and are geographically less dispersed are the ones that get organized in equilibrium (Mitra, 1999).

3.5 Non-political factors, asymmetric information and lobby competition

The protection for sale model is not free from the usual critiques of agency models. Oljemark (2009) in her theoretical survey of special interest groups and endogenous policies pointed out the necessity to increase the study on the motives behind the different agents. Treating all industries as isolated agents from each other that are only able to influence policies by economic means can be misleading. There are other options such as coercion, political influence in each party and reputation of the industry. With respect to the government, a hierarchical and heterogeneous administration has different stages of actions. Besides the bureaucratic procedures that a policy has to face, it also has the society as an actor. The emotions and feelings that a policy can generate in the people may be enough reason to bring down a measure. At the end, a common agency model like the protection for sale model needs to include these different edges.

For further development of the protection for sale model it is also interesting to broaden the analysis of asymmetric information. There is a lack of complete information among sectors, lobbies and industries that does not allow truthful strategies. Martimort and Semenov (2007) introduced asymmetric information on a decision maker's preferences in a common agency model. In this model, interest groups use nonlinear contribution schedules for two purposes: to compete for the agent's services, and to learn about his preferences.

Martimort and Semenov (2008) proposed that under asymmetric information, competition between interest groups leads to huge inefficiencies in policy choices. There always exists a strong bias towards the decision-maker's ideal point. If ideological uncertainty is sufficiently

large, transaction costs also become large. Interest groups might stop contributing and leave the decision maker free to pursue his own ideological views.

4. Empirical studies

4.1 Trade liberalization and endogenous protection

One of the first empirical approaches before the protection for sale model but highly important in trade liberalization and endogenous protection was developed by Trefler (1993). Trefler demonstrated that the theoretical prediction of a higher import competition and its consequence of an increase in the lobbying activity for protection of the domestic industries has to be analyzed simultaneously. Therefore, imports and protection have to be modeled simultaneously or there would be a downward bias of the impact of trade liberalization on imports.

The theory of endogenous protection is based on the equilibrium between supply and demand. First, the protection is demanded by lobby groups that measure their costs and benefits of these actions. Second, the supply comes from politicians who receive these benefits. The nontariff barriers (NTB) are the variables that will measure the benefits and costs for lobby groups and the supply of protection. In order to distinguish the lobby groups they are classified in business and labor.

The main contribution of Trefler (1993) was the endogenous analysis of protection and imports. First, the high level of protection will reduce imports. Second, an increase in protection is needed because there is a high level of imports. The way to solve this is to isolate the two effects by estimating an import equation and a NTB equation. The dependent variable in the import equation is import penetration defined as gross imports divided by domestic consumption. The

dependant variable in the NTB equation is the NTB coverage ratio which is the proportion of imports that have a nontariff barrier. The two equations are,

$$N = \begin{cases} M_{\gamma M} + X_N \beta_N + \varepsilon_N & M^* > 0, N^* > 0 \\ 0 & M^* > 0, N^* \leq 0 \\ 0 & M^* \leq 0 \end{cases} \quad (37)$$

$$M = \begin{cases} N_{\gamma N} + X_M \beta_M + \varepsilon_M & M^* > 0, N^* > 0 \\ 0 & X_M \beta_M + \varepsilon_M & M^* > 0, N^* \leq 0, \\ 0 & M^* \leq 0 \end{cases} \quad (38)$$

where N is a NTB coverage ratio, M is import penetration, X_N collects measures of the determinants of NTB's, X_M collects measures of factor endowments, ε_N and ε_M are a bivariate normal residual vectors, $N^* = M_{\gamma M} + X_N \beta_N + \varepsilon_N$ and $M^* = N_{\gamma N} + X_M \beta_M + \varepsilon_M$.

The restriction imposed for $M < 0$ then $N = 0$ is to assure that when import penetration is zero there is no lobby intervention for NTBs.

The data used corresponds to 1980 and 1983. The variation of import penetration in manufacturings equals $M_{1983} - M_{1980}$ and the structural parameters of the equation (38) are estimated using full information maximum likelihood estimation (FIML).

The results obtained by Trefler are presented in Table 3,

Table 3	
NTB equation	
Dependent variable: NTB's	Beta coefficient
Import penetration	0.11 [0.46]
Δ (import penetration)	1.74 [2.58]
Exports	-0.94 [-5.26]

T-statistic values are in square brackets.
Source: Trefler (1993)

Import penetration has a positive sign but a non-significant t-statistic. The variation in the import penetration has a large beta coefficient and a significant t-statistic. This means that a rise in import penetration leads to greater protection. The coefficient for exports is negative with a significant t-statistic. Export oriented industries do not lobby for protection because they do not have import competition or because intra-industry trade NTB's will evoke unwanted foreign retaliation (Trefler, 1993).

Trefler's estimation increases 10 times previous estimations for exogenous NTB's. This is a reduction of \$49.5 billion of U.S. manufacturing imports for 1983. The intuition behind the study conducted by Trefler is that in industries where import penetration used to be low and increased, the comparative advantage existed but has been eliminated.

4.2 Estimating protection for sale

The first and most cited empirical study of the protection for sale model was developed by Goldberg and Maggi (1999). This paper is the first approach to determine the theoretical conclusions by Grossman and Helpman.

