THEORIES AND EMPIRICAL APPROACHES TOWARDS POLITICAL ECONOMY OF TRADE POLICY

By

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Abstract

It is usually preached by economists that trade should be free, but in reality, it is almost always chained. The reason for this discrepancy lies in the fact that trade policies are set in political contexts in which policy makers have different objective function than maximizing economic efficiency. So, endogenous protection literature evolved around the ideas and reasons to explain trade policy as determined under specific political contexts. The early empirical work until late 1980s examined the correlation between different political factors and trade policies. These works were helpful in identifying relative importance of political economy variables, but were criticized to have specifications which were loosely linked with the theories behind them.

In recent years with development of theoretical platforms, study of political economy of trade policy has moved to a more structured direction and empirical investigations have been done to link real world data with the model predictions. In this regard, Median Voter model and Grossman-Helpman (GH) model are the main branches of literature. Median Voter model predicts positive tariffs in capital-abundant countries and negative tariffs in labor-abundant ones, but in real world, negative tariffs are rare. Empirical investigation of this model tries to reconcile observed trade policies with median voter model and two of these studies are included in this report. Interest group model is the framework of Grossman-Helpman model in which the effect of organized lobbies in trade policy determination is taken into account. Two empirical studies of this model showed that real world data support this model. By employing modifications in GH model, researchers try to account for factors like lobbying competition and foreign lobbying in explaining data. These results show that foreign lobbying is not necessarily against trade and ignoring lobbying competition may lead to wrong conclusions about welfare mindedness of government.

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Chapter 1- Introduction

There is a general agreement among economists for free trade, but free trade is almost never seen. What we practically see in lots of governments are protectionist policies. Theoretical and empirical studies on the "political economy of trade policy" tend to shed light on the trends and policies seen in trade and explain why we do not see free trade. One of the main explanations is that trade policies are made not to maximize economic efficiency, but they are set in political contexts in which the objectives of policy makers are different.

The main objective of this report is to summarize theories and empirical studies on protection for sale. In this review of "endogenous" trade policy determination, I try to include the core of literature on the political economy of trade policy. Chapters in this study are organized as follows:

In chapter 2, first generation of theoretical and empirical studies for trade policy is reviewed. In this regard, results of studies on Canada's tariff structure (Caves 1976) and trade liberalization in U.S. import policy (Trefler 1993) are presented and evaluated against proposed models. In chapter 3, theoretical studies of the Median Voter model in shaping trade policies are reviewed. Empirical evidence to reconcile median voter model predictions with real world protectionism is also included. In chapter 4, the other branch of theoretical approaches in trade policy, the interest group theory, is reviewed. In this case, the "protection for sale" model developed by Grossman and Helpman (1994) (GH) is explained and the first two studies of empirical investigations of this model is reviewed. This chapter also includes studies of the extensions of the GH model in which the effect of lobbying competition and foreign lobbying is taken into account.

Chapter 2- First generation of empirical investigation of trade policy

The political economy of trade corresponds to the study of trade policy determination under different political economy contexts. The initial work in this area was mostly empirical until late 1980s in which economic and political factors in trade policy determination were examined. In this regard, several models were used to shed light on the reasons on receiving trade protection and how it is different in various industries. These models include pressure group or interest group model, adding machine model, status Quo model, social change model and foreign policy model. Each of these models are explained briefly first and the empirical works in support or deny of each is followed next. (Gawande and Krishna,2002)

2-1-First generation of theoretical models for trade policy

1) In pressure group or interest group model, politicians are influenced by lobbies in order to make policies which would benefit them more. It suggests that protection level in an industry and their ability to resist trade liberalization is linked to number of firms in that industry and the degree of geographic and seller concentration. Also, it suggests that industry protection is negatively related to industry growth rates and positively related to increase in import penetration ratios. (Olson 1965,Stigler 1971,Peltzman 1976,Pincus 1975)

2) In Adding machine model, the extent of trade protection in an industry is related to the voting strength of that industry and the amount of protection in an industry is positively related to the number of employees in it.(Caves 1976)

3) In Status Quo model, it is suggested that there is a conservative respect for the status quo by government officials and their wish to avoid huge adjustment costs. This model assumes that

present protection depends on past levels of protection and changes in tariff levels and changes in import penetration are positively related. Also, tariff levels are positively related to variables which show the ability of workers to adjust to tariff changes. (Corden 1974,Lavergne 1983)

4) In social change model, government is believed to have motivations based on social justice to move towards income equality in society, so it suggests high protection levels and low tariff cuts in sectors with low income and unskilled workers.(Ball 1967,Constantopoulos 1974)

5) In foreign policy model, trade policy depends on bargaining ability and countries' possibilities for trade negotiations. As an example, a country would rather to lower its trade barriers against another country in which it has investments, so that the ability of the country to limit the flow of earnings to investment country enhances the foreign country bargaining ability. (Krishna and Gawande 2001)

Using these models in first generation of empirical literature, the relevance of the variables suggested by the mentioned models such as industry size, employment, concentration ratio and level of imports were investigated using simple quantitative techniques and regression analysis by different researchers. (Krishna and Gawande 2002). In the next section, empirical studies of two authors, Caves (1976) and Trefler (1993) are reviewed.

2-2- First Generation of empirical evidence

2-2-1- Canada's tariff structure, a model for political choice

Caves (1976) studied patterns of tariff rates as of 1963 in support of Canada's secondary manufacturing industries. Variables were used in a cross industry regression analysis. He has

discussed three competing models of adding machine, interest group and national policy. (Caves 1976)

The principle dependent variable in his study was the effective rate of protection (EFT). He also included another dependent variable as the average nominal rate of tariff protection, so that effective rates could be tested to see whether they can be explained more complete than nominal rates. Nontariff-barrier's is a source of error in both dependent variables. Equations to be estimated and details of variables are included in table 2-1. In this study, variables abbreviations are as follows: (Caves 1976)

VPW is the Value added per worker in the Canadian industry in 1963. The lower the value added per worker, the more workers are benefited by a tariff that insulates a given amount of value added from import competition .CR4 is the percentage of industry shipments accounted for by the largest 4 enterprises,1968. MSC is shipments by the Canadian industry in 1967, expressed in units of average shipments per plant in the corresponding U.S. industry, 1967. TRN is the weighted average of rail and truck shipping costs per dollar's worth of product between Cleveland and Chicago. GEG is the percentage of employees located outside of Quebec and Ontario, 1963. BCR is the percentage of sales made by an industry to other industries that individually account for more than 5 per cent of its total sales to sectors other than itself, 1961.

GRO is the value of industry shipments in 1967 divided by value of industry shipments in 1958. NSP is one minus the industry's enterprise specialization ratio in 1968. NPC is the fraction of non-production workers in an industry's total labor force multiplied by the average compensation per non-production worker, United States industries, 1963. RPR is

the value added per employee in the United States industry divided by value added per employee in its Canadian counterpart, 1963, was taken directly from the volume; when observations had to be combined, employment in the Canadian industry was used as a weight. VRT is the value added in an industry divided by the value of its shipments in1967.

Table 2-1- Determinants of effective and nominal rates of protection

EQUATION NO	Constant	VPW	CR4	TRN	MSC	BCR	GRO	NSP	RPR	NPC	VRT	GEG	F
1	52.7	0.011 (0.669)	-0.278 (0.135)	-0.581 (0.306)	-0.058 (0.018)	-	-	-	-	-	-	-0.239 (0.197)	4.46
2	60.2	0.003 (0.710)	-0.265 (0.147)	-0.745 (0.341)	-0.064 (0.019)	0.015 (0.077)	-3.42 (2.87)	-0.135 (0.247)	-	-	-	-	2.95
3	29.8	-1.30 (0.59)	-	-	-0.042 (0.016)	-	-2.73 (3.15)	-	0.117 (0.084)	2.64 (3.27)	8.73 (24.1)	-0.286 (0.206)	2.67

Note: Standard errors appear below the regression coefficients

Note: dependent variable is EFT for all equations.

Based on statistical results for interest group, adding machine and national policy models, not all signs for F-ratios are correct and winner would not be picked simply. There is collinearity between VPW and CR4. CR4 coefficient is not influenced by omitting VPW, while VPW would be negative and significant upon omitting CR4. Caves (1976) empirical investigation showed great support for interest group and adding machine models from running equation 1 and 2 with CR4 omitted. However, sign of TRN and MSC variables support interest group model and GEG also weighs against adding machine model. For the National policy model, only one variable is significant and right-signed and MSC,GEG, RPR, NPC, and VRT are insignificant and correctly signed. So, judging on significant variables and right signs for each model, interest group model had the best results, while national policy model had low statistical significance and adding machine model suffers from wrong sign of significant coefficients. (Caves 1976)

2-2-2- Trade liberalization; U.S. import policy

Trefler in 1993, studied nontariff barriers (NTBs) in the United States and included the above mentioned analysis in his investigation. He estimated import and NTB equations simultaneously and investigated the theory of endogenous protection. (Brock and Magee 1978 ;Findlay and Wellisz 1982; Hillman 1982, 1989; Mayer 1984;Baldwin 1985;Magee, Brock and Young 1989) In NTB equation, regressors were measures of costs and benefits of lobbying and protection supply and he selected a factor endowment import equation in his study.

He then analyzed the relationship between import and protection by simultaneous estimation of NTB and import equation. In import equation, the dependent variable was import penetration which is gross import divided by domestic consumption. The extent of NTB protection is measured by NTB coverage ratio which is described as the fraction of commodities in an industry that is subject to any type of NTB. In this analysis, tariffs were neglected on the basis that low levels of US tariffs are continuously omitted by NTBs. Estimation of the structural model is done by simultaneous equations Tobit model as follows: (Trefler 1993)

$$N = \begin{cases} \mathrm{M}_{\gamma\mathrm{M}} + \mathrm{X}_{\mathrm{N}}\beta_{\mathrm{N}} + \epsilon_{\mathrm{N}} & \mathrm{M}^* > 0, \mathrm{N}^* > 0 \\ 0 & M^* > 0, N^* \leq 0 \\ 0 & M^* \leq 0\,, \end{cases} \tag{2-1}$$

$$M = \begin{cases} N_{\gamma N} + X_M \beta_M + \epsilon_M & M^* > 0, N^* > 0 \\ X_M \beta_M + \epsilon_M & M^* > 0, N^* \leq 0 \\ 0 & M^* \leq 0 \end{cases} \tag{2-2}$$

In these equations, N is an NTB coverage ratio (Bhagwati 1988), M is import penetration, X_N collects measures of the determinants of NTBs, X_M $c$ollects measures of factor endowments, and ($\varepsilon_N, \varepsilon_M$) is a bivariate normal residual vector.

Import penetration enters the NTB equation in three ways: (Trefler 1993)

1- Import penetration enters linearly and directly
2- Import penetration enters linearly but indirectly through $\Delta\ (import\ penetration)$ since $\Delta\ (import\ penetration)$ equal $M_{1983} - M_{1980}$, where M_t is import penetration in year *t*.
3- Import penetration enters nonlinearly and indirectly since in the region $(M^* \leq 0, N^* > 0)$,*N=0* rather than *N*= $X_N\beta_N + \varepsilon_M$. This means that when import penetration is zero, NTBs are constrained to equal zero. The idea is that when import penetration is zero, protection has no value to domestic rent seekers, so that there is no lobbying for NTBs.

Results of Trefler study is summarized in table 2-2. It was seen that import penetration has a positive sign, but insignificant statistically and change in import penetration was large, showing increasing import penetration leads to greater penetration. On the other hand, export oriented industries do not get protection, as evident by the negative coefficient. Regarding business regressors, buyer and seller concentrations are important. Scale and capital stock variables show up as negative signs, showing that over controlling of entry of competitors, barriers for entry eliminate the need of protection.

From NTB analysis based on labor regressors, it was seen that the highest income careers get the highest protection, while the low income occupations get little protection. This result is against social change model and does not support that.

Table 2-2: NTB Equation results

Dependent Variable: NTBs		Estimated Coefficient (1)	t-Statistic (2)	Beta Coefficient(3)
Comparative	Import penetration	0.17	0.46	0.11

advantage	**Δ(import penetration)**	**3.31**	**2.58**	**1.74**
	Exports	**-1.82**	**-5.26**	**-0.94**
Business	**Seller concentration**	**0.53**	**2.43**	**0.42**
	Seller number of firms	**-0.22**	**-1.86**	**-0.33**
	Buyer concentration	**-1.13**	**-2.08**	**-0.33**
	Buyer number of firms	**-0.06**	**-2.16**	**-0.32**
	Scale	**-1.83**	**-2.04**	**-0.46**
	Capital stock	**-0.27**	**-2.02**	**-0.24**
labor	**Union**	**0.10**	**0.42**	**0.05**
	Employment size	**0.08**	**0.31**	**0.03**
	Tenure	**-0.01**	**-0.33**	**-0.04**
	Geographic concentration	**0.11**	**0.71**	**0.07**
Broad -based	**Engineers, scientists**	**1.63**	**1.70**	**0.58**
	White-collar	**0.40**	**0.67**	**0.34**
	Skilled	**-0.31**	**-0.61**	**-0.21**
	Semiskilled	**0.15**	**0.61**	**0.16**
	Unskilled	**0.90**	**1.57**	**0.53**
	Unemployment	**1.22**	**1.96**	**0.30**
	Industry growth	**0.03**	**0.26**	**0.03**

Comparative advantage factors were measured by the change in import penetration ratio and the exports to value added ratio. As it can be seen in table 2-3, the regressors with the biggest t-statistics and beta coefficients have the expected signs which are negative and are sources of the comparative advantage. These factors are physical capital, white-collar labor and skilled labor. He concluded that the more skilled occupations are bigger sources of comparative advantage with the exceptions of inventors and engineers and scientists, which were source of

comparative disadvantage and not included in source of comparative advantage. It was shown in Trefler study that comparative advantages factors matter a lot in determination of NTBs and they are at least five times as important as business interest factors as were reported by Harkness (1978) and Bowen and Sveikauskas (1989).

Table 2-3: The import equation results

Depen.t VA: Import penetration		Estimated coefficient	T-Statistic	Beta Coefficient	Sensitivity Analysis
NTBs (γ_N)		-0.51	-11.56	-0.80	
Capital	Physical capital	-2.01	-4.44	-0.44	-0.52
	Inventories	1.71	1.69	0.17	-0.46
Labor	Engin,scien	0.54	0.98	0.07	-0.55
	White-collar	-1.70	-4.90	-0.45	-0.50
	Skilled	-1.27	-3.44	-0.34	-0.55
	Semiskilled	-0.59	-2.01	-0.15	-0.52
	Unskilled	0.40	1.98	0.20	-0.54
Land	Cropland	0.26	0.61	0.11	-0.53
	pasture	0.85	1.77	0.15	-0.53
	Forest	1.19	0.15	0.01	-0.53
subsoil	Coal	1.62	0.39	0.02	-0.51
	Petroleum	-0.16	-0.78	-0.05	-0.61
	Minerals	1.29	0.39	0.02	-0.50
Constant	-	0.81	15.89	0.00	-

His theory predicted that the higher the degree of protection, the more valuable protection is to private interests and US import policy is shaped by American business rather than organized labor which supports interest group and adding machine models. (Trefler 1993)

According to Trefler study, manufacturing NTBs reduced US imports around $50 billion which is 24% of US manufacturing imports. This estimate is much higher than those which are derived from single equation models.

2-3 Conclusion

In summary, the relevance of several determinants of trade policy was investigated in the first generation of trade policy. Empirical results in each case provided a measure of support or denial to the theories in various areas; some we showed were for tariffs in Canada and nontariff barriers. A summary of the strengths of models in explaining empirical results is shown in table 2-4. The biggest problem with studies which try to compare different models and get the relative importance of each is the need to determine one-to-one the variables that represent each model. Most of the time, these variables are not sharply separated and are correlated which hinders detailed and precise determination of validity of models.

In order to overcome this shortcoming, we need more specified micro-foundation models, and this was done with evolution of more structural models which link empirical data to the models explaining them more tightly. These models are reviewed and presented in the following chapters.

Table 2-4: Strength of each model in explaining empirical results

	Interest group	Adding Machine	Status Quo	Foreign Policy	Social Change
Trefler(1993) (NTBs)	strong	none	none	none	none
Caves(1976) (Canada Tariffs)	Strong	Low	none	none	none

Chapter 3- Median Voter model for trade policy

In chapter 2, I have reviewed first generation of empirical approaches towards endogenous trade policy determination in which simple quantitative techniques and regression analysis were used to find evidence of support for specific models. Some theoretical frameworks have also been developed to explain trade policy determination and empirical data were used to evaluate the predictions of these models. In this chapter, I review theoretical studies of the role of democracy in shaping trade policy by majoritarian elections and provide some examples of where empirical data were examined against theoretical models.

There are two branches in theoretical studies on trade policy, one represent the direct democracy or median-voter approach, and the other represents the interest group theories. In the median voter approach, it is assumed that trade policy is being directly voted, or the government selects policies such as to reflect majority opinion on the issue. In interest group theories, it is assumed that trade policy is determined by the interaction among lobbies, which represent the economic interest of their members, and government (Krishna and Gawande 2001). Here, I explain median voter model and some empirical approaches to test this model.

3-1-Median Voter Model

The median voter theorem, first shown by Black (1948), is the result of a classical model used to describe the positioning of candidates in majority-rule elections, stating that candidates will converge to the median. It was shown by Black (1948) that in a policy context which is uni-dimensional and with a single peak in individual preferences over the policy, the median voter's preferred policy choice dominates over any alternative.

Mayer (1984) derived the implications of this result in the context of general equilibrium models of trade. In the two sector two factor Heckscher-ohlin version of Mayer's model (MHO), it is predicted that equilibrium trade policies are biased against trade in capital rich countries and for trade in capital poor countries. Since more trade leads to a high factor reward for the abundant factor and a low factor reward for the scarce factor, we would see import barriers and import subsidies in capital-rich and capital-poor countries, respectively. Median voter theorem has the prediction of positive tariffs in capital abundant countries and negative tariffs in labor abundant countries. In real world, however, trade policies are almost always against trade which is in contrast with median voter predictions. It should be noted that other factors of pressure on government through lobbies and interest groups affect the real world trade policies. (Dutt and Mitra 2002)

3-2- Empirical Evidence of median voter model

3-2-1-: Endogenous trade policy, median voter approach

Researchers have tried to reconcile the median voter theory results with observed protectionism across countries. Dutt and Mitra (2002) used the median voter approach to trade policy determination and investigated another prediction which is about cross-country variations in trade barrier levels and not the absolute tariffs. They used the Mayer-Heckscher-Ohlin framework to predict variations in trade policy across countries, using cross-sectional data on inequality, capital abundance and measures of trade restrictions and openness. Keeping other factors in trade policy determination constant with respect to inequality, total import tariff would rise or fall with inequality, so that the positive or negative Mayer component becomes more positive or negative. (Dutt and Mitra 2002)

Two measures of inequality, Gini-coefficient, as a summary measure of inequality and the share of the median quintile of the population in national income as the share of median voter in Mayer framework, were used to investigate levels of trade restrictiveness. (Dutt and Mitra 2002)

Dutt and Mitra (2002) used a two-factor two-sector, small-open, Heckscher-Ohlin economy. There are 2 goods, one importable and one exportable which both need capital and labor in their production. Individual preferences are identical and homothetic and indirect utility function for individual *h* is $V(p)I^h$. An individual income can be written as:

$$I^h(p) = w(p) + r(p)\sigma^h K + \emptyset^h(p - p^*)M(p) \quad (3\text{-}1)$$

In which σ^h is the share of individual *h* of the overall capital stock of economy, *p* is the domestic price of the importable good and p^* is its world price, *K* is the aggregate capital stock of the economy, φ^h is the individual share in the total tariff revenue, *M(p)* is the import of good 1, *w(p)* and *r(p)* are the wage rate earned by labor and rental earned on capital, respectively.