The modified formula used by Goldberg and Maggi (1999) is

$$\frac{t_i}{1 + t_i} = \frac{I_i - \alpha_L}{\frac{\beta}{1 - \beta} + \alpha_L} \left(\frac{z_i}{e_i} \right). \quad (39)$$

The only difference between equation (39) and the original equation (16) is that the parameter a is replaced by $\frac{\beta}{1 - \beta}$. Both a and β represent the weight of welfare in the government's objective function. t_i is the ad valorem tariff on good i , e_i is the import-demand elasticity of good i , $z_i = \frac{X_i}{M_i}$ where X_i is the domestic output for good i and M_i is the imports of good i , $\alpha_L = \sum_{i \in L} \alpha_i$

represents the share of population that owns some specific factor, and I_i is a dummy variable that takes value one if the industry behind good i is organized and zero if it is not organized.

In order to proceed with the estimation, Goldberg and Maggi (1999) introduced an error term and specified its distribution. This error combines all the other variables that can influence protection but are left out of the model. Therefore, we need to estimate equation (41)

$$\frac{t_i}{1+t_i} e_i = \frac{I_i - \alpha_L}{\frac{\beta}{1-\beta} + \alpha_L} \left(\frac{X_i}{M_i} \right) + \epsilon_i \quad (40)$$

$$\frac{t_i}{1+t_i} e_i = \gamma \frac{X_i}{M_i} + \delta I_i \frac{X_i}{M_i} + \epsilon_i, \quad (41)$$

where $\gamma = \frac{-\alpha_L}{\frac{\beta}{1-\beta} + \alpha_L}$, $\delta = \frac{1}{\frac{\beta}{1-\beta} + \alpha_L}$ and the variables needed to estimate the model are t_i , e_i , I_i , and

$\frac{X_i}{M_i}$. As specified by Trefler (1993), Goldberg and Maggi (1999) measured protection using the coverage ratios for nontariff barriers. The original source of data for nontariff barriers (NTB) is the United Nations Conference on Trade and Development database on trade control measures. Even though, the model specifies for tariffs, the coverage ratios are the best available measures in the absence of reliable numbers on tariff equivalents and are the usual measures used in similar studies.

The import demand elasticities are obtained from Shiells et al. (1986), which is the only study that estimated elasticities at the 3-digit SIC level. The Standard Industrial Classification (SIC) is a system to classify products that is used to link the information of elasticities, imports, domestic products and tariffs for econometric estimations.

One of the main difficulties is to give an appropriate value to the politically organized dummy. The data was taken from the Political Action Committee (PAC). Contributions are positive for

all 3-digit SIC industries which implies that all sectors in the economy are organized. However, money contributions are not all destined to influence protection measures. The solution presented by Goldberg and Maggi (1999) is to divide the contribution level by a threshold. The dummy variable will be zero if the contribution level is lower than this threshold and I_i will be one if the contributions surpasses this threshold. The threshold chosen is 100 million dollars as the data shows that there is a natural break around this point. Many sectors contribute more than 130 million and others less than 90 million but few between these two values.

The inverse import penetration ratio $\left(\frac{X_i}{M_i}\right)$ is obtained from the National Bureau of Economic Research Trade and Immigration data file. All the data used for the analysis corresponds to 1983 and the estimation method is maximum likelihood. The results obtained are presented in Table 4.

Table 4	
Results from the basic specification (G-H model)	
Variable	Estimated value
$\frac{X_i}{M_i}$	-0.0093 (0.0040)
$\left(\frac{X_i}{M_i}\right) * I_i$	0.0106 (0.0053)
Implied β	0.986 (0.005)
Implied α_L	0.883 (0.223)

Standard errors are in parentheses.

Source: Goldberg and Maggi (1999)

The level of protection increases when there is an organized industry as the value changes from -0.0093 to 0.0106. The weight of welfare in the government's objective β is 0.986 while the fraction of the population represented by a lobby α_L is 0.883. The value of β of 0.986 with the standard error of 0.005 suggests that welfare considerations figure prominently in the government's objective. The high value of standard error for α_L does not allow a conclusive

relationship for the degree of people ownership in the sector. In addition, the values of β and α_L are located between zero and one even though it was not specified in the restrictions. All the results obtained are consistent with the Grossman and Helpman model as the relationship between protection and import penetration depends on the sector politically organized or unorganized (Goldberg & Maggi, 1999).

4.3 Protection for sale with intermediate goods

One of the main concerns related to the protection for sale model is the omission of variables that explain protection. Are lobby contributions the unique variable that influences a change in tariffs? Gawande and Bandyopadhyay (2000) tested a modified protection for sale model where they included new variables that influence protection, a different method of estimation and a way to deal with the endogeneity.

The first change to the original model is inclusion of two new variables. These variables are an average tariff on intermediate goods use in an industry (INTERMTAR) and the average NTB coverage of intermediate goods use in an industry (INTERMNTB). With the inclusion of a constant in the model, the equation to estimate is

$$\frac{NTB}{1 + NTB} = \alpha_0 + \alpha_1 \frac{z}{e} + \alpha_2 \left(I x \frac{z}{e} \right) + \alpha_3 INTERMTAR + \alpha_4 INTERMNTB + \epsilon_1. \quad (42)$$

One extra consideration done by the Gawande and Bandyopadhyay is the inclusion of the analysis of the deadweight loss (DWL). All else equal, the greater the dead-weight loss, the greater will be the political spending. The formula provided is

$$\frac{DWL}{VA} = 0.5 \left(\frac{t}{1+t} \right)^2 \frac{e}{z}, \quad (43)$$

where $\frac{DWL}{VA}$ is the deadweight loss as a fraction of value added, $1/z$ is imports as a fraction of value added, t is tariff of NTB protection, and e is the absolute own elasticity of import demand. As there is no measure for DWL the authors proposed the log of PAC spending as a proportion of value added $\ln(\frac{PAC}{VA})$. The stochastic version is

$$\ln \frac{PAC}{VA} = \beta_0 + \beta_1 \ln \frac{NTB}{1+NTB} + \beta_2 \ln e + \beta_3 \ln \frac{1}{z} + \beta_4 \ln DOWNSTREAMSHR + \beta_5 \ln DOWNSTREAMHERF + \beta_6 \ln HERF + \epsilon_2 , \quad (44)$$

where DOWNSTREAMSHR is the percentage of an industry's shipments used as intermediate goods in other industries, DOWNSTREAMHERF is the intermediate-goods-output buyer concentration and HERF is the Herfindahl index of firm concentration.