Maximizing $V(p)I^h(p)$ with respect to *p* gives the most preferred tariff of individual *h* as:

$$t^h = \frac{-I}{p^* M'(p)} \frac{\partial \emptyset^h / \partial p}{\emptyset^h} \quad (3\text{-}2)$$

In this equation, *I* is the aggregate income. If we assume that the voters differ only along a single dimension and along their capital-labor endowment K^h, median voter theorem can be used to get the tariff under the majority voting. This tariff is the one which maximizes the utility of the individual with the median relative capital-labor endowment in the economy. The objective function is then maximizing $V(p)I^{mv}$ or $v(p) + i^{mv}$ in which $v(p)=Ln\ V(p)$ and $I^{mv}=Ln$

I^{mv}. This objective function is assumed to be concave with respect to price. The first order condition is:

$$v'(p) + \frac{\partial i^{mv}}{\partial p} = 0 \tag{3-3}$$

In which i^{mv} can be expanded as

$$i^{mv} = \ln[w(p) + r(p)\sigma^{mv}K] + \ln[1 + \delta\left(p, \frac{K}{L}\right)] \tag{3-4}$$

Where δ is the ratio of total tariff revenue to national factor income. σ^{mv} is the share of median voter in the capital stock which is always less than the real world amount (Alesina and Rodrik 1994). σ^{mv} is an inverse index of inequality and was used to study the effect of a change in inequality on trade policy. Having t^{mv} as the most preferred level of tariff for the median voter, differentiating the first order condition would result in:

$$\frac{\partial t^{mv}}{\partial \sigma^{mv}} = \frac{-[r'(p)w(p) - r(p)w'(p)]K}{p^*[w(p)+r(p)\sigma^{mv}K]^2[v''(p)+\frac{\partial^2 i^{mv}}{\partial p^2}]} \tag{3-5}$$

For a capital-rich country, $r'(p) < 0$ and $w'(p) > 0$ and the opposite is true for a labor-rich country.

Because of having a restriction of concavity which is applied on objective function, the denominator of equation 3-5 is always negative, so that the derivative is negative for capital-rich countries and increasing inequality results in an increase in the equilibrium tariff. On the other hand, the derivative is positive for a labor-rich country and increasing inequality leads to an increased demand for redistribution which would benefit labor at the expense of capital.

Based on the previous discussion, in a country with high value of *K/L* ratio, inequality and trade restrictiveness are positively related and an inverse relationship exists for a country

with low *K/L* ratio. Using the following relationship, the turning point of *K/L* would be determined empirically:

$$\mathrm{TR}_i = \alpha_0 + \alpha_1 INEQ_i + \alpha_2 INEQ_i \times (\frac{K}{L})_i + \alpha_3 (\frac{K}{L})_i + X_i\beta + \epsilon_i \quad (3\text{-}6)$$

In which TR_i is trade restrictions in country i, $INEQ_i$ is the level of inequality, $(\frac{K}{L})_i$ the capital labor ratio and X_i is a row vector of control variables, and the first derivative is as follows:

$$\frac{\partial TR_i}{\partial (INEQ)_i} = \alpha_1 + \alpha_2 (\frac{K}{L})_i \quad (3\text{-}7)$$

The prediction of this equation is α_1<0 and α_2>0 and $\alpha_1+\alpha_2$ $(K/L)_i \geq 0$ as $(K/L)_i \geq (K/L)^*$ in which $(K/L)^* = -\alpha_1/\alpha_2$ is the turning point of capital to labor ratio. Also, $(K/L)^*$ should be within the range of *K/L* values in the dataset for the prediction to hold true.

Tables 3-1 and 3-2 show the regression results for the equation 3-6. Trade protection is the dependent variable and independent variables are inequality, the capital-labor ratio, democracy and political rights indicators and schooling. Multiple trade policy measures such as *IMPORT DUTY* as total import duties collected as a percentage of total imports, *TARIFF* as an average tariff rate , *QUOTA* as a coverage ratio for non tariff barriers to trade and *(X+M)/GDP* as an indirect measure of trade restrictions were used to test the robustness of the results. (Dutt and Mitra 2002)

Table 3-1: Gini Coefficient Regression with and without controls

	Tariff	Quota	Import duty	(X+M)/GDP	Tariff	Quota	Import duty	(X+M)/GDP
Gini	-0.029 (0.016)	0.012 (0.022)	-1.048 (0.679)	0.049 (0.04)	-0.051 (0.023)	0.016 (0.03)	-2.141 (0.794)	0.082 (0.05)
Gini*capital-labor ratio	0.003 (0.001)	-0.0002 (0.002)	0.144 (0.067)	-0.006 (0.004)	0.006 (0.002)	-0.001 (0.003)	0.249 (0.083)	-0.01 (0.005)
Capital-labor ratio	-0.189 (0.068)	-0.037 (0.093)	-8.406 (2.888)	0.341 (0.166)	-0.328 (0.11)	-0.03 (0.151)	-13.85 (3.986)	0.58 (0.247)
schooling	-	-	-	-	0.006 (0.019)	-0.03 (0.029)	0.593 (0.705)	-0.042 (0.042)
Political rights(Gastil)	-	-	-	-	-0.025 (0.021)	-0.02 (0.028)	0.397 (0.776)	0.037 (0.047)
Sub-saharan Africa	-	-	-	-	-0.068 (0.095)	-0.259 (0.126)	1.537 (3.341)	0.022 (21.7)
East Asia	-	-	-	-	-0.103 (0.088)	-0.202 (0.119)	-6.981 (3.189)	0.591 (0.203)
Oil	-	-	-	-	0.017 (0.081)	-0.107 (0.108)	1.085 (3.052)	-0.141 (0.187)
Constant	1.942 (0.71)	0.157 (0.96)	78.218 (29.54)	-2.372 (1.722)	3.291 (1.005)	0.414 (1.356)	129.835 (35.93)	-4.365 (2.273)
No.of observation	51	50	56	45	45	45	44	49
R^2	0.36	0.25	0.44	0.22	0.47	0.42	0.6	0.37
F-statistic	8.82	5.23	11.97	5.03	4.01	3.29	6.79	3.0
Critical capital-labor ratio	9.7	55	7.3	8.2	8.5	16	8.6	8.2

Table 3-2: Third Quintile Regression with and without controls

	Tariff	Quota	Import duty	(X+M)/GDP	Tariff	Quota	Import duty	(X+M)/GDP
Q^3	0.136 (0.042)	0.081 (0.06)	6.752 (1.821)	-0.196 (0.062)	0.121 (0.055)	0.021 (0.075)	5.15 (1.879)	-0.09 (0.068)
Q^{3*}capital-labor ratio	-0.015 (0.004)	-0.012 (0.006)	-0.747 (0.183)	0.025 (0.062)	-0.013 (0.006)	-0.005 (0.008)	-0.558 (0.2)	0.012 (0.007)
Capital-labor ratio	0.18 (0.057)	0.158 (0.082)	8.803 (2.215)	-0.324 (0.086)	0.15 (0.078)	0.07 (0.106)	6.508 (2.647)	-0.154 (0.096)
Schooling	-	-	-	-	-0.025 (0.018)	-0.054 (0.025)	-1.073 (0.602)	0.041 (0.021)
Political rights(gastil)	-	-	-	-	-0.015 (0.018)	-0.045 (0.025)	-0.602 (0.653)	-0.001 (0.023)
Sub-saharan Africa	-	-	-	-	-0.081 (0.083)	-0.162 (0.112)	1.003 (2.673)	0.023 (0.097)
East Asia	-	-	-	-	-0.051 (0.097)	-0.052 (0.133)	-2.717 (3.436)	-0.002 (0.124)
Oil	-	-	-	-	-0.089 (0.097)	-0.223 (0.133)	-2.142 (3.813)	0.017 (0.125)
Constant	-0.431 (0.58)	-0.863 (0.827)	-66.206 (24.942)	2.687 (0.855)	-0.995 (0.798)	0.435 (1.081)	-40.459 (26.87)	1.207 (0.979)
No. of observations	56	56	58	64	49	50	51	56
R^2	0.32	0.15	0.39	0.41	0.41	0.32	0.55	0.47
F-statistic	8.0	2.95	11.66	13.86	3.41	2.36	6.32	5.2
Critical capital-labor ratio	9.1	6.8	9.0	7.8	9.3	4.2	9.2	7.5

These results with and without controls strongly support median voter model predictions. When using Gini coefficient, $\alpha_1<0$ and $\alpha_2>0$ as predicted and reverse is true when Q3 (third quintile) was used. The turning point of capital-labor ratio is also indicated in results and except for quota regressions, the values are close to median and mean capital-labor ratio. They showed empirically that increasing inequality increases import protection in capital rich countries and reduces trade barriers in capital scarce countries which is consistent with two factor two sector Heckscher-Ohlin model in median voter approach. (Dutt and Mitra 2002)

3-2-2- Observed Tariffs and Median Voter Model

In another study, Dhingra (2010) showed that the optimal tariff in large countries is a sum of median voter term and a positive term of trade component. By assuming large countries, the world price of a good is affected by changes in the domestic tariff rate. She followed MHO framework with two goods and two factors in the economy. It was assumed that production functions are homogeneous of degree one and each agent can earn income equal to $w + rK^i$ and national factor rewards is:

$$\emptyset^i \equiv \frac{w+rK^i}{wL+rK} \tag{3-8}$$

In this equation, (w) is wage rate a unit of labor earns, and a unit of capital earns a rental rate (r).

If country impose tariff rate on good 1 so the total income y^i will be:

$$y^i = w + rK^i + T^i = \emptyset^i(wL + rK + T) = \emptyset^i Y \tag{3-9}$$

Each individual would like to maximize his utility by

$$\max U^i\left(p\left(\pi, t^i\right), y^i\right) \qquad i = 1, \ldots . I \tag{3-10}$$

Where U^i is indirect utility function, p is domestic price of good 1 in term of good 2 equal:

$p = \pi(1 + t)$.

t^i is tariff level and y^i is total income. π is world price (Dhingra 2010)

Choosing a tariff rate of $\frac{dU^i}{dt} = 0$, using Roy's identity to show the optimal tariff and differentiating national income, we get

$$\frac{dU^i}{dt} = \emptyset^i \frac{\partial U^i}{\partial Y^i}\left(\underbrace{t\pi \frac{dM}{dt}}_{Tariif-weighted\ imports} + \underbrace{\frac{Y}{\emptyset^i}\frac{d\emptyset^i}{dt}}_{i's\ Income\ share} + \underbrace{-M\pi_i}_{Terms\ of\ trade} \right) = 0 \qquad (3\text{-}11)$$

These are the three important elements in determining individual tariff rate. When change in tariff weighted imports is negative for all individuals, depending on individual *i*'s ownership of capital, the income share may rise or fall. For all individuals, the terms of trade effect is the same and is positive in a large country. (Dhingra 2010)

The distinction of Dhingra approach compared to standard MHO model is that he considered a large country which has an effect on world prices. Imposing a tariff by a large country leads to decrease in price for its imported goods which means terms of trade effect are positive. In standard MHO model, a small open economy is assumed and consequently, its tariff would not affect world prices.