As it was mentioned in section 1, the protection for sale model is a two-stage game. In the first stage the options of tariffs that determine the lobby contributions are given to the government. In the second stage, the government maximizes its objective function given the contributions schedules and releases a policy vector. In this case, the optimal vector of trade taxes is endogenously determined with the amount of lobby contributions. Therefore, the cross industry trade tax equation (42) must be simultaneously estimated with the cross industry lobbying spending of equation (43). In addition, equation (45) is added to control for imports that are endogenously determined with trade tariffs

$$\frac{1}{z} = \delta_0 + \delta_1 \frac{NTB}{1+NTB} + X_M \Delta + \epsilon_3 . \quad (45)$$

The estimation is done using the method of two stage least squares. In the first stage, the three endogenous variables and their nonlinear transformations are estimated using as instruments the exogenous variables, their quadratic terms and their cross products taken two at a time.

The results obtained by Gawande and Bandyopadhyay (2000) are reported in Table 5,

Table 5		
Estimates from Aggregate U.S. NTBs		
Variable	Coefficient	Standardized beta coefficient
$\frac{z}{e}$	-3.088 (1.532)	-0.917
$I \times \frac{z}{e}$	3.145 (1.575)	0.912

Standard errors are in parentheses.

Source: Gawande and Bandyopadhyay (2000)

These results support the original predictions of Grossman and Helpman (1994) in which there is a negative sign for the coefficient of z/e and a positive sign for the coefficient of $I \times (z/e)$. Both results are significant with a t-student greater than 2. The beta coefficient that measures the weight of welfare in the government's objective β is 0.912. The high value of β is similar to the one of Goldberg and Maggi (1999) and suggests that welfare considerations figure prominently in the government's objective. There is no value reported for the fraction of population represented by a lobby α_L .

4.4 Direct contributions and incomplete information

Another interesting approach was developed by Eicher and Osang (2002) in which contributions are incorporated directly into the model and does not rely on the Truthful Nash Equilibria.

The two models developed are called the tariff function approach and the influence driven approach (Eicher & Osang, 2002, p. 1704). In the tariff function approach there are two antagonist sectors that make contributions. The first group seeks an increase in protection while the second group objective is a decrease in protection measures. The tariff outcome will be a result of this competition. A sector is protected if a dollar spent by the pro-protectionism group raises the tariff more than it declines due to a dollar spent by the anti-protectionists.

In the influence driven approach there is a twist to the original model.

For protected sectors, $I = 1$, the tariff rate should decrease in the import penetration ratio. This is because the larger the domestic output, the more owners of specific factors gain from an increase in the domestic price, while the economy as a whole incurs fewer inefficiency losses when the volume of imports is low, *ceteris paribus*. For unprotected sectors, the relationship between tariffs and import penetration is positive. (Eicher & Osang, 2002, p. 1705)

The two empirical models that are tested are the tariff function approach,

$$\frac{\tau_i^*}{\tau_i^*+1} e_i = a_2 \frac{C_i^S}{C_i^O} \frac{1}{z_i} + a_3 \frac{1}{z_i} + \varepsilon_{2i} . \quad (46)$$

and the influence driven contribution approach,

$$\frac{\tau_i^*}{\tau_i^*+1} e_i = a_4 I_i \frac{1}{z_i} + a_5 \frac{1}{z_i} + \varepsilon_{3i} , \quad (47)$$

where $\tau_i^* = \tau_i - 1$ is the tariff for good i , e_i is the import demand elasticity, C_i^S and C_i^O represent the respective expenditures of protection supporters and opponents, $z_i = \frac{X_i}{M_i}$ is the import penetration ratio and ε_{ji} is a disturbance term that captures the effect of omitted variables and measurement error.

Tariffs and the import penetration data were obtained from the same source of Trefler (1993). Import elasticities and the organized index were obtained and used under the same criteria as Goldberg and Maggi (1999). The contributions of supporters and opponents were organized under the different sector owners of factors and workers. Supporters of sector i include the owners of factors and workers from sector i , while the opponents are the owners of factors and workers from all other sectors. Hereafter, all the contributions in each sector are added and then divided by all the contributions of all sectors.

In order to control for endogeneity Eichner and Osang (2002) adopted the instrumental variables used by Goldberg and Maggi (1999). The estimation method used is the minimum distance estimation (MDE) and the results obtained are presented in Table 6.