When individual trade policy preferences are single peaked, according to the median voter theorem, the adopted tariff is the median voter's optimal tariff as follows: (Dhingra 2010)

$$t^{\sim mv} = \pounds = \left(\frac{Y}{\pi\left(-\frac{dM}{dt}\right)} \right)\left(\frac{\frac{d\emptyset^{mv}}{dt}}{\emptyset^{mv}} \right) + \left(\frac{\frac{M\pi_i}{\pi dM}}{dt} \right) \qquad (3\text{-}12)$$

In which the first term is the Mayer median voter component and the second one is a terms of trade component (TOT). TOT part is the inverse of the export supply elasticity of home country's imports of good 1, so trade policy can be written as:

$$t^{\sim} = \left(\frac{Y}{\pi\left(-\frac{dM}{dt}\right)} \right)\left(\frac{\frac{d\emptyset^{mv}}{dt}}{\emptyset^{mv}} \right) + \frac{1}{\mu^*} \qquad (3\text{-}13)$$

The sign of median voter term is determined by the change of median voter's income share by a domestic tariff, $d\varphi^{mv}/dt$. For a small country, the second term is zero since small countries have a perfect elastic export supply and hence, tariffs are positive in capital abundant countries and negative in labor abundant ones. In a large capital-abundant country, tariff is positive due to positive median voter and terms of trade components. However, in a large labor-abundant country, tariffs may become positive due to terms of trade considerations which are opposite to the case of small countries. He then used an empirical model to test the large country level of tariff prediction.

He described the optimal tariff by equation:

$$t^{\sim} = \left(\frac{Y}{\pi\left(-\frac{dM}{dt}\right)}\right)\left(\frac{\frac{d\emptyset^{mv}}{dt}}{\emptyset^{mv}}\right) + \frac{1}{\mu^{*}} = \emptyset^{mv}\text{MV+TOT} \qquad (3\text{-}14)$$

In which $\emptyset^{mv} \equiv (\frac{dw}{dt} - \frac{w}{r}\frac{dr}{dt})/|\pi dM/dt|$ is the median voter coefficient. Sign of this coefficient depends on factor-abundance.

She stated that level of tariff prediction would imply that majority considerations have a negative effect on labor abundant countries and a positive effect in capital rich countries. If $kc \equiv (K/L)_c$, and K^* shows the threshold capital-labor ratio which separates countries to labor and capital abundant, then $\theta^{mv} < 0$ for all countries with $k_c < k^*$ and $\theta^{mv} > 0$ for all countries with $k_c > k^*$.

Also, the large country level prediction leads to the prediction of a positive influence of terms of trade in all large countries. The linear regression she used is as follows:

$$t_c = \theta_1 MV_C + \theta_2 MV_c \,.\, k_c + \theta_3 k_c + \theta_{tot} ToT_c + \acute{Z}_c \delta + \varepsilon_c \quad (3\text{-}15)$$

In which Z is vector of controls and ε is an error term.

In order to construct TOT measures, she used either import elasticity data or import shares and tested the signs of key variables with the ones predicted by large country MHO model. These results are summarized in table 3-3. (Dhingra 2010)

Table 3-3: large country level prediction test

Variable description	Variable	Coef.	Expected sign
Majority's relative earning	MV	θ_1	(-)
Majority's relative earning (K/L)	MV.k	θ_2	(+)
Terms of trade	TOT	θ_{tot}	(+)

A result of estimating equation 3-15 is shown in table 3-4. In this table, column (*a)* corresponds to results for small country (without TOT) and columns (*b)* and (*c)* correspond to results of level prediction for large countries.

Table 3-4: Absolute and relative levels: Trade Restrictiveness Indices (TRIs)

Level of TRI			
	(a) OLS	(b) OLS	(c) IV
MV	-15.619 (3.521)	-16.758 (3.698)	-17.239 (3.513)
MV.*k*	10.061 (2.264)	10.950 (2.386)	11.326 (2.254)
ToT(elasticity)	-	0.322 (0.201)	0.458 (0.219)
K	-0.288 (0.077)	-0.314 (0.083)	-0.324 (0.079)
intercept	0.635 (0.141)	-2.863 (2.192)	-4.340 (2.396)
k^*	1.55	1.53	1.522
N	35	35	35
R^2	0.283	0.335	0.326

According to table 3-4, the median voter variable and the interaction term are statistically significant and have the expected signs for both small and large countries. It shows that in all countries with human capital lower than k^*, the median voter component is negative, while it is positive in all countries with human capital higher than k^*. It is seen in columns a and b that k^* is similar in large and small countries.

In large countries, terms of trade is also included in level of tariff and it is positive and significant (column b). Test of endogeneity bias was also done to check for any endogeneity bias due to the influence of trade policy on median voter term or terms of trade variables. When only TOT is assumed to be endogenous, instrumental variable (IV) estimates are similar to OLS results in large country level prediction (column c).

The baseline results show that TOT coefficients are not estimated precisely which can be due to World Trade Organization (WTO) membership. This parameter should be accounted for to get precise results which were done by adding an interaction term for WTO members and TOT. Then, TOT coefficients were found to be positive and statistically significant which is seen in columns a and b of table 3-5. TOT component of tariff is lower for WTO members since members of WTO may get tariff adjustments for reasons other than terms of trade externalities. (Dhingra 2010)

Table 3-5: level test: Trade Restrictiveness Indices (TRIs)

	Without controls OLS (a)	With controls OLS (b)
MV	-16.758 (3.698)	-19.078 (3.721)

MV.HKI	10.950 (2.386)	13.063 (2.426)
ToT (Elasticity)	3.322 (0.201)	5.458 (0.915)
Member. ToT	-	-5.092 (0.940)
Member	-	55.578 (10.285)
N	35	35

3-3- Conclusion

To conclude, Dhingra (2010) has examined median voter model in a large country to see role of majority concerns and terms of trade in tariff setting across countries. It was shown that tariff in a large country is a sum of median voter and TOT components which the latter is positive and has a positive impact on tariff across all large countries. Terms of trade component, on the other hand, has a negative impact on tariffs in labor abundant and positive impact in capital abundant countries which is in line with median voter model.

In this chapter, theoretical framework for trade policy determination was explained, with an emphasis on median voter model. I have provided two examples of literature where median voter theory was tested for empirical data across countries. Other factors like TOT had to be added to model in Dhingra work to account for the observed data.

Chapter 4- Interest group model for trade policy

In previous chapter, the median voter model in determining trade policy outcomes was reviewed, along with empirical investigation of its predictions in a couple of studies. In this chapter, the other branch of theoretical approaches in trade policy, the interest group theory, is reviewed. In this case, the "protection for sale" model developed by Grossman and Helpman (1994) (GH) has become the most prominent representative of this part of the literature. Given its importance, in the first part, I explain GH model along with its predictions, and in second part, the first two studies of empirical investigations of this model is reviewed. In the last part of this chapter, I review an extension of GH model in which lobbying competition and foreign lobbying is also taken into account.

4-1- Grossman-Helpman model

In Grossman and Helpman (GH) model (1994), a small economy with n specific factors is modeled. This is a model with a relatively simple structure that yields clear-cut empirical predictions and has been applied in a number of subsequent theoretical analyses (maggi and Goldberg 1999) This model has implications for the cross-sectional structure of trade protection and predicts that the cross-sectional differences in protection should be explained by three variables of import elasticity including, import penetration ratio and whether industry is organized politically.

GH (1994) considers a small open economy with a numeraire good and "*n*" non-numeraire goods. The numeraire good is produced one to one from labor, while each non-numeraire good is produced from labor and sector specific input. Returns to specific factor *i* depends on p_i and is shown by $\pi_i(p_i)$ and by Hotelling's lemma, $\pi'_i(p_i) = y_i(p_i)$ in which $y_i(p_i)$

is the supply function for good i. In GH model, a linear government objective function is assumed which derives expressions for cross sectional patterns of tariffs that could be tested directly. (Krishna and Gawande 2001)

The demand side of the model is represented by consumers with the same additive and quasilinear preference structure as represented by expression: analyses (Maggi and Goldberg 1999)

$$U = c_0 + \sum_{i=1}^{n} u_i \ (c_i) \tag{4-1}$$

In which c_0 is consumption of the numeraire good (good 0), c_i is consumption of goods $i=1.....n$. and u_i is an increasing concave function. This implies that the demand for each non-numeraire good is not affected by income or substitution effects. The assumptions on the supply and demand sides of the model imply that GH(1994) represent an economy with a collection of partial equilibrium sectors where the price of each non-numeraire good is not affected by price of other goods.

In GH (1994) model in which individuals have the quasi linear preferences as in equation 4-1, some sectors are organized politically which influence politicians through campaign contributions. Politicians maximize a linear objective function with political contributions by lobbies and aggregate social welfare as its components. Politicians and lobbies interact in a form of menu auction. In this system, each organized lobby provides a contribution schedule to the government in which they state the promised contribution level for any possible domestic price vector implemented by the government. In the first stage, each lobby present its contribution schedule, assuming other lobbies contribution schedules as given, and in the second stage, government decides tariffs in an optimization process, taking all lobbies contribution schedules

as given. Prediction across sectors is measured as a vector of export and import subsidies and taxes on the *n* goods. GH predicts the cross-industry pattern of protection as follows :(Krishna and Gawande 2001)

$$\frac{t_i}{1+t_i} = \frac{I_i - \alpha_L}{a+\alpha_L}\left(\frac{z_i}{e_i}\right) \tag{4-2}$$

In equation (4-2), p_i is the domestic price of good i and p is the world price, $t_i = \left(\frac{p_i - p}{p}\right)$ is the ad valorem tariff or subsidy on good *i* in equilibirum. I_i equals one indicates sector *i* is organazid into a lobby and it is zero otherwise. the parameter α_L is the fraction of the population organized into lobbies, z_i is the equilibirum ratio of domestic output to imports and e_i is the elasticity of import demand (positive) or export supply(negative).

The effect of organized interest in securing trade protection can be seen in this model. If an industry is import-competing producer and is organized *(I_i>0),* it is able to buy protection and gets a protective import tax, but if it is not organized *(I_i<0)*, it gets an import subsidy. Also, if the industry is an exporter and it is organized, it would be able to buy an export subsidy, but if it is not organized, its exports are taxed. The extent of protection which an industry receives is determined by the industry's stakes from protection. It can also be observed that protection depends inversely on elasticity of import demand and the extent of competition among lobbies manifests itself in tariff expression. The mathematic expression of equation 4-3 can be written in an empirically testable form as: (Krishna and Gawande, 2001)

$$\frac{t_i}{1+t_i} = -\frac{\alpha_L}{a+\alpha_L}\left(\frac{z_i}{e_i}\right) + \frac{1}{a+\alpha_L}\left(I \times \frac{z_i}{e_i}\right) \qquad i=1,\ldots..,n \tag{4-3}$$

Based on this equation, it is predicted that the coefficient on z_i/e_i is negative, the coefficient on is $I \times \frac{z_i}{e_i}$ positive, and sum of coefficient must be positive, since $\alpha_L \leq 1$. Also, using z_i/e_i and $I_i \times z_i/e_i$ coefficinets, the size of "a" which is the weight that government places on aggregate welfare compared to the weight on aggregate political contributions can be adressed quantitavely.

4-2- Empirical investigation of GH model;U.S. nontariff bariers

Predictions of this model were tested by Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000). Goldberg and Maggi used data on nontariff barriers for the United States in 1983. For government and lobbies interaction, they assumed a Nash bargaining game mechanism which is a simpler mechanism than menu auction and leads to the same trade policy result. In Nash bargaining solution, trade policies are selected to maximize the joint surplus of all parties involved and the joint surplus is given by equation (Goldberg and Maggie 1999)

$$\Omega = \beta W + (1-\beta) \sum_{j \in L}^{n} W_j \qquad (4\text{-}4)$$

Where Ω is joint surplus, β is the weight of welfare In the government's objective. W is aggregate well-being lobby's j.

Using this equation to find equilibrium trade policies, one gets the following equation:

$$\frac{t_i}{1+t_i} = \frac{I_i - \alpha_L}{\frac{\beta}{1-\beta} + \alpha_L} \cdot \frac{z_i}{e_i} \qquad (4\text{-}5)$$

Where t_i is the ad valorem tariff on good i, e_i is the import-demand elasticity of good i.

This equation is used as the basis of their empirical specifications with adding an error term that can be thought of as a composite of other variables affecting protection. After adding the error term, the estimating equation is as equation:

$$\frac{t_i}{1+t_i}e_i = \frac{I_i-\alpha_L}{\frac{\beta}{1-\beta}+\alpha_L}\frac{X_i}{M_i} + \epsilon_i = \gamma\frac{X_i}{M_i} + \delta\frac{X_i}{M_i} + \epsilon_i \quad (4\text{-}6)$$

Where $\gamma = [-\frac{\alpha_L}{\frac{\beta}{1-\beta}} + \alpha_L]$, and $\delta = [\frac{1}{\frac{\beta}{1-\beta}} + \alpha_L]$

The full econometric model to estimate is as follows:

$$y_i^* = \frac{t_i^* e_i}{1+t_i^*} = \gamma\frac{X_i}{M_i} + \delta I_i\frac{X_i}{M_i} + \epsilon_i \quad (4\text{-}7)$$

$$t_i = \begin{cases} \frac{i}{\mu}t_i^* & if\ 0 < t_i^* < \mu \\ & if\ \ t_i^* \le 0 \\ 1 & if\ \ t_i^* \ge \mu \end{cases} \quad (4\text{-}8)$$

$$\frac{X_i}{M_i} = \delta_1' Z_{1i} + U_{1i} \quad (4\text{-}9)$$

$$I_i^* = \delta_2' Z_{2i} + U_{2i} \quad (4\text{-}10)$$

$$I_i = \begin{cases} 1 & if\ I_i^* > 0 \\ 0 & if\ \ I_i^* \le 0 \end{cases} \quad (4\text{-}11)$$

Where t_i^* is a latent variable that can be thought as the ‘’True’’ level of protection. This is equal to a multiple (μ) of the coverge ratio, represented by $\sum_k n_k^i w_k^i$, if the coverage ratio is strictly between zero and one. Similarly I_i^* is a latent variable and if this variable is positive, the sector is organized and the other organization dummy takes the value 1, otherwise the dummy is zero. The vectors Z_{1i} and Z_{2i} consist of variables employed in the specification for the inverse

import penetration ratio and the political organization dummy respectively. ϵ, U_1, U_2 are error terms.

Signs of the coefficients γ and δ are examined to see if they match with the signs predicted with model. Also, structural parameters β and α_L are derived to various values of μ to check if they fall into 0 to 1 range or not. In addition, more variables are introduced in the estimation to see if they can provide a better fit. These variables include sectoral employment size and unemployment rate, unionization measures, changes in import penetration, market concentration indices.

Table 4-1 shows the results of estimating the trade protection equation. According to this table, for all cases of μ, the signs for coefficients γ and δ are consistent with GH model predictions. The sign prediction of $\delta+\gamma > 0$ does not find strong support. The model prediction that the relationship between protection and import penetration depends on politically organized or non organized sector is also supported by these results. Sign and statistical significance of δ shows that there is a different pattern in protection in organized and non-organized sectors. In non-organized sectors, the prediction of positive relationship between import penetration and protection is positive is also supported. However, the negative relationship of mentioned factors in organized sectors gets only weak support.

Table 4-1: results from the basic specification (GH model)

Variable	$\mu = 1$	$\mu = 2$	$\mu = 3$
$\frac{X_i}{M_i}$	-0.0093 (0.0040)	-0.0133 (0.0059)	-0.0155 (0.0070)
$\frac{X_i}{M_i} * \mathbf{I_i}$	0.0106 (0.0053)	0.0155 (0.0077)	0.0186 (0.0093)
Implied β	0.986 (0.005)	0.984 (0.007)	0.981 (0.009)
Implied α_L	0.883 (0.223)	0.858 (0.217)	0.840 (0.214)

Structural parameters β and α_L were retrieved, using γ and δ. It is seen that the higher μ, the higher the equivalent tariff and a lower weight on welfare and lower degree of lobby representation. The estimates of β and α_L are within 0-1 range which is within the permissible range. They also tested for the variables which should not influence protection, according to the GH model. So, empirical specification was extended to include these variables and results of this exercise are shown in table 4-2. (Goldberg and Maggie 1999)

Table 4-2: Alternative Specifications ($\mu = 1$)

Variable	Specification 1 Log-likelihood: -134.9	Specification 2 Log-likelihood:-132.06	Specification 3 Log-likelihood:-132.04	Specification 4 Log-likelihood:-130.61
$\frac{X_i}{M_i}$	-	-0.0093 (0.0040)	-0.0096 (0.0043)	-0.0109 (0.0045)
$\frac{X_i}{M_i} * \mathrm{I_i}$	-	0.0106 (0.0053)	0.0105 (0.0053)	0.0123 (0.0055)
constant	-0.0640 (0.1104)	-	-0.0287 (0.1375)	-0.2619 (0.2559)
Unemployment	-	-	-	1.5722 (1.5884)
Employment size	-	-	-	1.1836 (0.8235)

In column 1, results from specification in which γ and δ were left out and only one constant was included are reported. In column 2, the results from GH model are shown to provide a standard for comparison. Results of a specification in which two variables of model and one constant are included can be seen in column 3. Comparing column 1 and 3 gives us an idea of the fit of GH model. It is concluded that two variables of model improve fit of model. When other regressors were added in various specifications, no significant improvement of model fit was observed.

Likelihood function was improved by a nonnegligible amount only in specification in column 4, in which sectoral unemployment and employment size were included in the

specification. So, there is some evidence that factor relating to unemployment can affect protection which is different than channels suggested by GH model. All in all in Goldberg and Maggi (1999) study, strict version of GH model was seen to be the model which can predict trade protection accurately with just simple enough, theoretically sound specification. The fact that model prediction was consistent with data and helps to explain the cross sectoral structure of trade protection was remarkable, compared with disastrous results of empirical performance of strict version of trade models, such as Heckscher- Ohlin model.

4-3- Empirical investigation of an extension of GH model; U.S. nontariff bariers

In strict GH model, the central role is given to inverse import penetration ratio, import elasticity and the level of protection. However, empirical literature on endogenous protection which we reviewed in previous chapter showed that other factors including market structure, firm concentration, average earnings, labor intensity, industry voting strength, skill composition of employees are the effective factors. Gawande and Bandyopadhyay (2000) investigated the real world data against predictions of GH model, using cross sectional US nontariff barriers and considering lobbying due to protection on intermediate inputs as well as the effects of welfare and counter-lobbying on contribution schedules. They estimated two specifications, one is the sparse specification based on the pure GH model with intermediate goods, and the other is a larger specification based on the existing empirical work. The equations for these specifications are as follows: (Gawande and Bandyopadhyay 2000)

$$\frac{NTB}{1+NTB} = \alpha_0 + \alpha_1 \frac{z}{e} + \alpha_2 \left(I \times \frac{z}{e}\right) + \alpha_3 INTERMTAR + \alpha_4 INTERMNTB + \epsilon_1 \qquad (4\text{-}12)$$

$$\ln \frac{PAC}{VA} =$$

$$\beta_0 +$$

$$\beta_1 \ln \frac{NTB}{1+NTB} + \beta_2 \ln e + \beta_3 \ln \frac{1}{z} + \beta_4 \ln DOWNSTREAMSHR + \beta_5 \ln DOWNSTREAMHERF +$$

$$\beta_6 + \epsilon_2$$

$$\frac{1}{Z} = \delta_0 + \delta_1 \frac{NTB}{1+NTB} + X_m \Delta + \epsilon_3$$

And (4-12′)

$$\frac{NTB}{1+NTB} = \alpha_0 + \alpha_1 \frac{z}{e} + \alpha_2 \left(I \times \frac{z}{e} \right) + \alpha_3 INTERMTAR + \alpha_4 INTERMNTB + X_N \boldsymbol{\Gamma} + \boldsymbol{\epsilon_1}$$

$$\ln \frac{PAC}{VA} = \beta_0 + \beta_1 \ln \frac{NTB}{1+NTB}$$
$$+ \beta_2 \ln e$$
$$+ \beta_3 \ln \frac{1}{z}$$
$$+ \beta_4 \ln DOWNSTREAMSHR$$
$$+ \beta_5 \ln DOWNSTREAMHERF + \beta_6 \ln HERF + X_p \pi + \epsilon 2$$

$$\frac{1}{Z} = \delta_0 + \delta_1 \frac{NTB}{1+NTB} + X_m \Delta + \epsilon_3$$

Where z is the inverse import penetration ratio, e is the import elasticity, t is level of protection, I is an indicator variable that equals 1 if sector *i* is organized into a lobby. $\alpha_L$is the fraction of the population organized in to final good lobbies, and $\alpha_X$is the intermediate good lobby.