Table 6		
Strictly theory-based tests of endogenous protection models		
Dependent variable $\frac{\tau_i^*}{\tau_i^* + 1} e_i$	Tariff function approach	Influence driven contributions approach
$\frac{1}{z_i}$	-0.0128 [6.30]	-0.0098 [4.3073]
$\frac{C_i^S}{C_i^O} \frac{1}{z_i}$	1.904 [6.998]	
$I_i \frac{1}{z_i}$		0.0374 [7.265]

T-statistic values are in square brackets and standard errors are not reported.
Source: Eichner and Osang (2002)

The coefficients obtained are significant at the 1 per cent level and the signs are the ones predicted by Grossman and Helpman (1994). With the inclusion of contributions, in both approaches, there is a large effect on the dependent variable. The weight that the tariffs assign to pro-protectionism is twice as much from those who are protectionism opponents. The weight assigned (λ) equals 0.66 and is obtained from the formula $T[\cdot] = \lambda(C^S)^2 - (1 - \lambda)(C^O)^2$.

The results obtained confirm that there is a crucial difference between organized and unorganized sectors and their results of import penetration and protection. The government weight on welfare β is 0.96 while the population that is represented by a lobby α_L is 0.26. This result is more realistic compared to the 0.88 obtained by Goldberg and Maggi (1999).

The results by Eicher and Osang (2002) share the main characteristics of the protection for sale model. Protection is greater in industries represented by lobbies and with lower import elasticities. Protection increases with import penetration in unorganized sectors and decreases in

organized sectors. In addition, the indicator variable of the existence of a lobby is more significant than the amount of lobby contributions when the tariff function and the influence driven contribution approaches are compared.

4.5 Tariffs introduction: The Australian case.

Another empirical analysis of the protection for sale model was done by McCalman (2004). In his study he performed the regression for two different years in order to determine a relationship for trade liberalization in Australia.

McCalman (2004) addressed three main problems with previous studies and used Australia as a perfect example to avoid these issues. The first problem is that tariffs are not used in the empirical approaches. Second, there is no space for a foreign regulator even though it always exists in trade policy. Finally, the original model is based on a small economy and the United States does not enter into this category. McCalman (2004) solved these problems by using tariffs that have an intervention from the GATT on Australia which is considered a small economy.

The equation used is

$$\frac{t_i}{1+t_i} e_i = \beta_1 \frac{y_i}{m_i} + \beta_2 I_i \frac{y_i}{m_i} + \sum_{j=1}^7 \beta_{j+2} D_j t_i^q + \varepsilon_i, \quad (48)$$

where $\beta_1 = \frac{-\alpha_L}{(a+\alpha_L)}$, $\beta_2 = \frac{1}{(a+\alpha_L)}$ and D_j is a dummy variable that equals one if an industry belongs to the group j and zero if not. The inclusion of this new dummy variable allows a variation in the coefficient due to different industries.

The ad valorem tariff on final goods (t_i), domestic output (y_i), and imports (m_i) were taken from the Industry Commission for the two periods 1968/69 and 1991/92. The ad valorem tariff on intermediate good (t^q) for 1968/69 was obtained from Industry Assistance Commission and

1992/92 from Industry Commission. The import demand elasticities for the two periods were taken from Sawers. The industry contribution index was constructed on the data given by the independent advisory body called the Tariff Board. As the legislation changed between 1940 and 1960 there were implemented some protective instruments as quantitative restrictions to achieve external balance. After 1960 tariffs emerged again as the major protective instruments. An industry was considered organized after it presented an inquiry to have its tariff revised after the change. This was the method to determine the organization or not of a sector.

McCalman also moved e_i to the left of the equation to control for endogeneity and measurement error. The method of estimation is a two-stage least squares that employs estimates of the political organization in a probit model (Goldberg & Maggi, 1999). The inverse import penetration ratio and the input tariff are both estimated using ordinary least squares. The two-stage least squares was chosen to avoid the correlation of variables with the error term such as the political organization, import penetration ratio and the tariff on the intermediate inputs. The instruments used are the ones that affect political organization (concentration ratio, number of firms, employment size, wage bill) and those that account for comparative advantage (physical capital, human capital and labor used in each sector).

The results obtained are presented in Table 7. As the original model predicted there is a negative sign for the coefficient β_1 and a positive sign for the coefficient β_2 . The results are statistically significant which confirms that the relationship between protection through tariffs and import penetration depends on whether the sector is organized or not. The variation of a , government's valuation of welfare relative to contribution, is not significant which implies no effect on trade liberalization. However, the percentage public represented by lobbies is 0.88 in 1968/69 which is the exact value obtained by Goldberg and Maggi (1999) and increases to 0.96 in 1991/92. For

this reason, McCalman (2004) thinks there is strong support to relate the changes in lobbying behaviour and the process of trade liberalization in Australia.

Table 7				
Model estimates				
	1968/69		1991/92	
Parameter	Estimate	t-statistic	Estimate	t-statistic
β_1	-0.022 (0.012)	-1.84	-0.022 (0.013)	-1.75
β_2	0.025 (0.013)	1.91	0.023 (0.013)	1.75
a	40.88 (14.63)		43.41 (21.36)	
α_L	0.88 (0.004)		0.96 (0.003)	

Standard errors are in parentheses.

Source: Gawande and Bandyopadhyay (2000)

Including trade liberalization in the original model of protection for sale was an innovative way to test the predictions made by Grossman and Helpman and find relationships in trade policies. Parameter signs were consistent with the theory.

4.6 Foreign lobbies

Another critique to the protection for sale model is that it does not provide predictions for the existence of foreign lobbies. As previously discussed, tariffs are not a result of a unilateral decision but multilateral negotiations. These negotiations include local as well as foreign lobbies. Gawande, Krishna and Robbins (2006) developed a model that includes the presence of foreign lobbies contributing to determine a tariff policy in the United States.

The model proposed by Gawande (2006) added the foreign lobby interaction in the original model as follows

$$\frac{t_i}{1+t_i} = \beta_1 \left[\frac{X_i}{m_i} \cdot \frac{1}{|\epsilon_i|} \right] + \beta_2 \left[I_i^h \cdot \frac{X_i}{m_i} \cdot \frac{1}{|\epsilon_i|} \right] + \beta_3 \left[I_i^f \cdot \frac{X_i}{m_i} \cdot \frac{1}{|\epsilon_i|} \right] + e_i, \quad (49)$$

where t_i is the effective ad valorem import tax, X_i is the aggregate production of i in the home economy, m_i is imports, ϵ_i is the import elasticity, I_i^h is the index for home based lobbies, I_i^f is the index for foreign based lobbies, e_i is the error term, $\beta_1 = \frac{2a}{a+\alpha}$, $\beta_2 = \frac{2}{a+\alpha}$ and $\beta_3 = \frac{-2b}{a+\alpha}$.

In this study both tariffs and NTB coverage ratios are used together to obtain the protection variable. The effective ad-valorem tariff rates were obtained from Professor Robert Feenstra's database maintained at <http://www.internationaldata.org> while the NTB were obtained from the UNCTAD and the World Bank. The import penetration ratio X_i/m_i was taken from the annual survey of manufactures. The import elasticity was taken from the study by Sheills, Stern and Deardorff (Gawande et al., 2006).

The domestic political organization dummy was also constructed based on thresholds. If the mean of domestic PAC spending per thousand dollars of sectorial value added was in excess of 0.05 or 0.10 the dummy was assigned the value of one. The period of the study was 1978-1982. For the foreign lobby the data was also organized by thresholds obtained from the Foreign Agents Registration Unit (FARA) from 1978 to 1982. There are four percentile thresholds based on the distribution of expenditures per unit value added and the results are reported under these thresholds. The dummy variable was assigned a value of one if that sector was in that percentile, 0th, 25th, 50th or 75th, for all the four years in the sample period (Gawande et al., 2006).

To control for endogeneity Gawande (2006) used the two-stage least squares for estimation. Industry endowments (such as capital stocks, inventories, labor stocks and industry natural resource use) are used to instrument for the import penetration ratio. Seller concentration ratios and unemployment levels are used to instrument for domestic political organization. The ratio of

exports by foreigners to the US to their worldwide exports in an industry is used to instrument for foreign political organization. In the first stage the right-hand-side variables are estimated using the instruments, their quadratic terms and their second-order cross-product terms. There was no variation for the second stage.

The results obtained are presented in Tables 8 and 9.

Table 8				
Model estimates				
Foreign Political Activity and Tariffs (1978 – 1982) Domestic threshold 0.05				
Parameter	0th Percentile	25th Percentile	50th Percentile	75th Percentile
β_1	-0.007 [0.606]	-0.011 [0.940]	-0.015 [1.265]	-0.015 [1.315]
β_2	0.259 [4.203]	0.334 [5.373]	0.359 [5.588]	0.347 [5.726]
β_3	-0.766 [1.305]	-0.241 [2.860]	-0.29 [3.282]	-0.286 [3.329]

T-statistic values are in square brackets and standard errors are not reported.

Source: Gawande et al. (2006)

Table 9				
Model estimates				
Foreign Political Activity and NTBs (1978 – 1982) Domestic threshold 0.05				
Parameter	0th Percentile	25th Percentile	50th Percentile	75th Percentile
β_1	-0.012 [0.578]	-0.015 [0.748]	-0.019 [0.950]	-0.019 [0.962]
β_2	0.308 [2.955]	0.442 [4.151]	0.461 [4.267]	0.443 [4.311]
β_3	-0.006 [0.061]	-0.263 [1.824]	-0.301 [2.022]	-0.283 [1.945]

T-statistic values are in square brackets and standard errors are not reported.

Source: Gawande et al. (2006)

In all cases where the threshold was 0.05, in Tables 8 and 9, the coefficients β_1 , β_2 and β_3 are statistically significant and with the sign expected. A positive β_2 implies that, holding everything else constant, domestic political presence leads to higher trade barriers. A negative β_3 implies

that foreign contributions are able to obtain lower tariffs. While the values approach the higher percentile the foreign coefficient tends to be higher.

Table 10				
Model estimates				
Foreign Political Activity and Tariffs (1978 – 1982) Domestic threshold 0.10				
Parameter	0th Percentile	25th Percentile	50th Percentile	75th Percentile
β_1	0.007 [0.576]	0.003 [0.197]	-0.004 [0.303]	-0.004 [0.341]
β_2	0.26 [2.689]	0.631 [4.031]	0.665 [4.258]	0.596 [4.532]
β_3	-0.062 [0.870]	-0.511 [3.108]	-0.564 [3.383]	-0.509 [3.523]

T-statistic values are in square brackets and standard errors are not reported.

Source: Gawande et al. (2006)

Table 11				
Model estimates				
Foreign Political Activity and NTBs (1978 – 1982) Domestic threshold 0.10				
Parameter	0th Percentile	25th Percentile	50th Percentile	75th Percentile
β_1	0.008 (0.429)	0.007 (0.379)	0.002 (0.105)	0.002 (0.119)
β_2	0.186 (1.243)	0.639 (2.736)	0.648 (2.861)	0.579 (2.921)
β_3	0.08 (0.730)	-0.436 (1.778)	-0.458 (1.891)	-0.396 (1.818)

T-statistic values are in square brackets and standard errors are not reported.