In equation 4-12, the first equation is based on GH predictions about the rate of protection across industries in which level of protection is measured by the overall nontariff barrier coverage ratio (NTB). In the second equation, the dependent variable is measured by lobbying spending per contributing firm, scaled by value added. Measurement of lobbying competition is done by the bargaining strength of downstream users whose interests are in contrast with protectionism in upstream producers.

They used two measures for this end: the share of the upstream lobby's output that is sold downstream as intermediate goods (DOWNSTREAMSHR) and a Herfindal measure of buyer concentration among downstream industries for the upstream lobby's output (DOWNSTREAMHERF). With respect to lobbying competition, the strong competition hypothesis is the joint hypothesis of $\beta_4 > 0 \; and \; \beta_5 > 0$ And a weaker hypothesis is any of these factors positive. The third equation is the specification of import equation which is based on Trefler (1993) work.

In NTB equation of specification 4-12', exogenous political economy variables are included as control variables, XN which are based on the works of Baldwin (1986), Brock and Magee(1978),Caves(1976),Corden(1974),Olsen(1965) and Trefler (1993).These variables are corresponding to both special interest theories and public interest ones and are described in table 4-3. (Gawande and Bandyopadhyay, 2000)

Table 4-3: Descriptions of Variables Used In the Econometric Analysis

Variable	Description
NTB_j	U.S all nontariff barriers coverage of imports from partner j,1983
TAR	U.S post-Tokyo round ad-valorem tariffs(Ratio)
PACFIRM	Corporate PAC spending per contributing firm, over 1977-1984.($100Mn)
PACTRADE	Trade-related PACFIRM/VA
VA	Value Added,1983($Bn)
IMP_J	U.S import from partner j,1983($Bn)
EXP_J	U.S export to partner j,1983($Bn)
IMP	U.S total imports across all partners
EXP	U.S total exports across all partners
CONS	U.S consumption,1983 ($Bn)=VA+IMP-EXP
NTB_J^*	Partner j's NTB coverage of its imports from the U.S ,1983.(ratio)
UNION	Fraction of employees unionized ,1981
SCIENTISTS	Fraction of employees classified as scientists and engineers,1982)
MANAGERS	Fraction of employees classified as managerial ,(1982)
UNSKILLED	Fraction of employees classified as unskileed,1982
AVGERAN	Average earnings per employee,1982($000/year)
FIRMSCALE	Measure of industry scale :Value added per firm,1982.($Bn/firm)
CONC4	Four-firm concentration ratio,1982
STATES	Number of states in which production is located,1982
NE82	Number of employees,1982(Mn.persons)
IMPGROWTH	Change in U.S import-consumption ratio between 1979 and 1982.
ΔTAR	Change in ad valorem tariffs due to Tokyo round cuts
EARNGROWTH	Change in earnings between 1979 and 1982.
NEGROWTH	Growth in employment during 1982
LABORSHARE	Labor intensity=share of payroll in value added, 1982.
DOWNSTREAMSHR	Percentage of an industry's shipments used as intermediate goods in other.
DOWNSTREAMHERF	Intermediate-goods-output buyer concentration.
HERF	Herfindahl index of firm concentration
INTERMTAR	Average tariff on intermediate goods use in an industry
INTERMNTB	Average NTB coverage of intermediate goods use n an industry.
ELAST0	Own price elasticity of imports (from Sheills et all(1986))
CROSSEL0	Cross price elasticity between home (U.S) and imports. (from Sheills et all(1986))
ELAST1	ELAST0 corrected for errors-in-variables
CROSSEL1	CROSSEL0 corrected for errors-in-variables
Z	(CONS/IMP)/10000
$\frac{z}{e}$	|(CONS/IMP)/$\lvert ELAST1 \rvert$|/10000
$D_g, g = 1 \ldots, 4$	Dummies for four industry groups: food processing,resource-intensive,general manufacturing, and capital-intensive
K/L	Capital-labor ratio
$(K/L)_g, g = 1, \ldots, 4$	K/L × D_g, where D_g,g=1,…4 are the four industry group-dummies

Gawande and Bandyopadhyay (2000) checked size and sign of coefficients, similar to Goldberg and Maggi (1999) study. They also checked if a larger model over fits data or not. The larger NTB model has a good explanation power and provides the right signs of variables.

Results of estimating NTB and lobbying equations of specification 4-12' are presented in table 4-4. The bold numbers are estimates that confirm the G-H predictions and italicized

estimates are in contrast with GH model. On NTB equation, the signs of *z/e* and $I \times z/e$ coefficients are negative and positive, respectively, which are consistent with predictions of GH model, and both coefficients are measured precisely. (Gowanda and Bandyopadhyay 2000)

Table 4-4:2SLS Estimates From Aggregate U.S NTBs: Three equation model [NTB, LOBBYING, IMPORT]. Grossman-Helpman specification (parsimonious)

Model 1				
	NTB Eq		LOBBY Eq	
	Coef	s.e	Coef	s.e
NTB/(1+NTB)	DEP	-	-	-
Ln (PACFIRM/VA)	-	-	DEP	-
z/e	-3.088	1.532	-	-
I × z/e	3.145	1.572	-	-
INTERMTAR	0.780	0.242	-	-
INTERMNTB	0.362	0.062	-	-
Ln (HERF)	-	-	0.177	0.068
Ln (IMP/CONS)	-	-	0.298	0.064
Ln (NTB/(1+NTB)	-	-	-0.069	0.027
Ln (ELAST1)	-	-	0.376	0.242
Ln (DOWNSTREAMSHR)	-	-	0.321	0.105
Ln (DOWNSTREAMHERF)	-	-	0.278	0.091
constant	-0.042	0.017	-2.195	0.348
N	242		242	
k	5		7	
R^2	0.234		0.166	
Model F	18.10		7.82	
AIC	-1.369		3.047	
SIC	0.648		-1.574	
Ln L	170.7		-361.7	
∂ ln (PAC/VA)/ ∂ln (DWL/VA)	-		0.634	0.250

This result is in contrast to empirical literature on protection which states that *1/z* should be positively related to protection. One reason for this contrast is that import elasticity's were not used in empirical literatures, while their inclusion in GH model is a unique feature of the model. Also, in traditional literature, role of political organizations was measured by proxy variables such as concentration ratios and scales. However in GH model, treating political organizations is precise and it is also a unique feature of this model. (Gawande and Bandyopadhyay 2000)

Sum of coefficients *z/e* and *I*×*z/e* is also tested to be positive, but it is not statistically significant and close to zero. This observation implies that the fraction of population which is organized in lobbies is 1. This is not true for large populations, but for the case of study by (Gawande and Bandyopadhyay 2000), the sample covers 242 manufacturing industries, and this result can be true. Estimations of INTERMTAR and INTERMNTB variables are positive and precise which support the prediction that the rate of protection on intermediates has a positive effect on the rate of protection on the final good.

The other prediction that the lobbying competition with downstream industries leads to increased lobbying is also supported. The bigger DOWNSTREAMSHR, the higher the chances of facing political opposition, and it needs to pay more to overcome the opposition. The greater DOWNSTREAMEHR, their personal stakes is greater in preventing upstream rivals of buying protection.

Results of estimates of large model (specification 4-12') are presented in table 4-5. GH model predictions are supported from the larger model. The main prediction that for unorganized industries, protection varies inversely with z/e and positively for organized industries is also confirmed. Estimates of INTERMTAR and INTERMNTB coefficients are in accordance with GH model prediction of the higher the protection on intermediate goods used, the higher the protection afforded the final good. The prediction about lobbying competition is also confirmed strongly.

Table 4-5: 2 SLS estimates from aggregate U.S NTBs: three equation model [NTB, LOBBYING, IMPORT] large specification (SUBSUMES Grossman-Helpman specification)

Model 2				
	NTB Eq.		LOBBY Eq.	
	Coef.	s.e.	Coef.	s.e.
NTB/(1+NTB)	DEP	-	-	-
Ln (PACFIRM/VA)	-	-	DEP	-
z/e	-5.427	2.773	-	-
I × z/e	5.709	2.312	-	-
INTERMTAR	0.856	0.341	-	-
INTERMNTB	o.342	0.078	-	-
EXP/VA	-0.124	0.062	-	-
PACFIRM/VA	0.224	0.186	-	-
FIRMSCALE	1.469	0.572	-	-
CNC4	-0.002	0.054	-	-
NE82	0.395	0.229	-	-
UNION	-0.060	0.048	-	-
STATES	0.762	2.085	-	-
IMPGROWTH	0.163	0.101	-	-
ΔTAR	-0.118	0.106	-	-
EARNGROWTH	-1.603	8.604	-	-
UNSKILLED	-0.332	0.232	-	-
EMPGROWTH	0.045	0.060	-	-
LABORSHARE	0.114	0.097	-	-
SCIENTISTS	0.395	0.269	-	-
MANAGERS	-0.129	0.256	-	-
RERMELAST	0.048	0.024	-	-
RERXELAST	-0.001	0.014	-	-
CROSSEL1	-0.020	0.009	-	-
$D_g, g = 1 \ldots, 4$	NOTE2	NOTE3	-	-
Ln (HERF)	-	-	0.232	0.068
Ln (IMP/CONS)	-	-	0.324	0.063
Ln (NTB/(1+NTB)	-	-	0.129	0.027
Ln (ELAST1)	-	-	0.275	0.246
Ln (DOWNSTREAMSHR)	-	-	0.224	0.104
Ln (DOWNSTREAMHERF)	-	-	0.135	0.100
N	242		242	
k	26		26	
R^2	0.346		0.207	
Model F	4.58		6.51	
AIC	-1.447		3.009	
SIC	0.537		-1.580	
Ln L	201.1		-354.1	
∂ ln (PAC/VA)/ ∂ln (DWL/VA)	-		0.534	0.250

Note2: all four dummies statistically insignificant at 5%

Note 3: all four dummies are negative and statistically significant at 1 %

So, US NTB data supported GH model about protection and lobbying pattern and this observation was robust across sparse and large model specifications. When comparing pure GH model with larger model, it was observed that pure GH model is a better candidate to fit empirical data than larger model. This observation is consistent with the result of Maggi 1999 study.