Source: Gawande et al. (2006)

The results for Tables 10 and 11 are computed for the domestic threshold 0.10. In this case, the values of β_1 are not significant which represents a value close to zero. The estimates suggest that the government formulates trade policy almost entirely on the basis of political contributions with no regards to welfare. The values of β_2 and β_3 are significant and have the same interpretation for the threshold of 0.05. A positive β_2 implies that, holding everything else constant, domestic political presence leads to higher trade barriers. A negative β_3 implies that foreign contributions are able to obtain lower tariffs.

Ceteris paribus, the results confirmed the original model, where tariffs and NTB coverage ratios are strongly positively correlated with the presence of organized import-competing lobbies and negatively related to organized foreign lobbies. Gawande (2006) contributed to the literature analyzing the existence of foreign lobbies, including data from actual tariffs and working with data divided into percentiles. What was not analyzed is the existence of multilateral policy settings such as the World Trade Organization (WTO) where governments negotiate over trade policies that are themselves influenced by domestic and foreign lobbies.

4.7 Antidumping measures

An additional analysis emerges when we use antidumping measures. Throughout this paper we express that tariffs are not the easiest way to avoid free trade because of multilateral negotiations and restrictions from the WTO. That is why antidumping policies are one of the instruments that governments are able to modify in order to prevent unfair trade and protect domestic industries. In the paper presented by Evans and Sherlund (2011) the model of protection for sale is tested with antidumping duties to determine if industrial contributions buy protection through this mechanism.

The equation used in this model is

$$\frac{t_i}{1+t_i} e_i = \beta_1 z_i + \beta_2 I_i z_i + \beta_3 \Lambda_i + \varepsilon_i , \quad (50)$$

where t_i is the antidumping duty rate obtained from Bruce Blonigen and Chad Bown and supplemented with additional consultation with International Trade Commission (ITC), International Trade Administration (ITA) of the Department of Commerce (DOC), and Customs and Border Protection. The elasticities of demand e_i were obtained from Gallaway (2003). The inverse import penetration ratio z_i was calculated from imports and shipments from the National

Bureau of Economic Research. λ_i is the inverse Mill's ratio defined as the ratio of the standard normal probability distribution function to the standard normal cumulative density equation.

The political contributions and the thresholds created in previous studies can be considered biased as not all contributions are made to influence trade policy. Therefore, to determine if the industry is organized the authors compiled a unique database that links the petitions for antidumping protection for imports and their outcome. Therefore, I_i receives a value of one if there was a petition made by the Political Action Committees associated with the industries and the outcome decided by ITA and the ITC (Evans & Sherlund, 2011).

The import demand elasticity term was placed in the left hand of the equation to control endogeneity and measurement error. However, z_i and $I_i z_i$ are also endogenous as they can be influenced by the protection outcome. To address this issue Evans (2011) introduced instruments for both the organization indicator and the inverse penetration ratio. The variables used for the organization index are: the concentration ratio, the Herfindahl index, unionization within an industry, average value-added per firm, size of capital stock, the ratio of production workers to total workers within an industry and the sheer number of workers.

For the inverse penetration ratio the instruments are: the lagged inverse import penetration ratio and the ratio of production workers to total workers.

The method of estimation is a two stage least squares and the results are presented in Table 12. For column (1) Evans (2011) uses the above industry-relevance-adjusted average on an overall sample basis where political organization affects the level of antidumping protection. As it was predicted in the protection for sale model, β_1 is negative and β_2 is positive. A negative β_1 implies that politically unorganized industries face increasing antidumping duty rates as the

import penetration ratio increases. A positive β_2 implies that those antidumping duties, all else being equal, are higher in politically organized industries. The fraction of the population represented by a lobby is around 42%. The result for the weight on welfare by the government is 99%.

Table 12			
MEASURE OF POLITICAL ACTIVITY			
VARIABLE	Above Industry- Relevance-Adjusted Average (Overall Sample Basis) (1)	Above Industry- Relevance-Adjusted Average (Annual Basis) (2)	Relative Contributions (3)
$z_{i,t}(\beta_1)$	-0.0025*** (0.0010)	-0.0025*** (0.0010)	-0.0008 (0.0010)
$z_{i,t}I_{i,t}(\beta_2)$	0.0061*** (0.0010)	0.0061*** (0.0010)	0.0074 (0.0045)
λ_i	0.5093*** (0.0332)	0.5086*** (0.0337)	0.4946*** (0.0335)
α_L	0.4151***	0.4144***	0.1111
β	0.9939*** (0.0010)	0.9939*** (0.0010)	0.9927*** (0.0045)

*** values are statistically significant at 1% level and robust standard errors are in parentheses.

Source: Evans and Sherlund (2011)

In column (2) the results are practically the same with the annual basis analysis. A negative β_1 , a positive β_2 , the fraction of population represented by a lobby is around 41% and the weight of the government on welfare is 99%. All these results are statistically significant.

Column (3) presents the relative contributions that introduce the scaled level of contributions by petitioners in a case relative to all corporate and labor donations as a continuous variable (Evans & Sherlund, 2011). Even though the coefficients β_1 and β_2 have a negative sign and a positive sign respectively, they are not statistically significant. The fraction of population represented by a lobby is 11% and the weight that government places on welfare is 99%.

All these results are consistent with the original model and imply that antidumping duties are positively correlated with the import penetration ratio for politically inactive petitioners but

negatively correlated for politically active petitioners. Thus, when the protection for sale model was analyzed in a more consistent way, where the contribution index is associated directly with the petitioners filing cases, the antidumping policies also respond to the political contributions as predicted by Grossman and Helpman (1994).

5. The use of instruments

In all seven empirical models studied in this paper that estimated the protection for sale model the estimation method varied among four. Trefler (1993) used full information maximum likelihood estimation (FIML), Goldberg and Maggi (1999) used maximum likelihood (ML), Eicher and Osang (2002) used minimum distance estimation (MDE) and Gawande and Bandyopadhyay (2000), McCalman (2004), Gawande (2006) and Evans and Sherlund (2011) used instrumental variables (two-stage least squares). All these methods were used to avoid endogeneity and the most used method was the two-stage least squares (2SLS). However, nothing has been said in reference to the degree of reliability of the instruments used to perform these estimations.

Gawande and Li (2009) explained the problem behind weak instruments in the 2SLS estimation. Biased estimators obtained when there is endogeneity in an ordinary least square method (OLS). In order to tackle endogeneity they use the instrumental variables method. The most common method used of instrumental variables is the 2SLS. For example, in the single regression model we have

$$y = Y\beta + \epsilon. \tag{51}$$

The endogenous variable is Y and is correlated with ϵ . Therefore, a random shock that affects y will also affect Y so the parameter β is unidentified. In order to identify β Gawande and Li (2009) estimate the endogenous variable with the instruments

$$Y = Z\Pi + v. \quad (53)$$

The variable Z is uncorrelated with the error term v making it exogenous and also uncorrelated with the error term ϵ solving the endogeneity problem in the first equation (Gawande & Li, 2009). Consequently, a good instrument has to be correlated with the exogenous variable but uncorrelated with the error term.

At least in theory the 2SLS solves this problem. However, if the correlation of Z with Y is weak the parameter β remains invalid. This explains why an instrument diagnosis needs to be included in any political economy analysis. In addition, the first stage estimation should include the F-tests to validate the results.

Furthermore, the 2SLS is not the only method to solve endogeneity. The limited information maximum likelihood (LIML) has been proved as a more reliable method than the 2SLS when the valid instruments are empirically weak. In order to determine which method presents the more robust results in the protection for sale model Gawande (2009) used tables of critical values to compare first stage F-statistics from Stock and Yogo (2004).

The estimated equation is

$$\frac{t_i}{1+t_i} = \beta \left(I_i \times \frac{X_i/M_i}{e_i} \right) + \epsilon_i, \quad (54)$$

where $\beta = 1/a$ and ϵ_i is independently and identically distributed across all i . t_i is the nontariff barrier computed for the year 1995 from the Trade Analysis and Information System (TRAINS) data based from the UNCTAD. The inverse import to output ratio X_i/M_i was obtained from the Annual Survey of Manufactures for 1995 on domestic production and imports.

The import demand elasticities were taken from Gallaway, McDaniel and Rivera (Gawande & Li, 2009).

The I_i variable was constructed from lobbying data from the 1992 to 92 and 1993 to 94 election cycles. The selection criterion was based on PAC spending creating three percentile thresholds. These thresholds are, 10th, 25th and 50th.

The results obtained for the 2SLS estimation are presented in Table 13.

Table 13			
Two stage least squares estimates of Tobit structural equation			
	I defined at		
	10% cutoff (I = I ₁₀)	25% cutoff (I = I ₂₅)	50% cutoff (I = I ₅₀)
I x (X/M)/e	0.008 [4.940]	0.009 [5.290]	0.013 [4.470]
Implied values of <i>a</i>	125	111.1	76.9
Coefficient of first stage residual	-0.009 [-4.540]	-0.011 [-4.710]	-0.013 [-3.850]
First stage statistic F	3.88	4.82	4.29

T-statistic values are in square brackets and standard errors are not reported.

Source: Gawande and Li (2009)

The estimates of β range from 0.008 and 0.0013 and are statistically significant at the 1% level. The positive sign of these values confirm one of the predictions of the protection for sale model. The government weight on welfare ranges between 77 to 125 times as much as a dollar of campaign contribution. However, the main intention of Gawande and Li (2009) is to test the quality of the instruments used. The first test determines the hypothesis that the bias of the 2SLS estimator relative to the OLS bias is greater than a specific acceptable level. The table provided by Stock and Yogo (2004) specifies that in order to ensure that the 2SLS relative bias is no greater than 30% the F-statistic must be greater than 4.59. Therefore, the results of 3.88, 4.82 and 4.29 suggest that the estimates tolerate a bias from 30% to 40% relative to the OLS bias.

The second result tested the hypothesis that the actual size of the 2SLS t-test values at 5% can exceed a specific acceptable tolerance level. The size of the test is the maximal probability of rejecting a true null hypothesis. The critical value with 16 instruments, which is 15.19, rejects the hypothesis that the size of the 5% test is actually less than 25% (Gawande & Li, 2009). The results obtained for the LIML estimation are presented in Table 14.

Table 14			
LIML estimates of Tobit structural equation			
I defined at			
	10% cutoff (I = I ₁₀)	25% cutoff (I = I ₂₅)	50% cutoff (I = I ₅₀)
I x (X/M)/e	0.014 [5.80]	0.016 [5.93]	0.026 [5.21]
Implied values of <i>a</i>	70.8	64.3	37.8
First-stage statistic F	3.88	4.82	4.29

T-statistic values are in square brackets and standard errors are not reported.

Source: Gawande and Li (2009)

The estimates of β range from 0.014 to 0.026 and all of them are significant at the 1% level. The values are also positive as predicted by the original model of Grossman and Helpman. The estimates of *a* are smaller as the values of β are bigger and they range from 37.8 to 70.8. The much smaller critical values from the table of Stock and Yogo (2004) compared to the 2SLS show that LIML is more robust to size distortions with the same instruments. The critical value is 3.27 and all the F-statistics are greater than this and rejecting the hypothesis that the actual size exceeds 10% (Gawande & Li, 2009).