4-4- extension of GH model

In the previous parts of this chapter, the link between domestic lobbies and government in determining trade policy was reviewed. However, there are other studies that have focused on the effect of foreign lobbies in country political processes. The general assumption is that interaction of foreign lobbies and domestic government is harmful for home economy. However, this is not always true and foreign lobbies may shift trade policies in home country in the direction of improving domestic consumer surplus and possibly improving welfare.

4-4-1- Effect of foreign lobbies on U.S. trade policy

Gawande, Krishna and Robbins (2007) have investigated foreign lobbies' effect on U.S. trade policy. To account for the role of foreign lobbies, some modifications have been made to the GH theoretical framework. Similar to GH model, they assumed an open economy having the utility function as below:

$$U=c_o + \sum_i u_i(c_i) \qquad (4\text{-}13)$$

In which c_o is consumption of the numeraire good (good 0), and c_i is consumption of good i=1….,n .

Also, assuming sub-utilities u_i are quadratic functions with parameters such that domestic demand for the nonnumeraire goods have the linear form of equation 4-14:

$$P_i = A - Q_i, \qquad i = 1, \ldots\ldots, n \tag{4-14}$$

Where Q_i is aggregate consumption of good *i.*

Good *0* is produced from labor by Ricardian technology and is freely traded internationally in perfect competitive markets. Goods *i=1,…,n* are produced by constant-return technologies with labor and are sold in international segmented oligopolistically competitive markets using supply provided by fixed numbers of domestic and international firms, which produce at constant costs and compete in the domestic market in Cournot-Nash fashion.

The interaction of government and lobbies represents domestic and foreign firms separately. So that the government objectives function are weighted function of lobbying contributions and 3 components of welfare, including producer surplus, consumer surplus and profits. The functional form is as equation 4-15:

$$G = \sum_{i \in L^h} C_i^h + a\,(\sum_i n_i^h \pi_i^h + TR + CS) + b \sum_{i \in L^f} C_{i,}^f \tag{4-15}$$

Where L^h is the sectors with organized domestic lobbies, C_i^h is lobbying contribution by the domestic lobby in *i*, $L^f$is the set of organized foreign lobbies, $C_{i,}^f$is foreign contribution,TR is tariff revenue and CS is consumer surplus, π_i^h is profit earned by an individual domestic producer in sector I, n_i^h is the number of domestic firm in sector *i*, *a* is a constant reflecting the government's preference for welfare relative to domestic campaign contribution and *b* is a constant reflecting the government's preferences for foreign contributions relative to domestic contribution.

These domestic and foreign lobbies would like trade policies to be set in a way that would suit them the best. Then, trade policy vector chosen would maximize the following equation:

$$\sum_{i\in L^h} n_i^h \pi_i^h + \alpha(TR + CS) + a(\sum n_i^h \pi_i^h + TR + CS) + b\sum_{i\in L^f} n_i^f \pi_i^f \quad (4\text{-}16)$$

Where n_i^f is number of foreign firms in sector *i,* and π_i^h is profit earned by an individual foreign firm. In which α is the fraction of domestic population which is organized into any lobby, the equilibrium trade policy expression is as equation 4-17:

$$\frac{\tau_i}{p_i} = \left(\frac{2I_i^h}{a+\alpha} + \frac{2a}{a+\alpha}\right)\left(\frac{X_i}{m_i}\right)\frac{1}{|\varepsilon_i|} - \frac{2bI_i^f}{a+\alpha}\left(\frac{X_i}{m_i}\right)\frac{1}{|\varepsilon_i|} \quad (4\text{-}17)$$

Where X_i is aggregation production of *i* in the home economy, m_i is imports and ε_i is an imports elasticity measure.

For cross-sectional determinants of tariff, this model predicts that sectors with organized domestic lobbies get more protection (I_i^h is positive), sectors with foreign political presence get less protection (I_i^f is negative) and sectors with neither domestic nor foreign political presence get positive protection due to the assumption of imperfect competitive nature of the product market. The equation to be estimated is as equation 4-18 in which an error term e_i is entered:

$$\frac{t_i}{1+t_i} = \beta_1\left[\frac{X_i}{m_i}\cdot\frac{1}{|\epsilon_i|}\right] + \beta_2\left[I_i^h\cdot\frac{X_i}{m_i}\cdot\frac{1}{|\epsilon_i|}\right] + \beta_3\left[I_i^f\cdot\left[\frac{X_i}{m_i}\cdot\frac{1}{|\epsilon_i|}\right]\right] + e_i \quad (4\text{-}18)$$

Which t_i is the effective ad valorem import tax, $\beta_1 = \frac{2a}{(a+\alpha)}$, $\beta_2 = 2/(a+\alpha)$, $\beta_3 = -2b/(a+\alpha)$. β_1 *and* β_2 are predicted to be greater than zero and β_3 is less than zero.

In order to assign foreign political organization, first the percentile distribution of expenditures per unit value added was determined in four percentiles. Then, for any threshold,

sector was assigned I*=1 if the sector was in that percentile for all years of sample period. Domestic political organization variable *I* was also assigned on the basis of percentile. It was assigned a value of 1 if the mean of domestic PAC spending per thousand dollars of sectoral value added was in excess of 0.05 or 0.1.

Results of estimate of EQUATION 4-18 are presented in table 4-6 where the protection measure is the tariff rate. Table 4-7 presents results of estimate with NTB as the protection measure. It is seen that β2 and β3 are statistically significant and have the signs predicted by model. β2 is positive which means domestic political presence results in higher trade barriers. β3 is negative which means that foreign political presence leads to lower tariff. The magnitudes of β2 and β3 are close, which implies that government sets an equal weight on a dollar of domestic lobbying contribution and a dollar of foreign lobbying contribution. (Gawande, Krishna and Robbins ,2007)

Table 4-6: Foreign political activity and tariffs (1978-1982)

	I^* Expenditures			
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 (5.88)	0.347 (5.726)
β_3	-0.766 (1.305)	-0.241 (2.860)	-0.29 (3.282)	-0.286 (3.329)
L	161.86	180.237	174.827	180.016
% Obs with I^*=1	0.52	0.22	0.08	0.04
% Obs with I=1	0.65	0.65	0.65	0.65
AIC	-1.28	-1.43	-1.39	-1.43
SIC	0.62	0.69	0.67	0.69

Table 4-7: foreign political activity and NTBs (1978-1982)

I^* Expenditures				
Parameter	**0th percentile**	**25th percentile**	**50 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)
L	31.68	46.215	45.451	49.378
% OBS with I^*=1	0.52	0.22	0.08	0.04
% OBS with I=1	0.43	0.43	0.43	0.43
AIC	-0.23	-0.35	-0.34	-0.37
SIC	0.09	0.15	0.15	0.17

Tables 4-8 and 4-9 show results with thresholds for domestic PAC spending per thousand dollars of value added set at 0.1. These results are closely in line with the results of tables 4-6 and 4-7. β_1 is seen to be insignificantly different from zero. From definitions of β_1 and β_2, it is suggested that structural parameter *a* is insignificantly different from zero and that government sets trade policies almost completely based on political contributions with little regard for welfare. This conclusion is not supported here, using β_2 to get *a,* it ends up being an implausibly high value.

Table 4-8: foreign political activity and tariffs (1978-1982)

I^* Expenditures				
Parameter	**0^{th} percentile**	**25^{th} percentile**	**50^{th} percentile**	**75^{th} 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)
L	151.61	124.506	118.192	138.408
% Obs with I^*=1	0.52	0.22	0.08	0.04
% Obs with I=1	0.65	0.65	0.65	0.65
AIC	-1.20	-0.98	-0.93	-1.09
SIC	0.58	0.47	0.44	0.52

Table 4-9: foreign political activity and NTBs (1978-1982)

I^* Expenditures				
Parameter	0th percentile	25th percentile	50th percentile	75th percentile
β_1	0.008 (0.429)	0.007 (0.379)	0.002 (0.105)	0.00 (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)
L	44.016	25.111	25.937	36.782
% Obs with I^*=1	0.52	0.22	0.08	0.04
% Obs with I=1	0.65	0.65	0.65	0.65
AIC	-0.33	-0.18	-0.19	-0.27
SIC	0.14	0.07	0.07	0.11

So, it was seen that tariffs and NTB coverage ratios are strongly and positively related with organized import-competing lobbies and negatively with organized foreign lobbies. These effects are larger when *I* and *I** are measured at higher percentile requirements which implies that after spending exceeds certain amounts, the industry is expected to be politically organized for lobbying.

It was seen by these results that foreign lobbying is not necessarily harmful to home economy. In a trade policy context, foreign lobbying can improve welfare, as was seen that tariffs and NTBs were both negatively related with foreign lobbying.

4-4-2- Effect of lobbying competition in trade policy

In addition to foreign lobbying which affects trade policy, competition between lobbies should also be taken into account. Since lobbies representing different economic interests tend to move trade policies in different directions, the policy outcome would be sensitive to the nature

and extent of competition between lobbies. In empirical investigation of interest group theory of trade policy determination by Golberg and Maggi (1999) and Gawande and Bandyopadhyay (2000), it was shown that government is close to welfare-maximizing in its behavior. So, in order to get protection and policy distortions, a high political contribution is necessary. However, in real world, policy distortions are being sold very cheaply. Gawande, Krishna and Olarraga (2012) empirically studied the political economy of trade policy determination when lobbying competition between upstream and downstream producers is present. The theoretical platform for their work is the GH model, with the modification to consider the extent of cross-sectoral use of intermediates in production (the input-output matrix). Gawande-Bandyopodhay (2000) used intermediates to study the link between final good tariffs and tariffs on intermediate goods used in their production. The result of their study was that a higher tariffs on output of intermediate good leads to higher tariffs on its users. However, Gawande, Krishna and Olarraga (2012) study tried to model the natural opposition to tariffs on intermediates by users of those intermediates through theory of lobbying competition.

The assumptions they used in the model are quite the same as GH model, with some modifications. The utility function is as follows: (Gawande, Krishna and Olarraga 2012)

$$U = c_0 + \sum_{i=1}^{n} u_i(c_i) \qquad (4\text{-}19)$$

Which c_0 is sonsumprion of the numeraire good (good 0) and c_i is consumtion of the non-numeraire goods *i=1,.....,n.*

Nonnumeraire goods in all industries are produced perfectly completely using sector-specific capital K_i, mobile labor l_i, and intermediate goods produced in all other industries. For non-numeraire goods, the output y_i is as follows:

$$y_i = min\left\{f_i(k_i, l_i, \frac{x_{0i}}{\Omega_{0i}}, \dots, \frac{x_{ni}}{\Omega_{ni}})\right\}, \qquad i = 1, \dots, n \tag{4-20}$$

Which f_i the value added produced using sector specific capital and mobile labor, Ω_{ji} is the amount of good j necessary to produce one unit of good i, x_{ji} is sector i's use of good j as an intermediate input.because of numeraire good is produce under constant returns to scale using only labor so that the wage rate w is fixed. Numeraire good is produced by labor only and the wage rate is fixed.