There are several conclusions after we compare the two estimations. First, a 2SLS does not solve the problem of endogeneity if the instruments are weak. Second, there are no analyzes of the instruments used in any of the empirical approaches of the protection for sale model. Finally, the LIML estimator has better small-sample properties than the 2SLS and has not been used in any analysis.

Conclusion

In this paper we study the relationship between the lobbying influence and the protection rates of international trade. Based on the protection for sale model, we show that organized sectors that contribute money to politicians have a better tariff protection than unorganized sectors. We also presented theoretical extensions that brought realism and accuracy to the analysis of protection. Despite the variations added to the model, the majority of empirical approaches presented in this paper are consistent with the original predictions. However, these approaches do not present any analysis related to the instruments used to correct endogeneity. This paper highlights the importance of the analysis of the methods in validating the results of the model. Without this analysis, the impact of contributions in protection tariffs is incomplete.

The main weakness of our paper is that the heterogeneity of the approaches studied does not allow us to obtain a quantitative conclusive result. The results presented focus on the sign of the parameter but an explanation of its magnitude does not exist. In addition, the data used in the empirical approaches is constructed from different and unofficial sources. This eliminates objectivity and makes it difficult to compare different approaches. More and better data with respect to political contributions and elasticities will result in coherent estimates. Moreover, we need to collect data in other countries where the amount of contributions given to politicians is not recorded and the protection for sale model cannot be tested.

Further research should include the real structure of passing a law for protection measures with more than a single actor. This can include approval from the senate and surveillance from foreign institutions like the World Trade Organization. In addition, the level of protection does not depend only on unilateral negotiations. Gains and losses from one country can be balanced by the gains and losses from the other country at the moment a tariff is

determined. We also need to include uncertainty in the protection policies, as the greater the ex-ante uncertainty, the lower the money contributions. More institutional detail in the protection for sale model can scale down the ownership estimates, increasing the realism of the original model.

References

- Ederington, J., & Minier, J. (2008). Reconsidering the empirical evidence on the grossman-helpman model of endogenous protection. *The Canadian Journal of Economics*, 41(2), 501-516.
- Eicher, T., & Osang, T. (2002). Protection for sale: An empirical investigation: Comment. *The American Economic Review*, 92(5), 1702-1710.
- Evans, C. L., & Sherlund, S. M. (2011). *Are antidumping duties for sale? case-level evidence on the grossman-helpman protection for sale model.*
- Facchini, G., Willmann, G., & Biesebroeck, J. V. (2006). Protection for sale with imperfect rent capturing. *The Canadian Journal of Economics*, 39(3), 845-873.
- Gawande, K., & Bandyopadhyay, U. (2000). Is protection for sale? evidence on the grossman-helpman theory of endogenous protection. *Review of Economics and Statistics*, 82(1), 139-152.
- Gawande, K., & Li, H. (2009). Dealing with weak instruments: An application to the protection for sale model. *Political Analysis*, 17(3), 236-260.

- Gawande, K., Krishna, P., & Robbins, M. J. (2006). Foreign lobbies and U.S. trade policy. *The Review of Economics and Statistics*, 88(3), 563-571.
- Goldberg, P. K., & Maggi, G. (1999). Protection for sale: An empirical investigation. *The American Economic Review*, 89(5), 1135-1155.
- Grossman, G. M., & Helpman, E. (1994). Protection for sale. *The American Economic Review*, 84(4), 833-850.
- Hillman, A. L. (1982). Declining industries and political-support protectionist motives. *The American Economic Review*, 72(5), 1180-1187.
- Hillman, A. L., & Ursprung, H. W. (1988). Domestic politics, foreign interests, and international trade policy. *The American Economic Review*, 78(4), 729-745.
- Imai, S., Katayama, H., & Krishna, K. (2013). A quantile-based test of protection for sale model. *Journal of International Economics*, 91(1), 40-52.
- Martimort, D., & Semenov, A. (2007). Political biases in lobbying under asymmetric information. *Journal of the European Economic Association*, 5(2/3, Proceedings of the Twenty-First Annual Congress of the European Economic Association), 614-623.
- Martimort, D., & Semenov, A. (2008). Ideological uncertainty and lobbying competition. *Journal of Public Economics*, 92(3-4), 456-481.
- McCalman, P. (2004). Protection for sale and trade liberalization: An empirical investigation. *Review of International Economics*, 12(1), 81-94.

- Mitra, D. (1999). Endogenous lobby formation and endogenous protection: A long-run model of trade policy determination. *American Economic Review*, 89(5), 1116-1134.
- Oljemark, E. (2009). *Special interest groups and endogenous policies-a review of common agency models*.
- Shiells, C. R., Stern, R. M., & Deardorff, A. V. (1986). Estimates of the elasticities of substitution between imports and home goods for the United States. *Weltwirtschaftliches Archiv*, 122(3), 497-519.
- Stock, James H., & Motohiro Yogo. (2004). Testing for weak instruments in linear IV regression. *In Identification and inference in econometric models: Essays in honor of Thomas J. Rothenberg*, eds. D.W. K. Andrews and J. H. Stock. Cambridge: Cambridge University Press.
- Trefler, D. (1993). Trade liberalization and the theory of endogenous protection: An econometric study of U.S. import policy. *Journal of Political Economy*, 101(1), 138-160.