Sector *i*'s profit is as equation 4-21:

$$\pi_i = p_i y_i - l_i - \sum_{j=1}^{n} p_j \Omega_{ji} y_i \tag{4-21}$$

If domestic price is $p_i = p_i^*(1 + t_i)$, and **p** is the n- dimensional domestic price vector. Surplus which is derived by consumers on the nonnumeraire goods is given by:

$$S(\boldsymbol{p}) = \sum_{i=1}^{n}(u(c_i) - p_i c_i) \tag{4-22}$$

There is one more assumption that the fraction of population which is represented by organized lobbies is small. The result of this assumption is that owners of specific factors just care about the prices of goods that they produce or use as intermediate inputs for their production. So sector i lobbies just to increase its profit. The surplus derived to owners of capital in sector *i* is the profit from production as follows,

$$v_i(\boldsymbol{p}) = \pi_i(\boldsymbol{p}) \tag{4-23}$$

The objective function of government is given by:

$$G(\boldsymbol{p}) = \sum_i C_i(\boldsymbol{p}) + aW(\boldsymbol{p}) \quad (4\text{-}24)$$

Where G (p) is the objective function of the government, $C_i(\boldsymbol{p})$ is the contribution schedule of the ith industry, $W(\boldsymbol{p})$ is gross social welfare, a is the weight the government attaches to social welfare relative to political contribution.

In this equation, it is assumed that all industries are politically organized. Maximizing the joint surplus of government and lobbies and having the equations above, the final theoretical prediction of trade protection in the presence of lobbying competition is given by:

$$\frac{t_i}{1+t_i} = \frac{1}{a}\left[\frac{1}{m_i.|e_i|}(y_i - \sum_{j=1}^{n} \Omega_{ij} y_j)\right] \quad (4\text{-}25)$$

Where $|e_i|$ is the absolute value of the import demand elasticity in sector i. $\sum_{j=1}^{n} \Omega_{ij} y_{j)} \neq 0$ lobbying by downstream users the level of production is lowerthan predicted.

The term in square brackets shows the lobbying competition between upstream and downstream users to increase production profits. Lobbying by downstream users decreases the level of protection. This equation predicts that the higher a, the lower tariffs. Using this equation, country-specific parameter a is predicted which measures the welfare mindedness of governments.

Introducing an additive error term u_i, a is estimated from the equation 4-26:

$$\frac{t_i}{1+t_i}.\left[\frac{m_i}{y_i - \sum_{j=1}^{n} \Omega_{ij} y_j}\right].|e_i| = \beta_c + u_i \quad (4\text{-}26)$$

Estimates of parameter β_c is obtained by sample averaging of the expression on the left hand side, and then, it can be inverted to give a. since there is only one constant on the right-hand side of equation, estimates of β_c are not subject to any endogeneity bias.

A more basic specification which does not take into account the intermediate-use-based counter lobbying and in the absence of lobbying competition is given by

$$\frac{t_i}{1+t_i}.\left[\frac{m_i}{y_i}\right].|e_i| = \beta_{nc} + u_i \qquad (4\text{-}27)$$

Which β_{nc} is the inverse of the parameter a when lobbying competition is not taken in to account.

Parameters β and β_c which are country-specific are estimated for 42 countries and the implied value of (a) are shown in table 4-10. These estimates are highly significant for all countries, however there is a cross-country variation of the estimates. Korea, Japan, Singapore and U.S. have low parameter estimates and high estimate of (a), while Bangladesh, Cameroon, Mexico, Pakistan, Thailand and Sri Lanka have high parameter estimates and low estimate of a. These results are in agreement with welfare mindedness of each government in setting trade policy. Estimate of a is lowered when lobbying competition is taken into account. These results show that lobbying competition lowers the estimate of welfare mindedness of governments significantly, so ignoring lobbying competition may result in incorrect estimate of welfare mindedness of government and the wrong conclusion that trade policies are set by a welfare-maximizing government. (Gawande, Krishna and Olarraga 2012)

Table 4-10: counter lobbying and endogenous trade policy (countries A-Z)

No counter lobbying				Counter lobbying			
Country	β_{nc}	Implied a	Rank	β_c	Implied a	Rank	N
Argentina	0.079 (5.17)	12.63	19	0.186 (7.98)	5.37	22	241
Australia	0.044 (2.35)	22.75	11	0.141 (4.96)	7.08	17	162
Bangladesh	0.571 (20.68)	1.75	41	0.993 (22.43)	1.01	41	74
Cameroon	0.317 (10.23)	3.16	38	0.685 (14.15)	1.46	39	59
Chile	0.089 (6.14)	11.25	21	0.187 (8.46)	5.36	23	270
China	0.055 (3.59)	18.29	14	0.174 (7.48)	5.76	20	243
Colombia	0.055 (3.81)	18.12	15	0.134 (6.01)	7.46	15	269
Costa Rica	0.148 (8.91)	6.77	32	0.256 (9.93)	3.90	30	205
Denmark	0.052 (3.71)	19.36	13	0.339 (14.05)	2.95	34	291

Ecuador	0.184 (10.52)	5.43	34	0.318 (11.46)	3.14	33	184
Finland	0.042 (1.27)	24.08	10	0.068 (1.36)	14.78	8	53
France	0.041 (2.18	24.57	9	0.068 (2.40)	14.63	9	162
Germany	0.034 (2.59)	29.28	7	0.064 (3.20	15.53	7	324
Greece	0.079 (5.68)	12.69	18	0.109 (5.11)	9.16	11	294
Guatemala	0.149 (7.40)	6.73	33	0.265 (8.58)	3.78	31	140
Hungary	0.102 (6.30)	9.80	25	0.195 (7.89)	5.12	25	215
Indonesia	0.092 (5.98)	10.86	22	0.144 (6.06)	6.94	18	238
Ireland	0.085 (5.09)	11.75	20	0.123 (4.79)	8.15	13	202
Italy	0.037 (1.98)	27.11	8	0.058 (2.05)	17.12	6	162
Japan	0.011 (0.82)	92.47	2	0.023 (1.16)	42.76	2	324
Kenya	0.205 (7.12)	4.88	35	0.529 (11.87)	1.89	38	68
Korea	0.027 (1.98)	36.65	4	0.120 (5.72)	8.32	12	297
Malaysia	0.129 (7.78)	7.73	29	0.235 (9.25)	4.26	28	204
Mauritius	0.293 (12.83)	3.41	36	0.769 (21.66)	1.30	40	108
Mexico	0.324 (18.62)	3.08	39	0.492 (18.52)	2.03	36	186
Netherlands	0.127 (7.85)	7.87	28	0.180 (7.28)	5.55	21	215
Norway	0.132 (5.66)	1.72	30	0.216 (6.09)	4.62	27	104
Pakistan	0.581 (17.64)	1.72	42	1.121 (21.88)	0.89	42	52
Peru	0.101 (4.58)	9.95	24	0.191 (5.65)	5.24	24	117
Philippines	0.145 (11.36)	6.89	31	0.285 (14.61)	3.50	32	346
Romania	0.050 (1.88)	20.18	12	0.102 (2.54)	9.80	10	81
Singapore	0.001 (0.06)	948.68	1	0.001 (0.05)	771.96	1	190
South Africa	0.097 (6.37)	10.29	23	0.211 (8.99)	4.75	26	243
Spain	0.030 (2.14)	33.82	5	0.050 (2.37)	20.04	4	297
Sri Lanka	0.296 (14.21)	3.38	37	0.504 (15.30)	1.99	37	130
Sweden	0.104 (2.28)	9.60	26	0.153 (2.19)	6.55	19	27
Taiwan	0.058 (3.34)	17.25	16	0.133 (5.02)	7.51	14	187
Thailand	0.356 (20.15)	2.81	40	0.457 (16.64)	2.19	35	181
United Kingdom	0.032 (1.83)	31.69	6	0.058 (2.21)	17.18	5	189
United States	0.019 (1.13)	54.03	3	0.047 (1.90)	21.10	3	212
Uruguay	0.126 (7.58)	7.91	27	0.250 (9.78)	4.00	29	203
Venezuela	0.079 (4.83)	12.70	17	0.138 (5.55)	7.26	16	213

4-5- Conclusion

To conclude, Grossman-Helpman model showed that its predictions are connected to the theory. It was examined empirically by Goldberg and Maggie (1999) and this empirical evidence supported the model predictions. The big picture of Gawande and Bandyopadhyay (2000) study is that U.S. protection pattern is affected by lobbying spending and lobbying competition, and therefore, protection is sold. According to their results, the reason why protection is lower in U.S. compared to other developed countries is that government gives almost equal weight to aggregate welfare and aggregate contributions. However, when taking the role of lobbying competition and foreign lobbies into account, it was seen that level of welfare mindedness of

government is lower than what is predicted in general GH model and trade policies are sold cheaply.

Chapter 5-Conclusion

Political economy of trade policy tries to explain trends and policies in trade and shed light on the reasons of protectionist policies. In first generation of empirical studies in trade policy determinations, the relevance of several determinants of trade policy was investigated. Comparing different models needs a one-to-one determination of variables that represent each model, which are usually correlated, and this leads to a lack of detailed justification of a model. More specified micro-foundation models were developed to solve this problem. These models are divided into two major branches. The first branch is the median voter approach, which assumes that government chooses policies based on the majority opinion on the issue. Empirical investigation of this model was done. Dhingra (2010) showed that tariff in a large country is a sum of median voter and TOT components which the latter is positive and has a positive impact on tariff across all large countries. Terms of trade component, on the other hand, has a negative impact on tariffs in labor abundant and positive impact in capital abundant countries which is in line with median voter model. The other branch represents interest group theories which assume trade policies are determined based on the interaction of government and organized lobbies. Grossman-Helpman model is the most prominent representative of this branch of literature and it was examined empirically by several researches. They observed connection between model and real world data, and it was shown that considering lobbying competition and foreign lobbies also affect the outcome, and overlooking them can lead to non-real conclusions.

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