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Political economy of Poland's trade policy. Empirical verification of Grossman-Helpman model

Abstract:

In our paper, we present an analysis of rent seeking behavior in trade policy based on the Grossman-Helpman (G-H), "Protection for sale" framework. In their model, various lobbies in organized industries provide contributions to the government in return for influencing the tariff schedules. Our empirical implementation (similar to that of Maggi and Goldberg) is dealing with the problem of Polish trade policy in the late 1990s. We have used the instrumental variable approach to estimate the model, taking into account possible endogeneity of the regressors. Herfindahl index and unit subsidy level seem to be the best proxies for the industry organization level. The latter variable was used basing on the presumption that the sectors, which are better organized can receive higher pecuniary benefits.

Our results are inline with the predictions of the theory. Most of our regressions support the theory and we find support for the significance of lobbies in formation of trade policy in Poland. The G-H model seems to work much better in the case of MFN than for preferential tariffs. There is some anecdotic evidence that lobbies managed to influence Polish trade policy several times, and this evidence is confirmed in our calculations. The importance of the lobbies is, however, significantly lower than in the case of the United States, which is in line with our expectations.

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The “Protection for Sale” model and Goldberg-Maggi estimation

The Grossman and Helpman (1994) model (G-H) is probably the most advanced and well known model of political economy. It is aimed at explaining the pattern of trade policy through operation of exogenous domestic lobbies.

In the early work of Findlay and Wellisz (1984) the interplay between domestic lobbies, representing capital and land owners, was represented by the “black box” tariff formation function. In the median voter model (Mayer, 1984) the trade policy was determined by majority vote. In the most elaborate G-H model the governmental policy is determined by elected politicians. They simultaneously consider the consumer welfare of electorate and contributions of lobbies, representing various sectors of the economy.

The formal G-H model, in a somewhat simplified version by Goldberg and Maggi (1999) and Feenstra (2004), can be described as follows. There is a continuum of individuals (consumers), with identical preferences of quasi-linear utility (increasing & strictly concave)

function (U), given by: $c_0 + \sum_{i=1}^N u_i(c_i)$ where: c_0 is a *numeraire* export good and c_i denotes

the consumption vector of all other goods ($h=1, \dots, n$). Assuming that I is the budget constraint of a representative consumer then $d_i(p_i)$ is per capita consumption of each good,

then remaining income is spent on the *numeraire* good, i.e. $c_0 = I - p'd(p)$;

where: $p = (p_1, p_2, \dots, p_N)$ is the vector of prices. Each consumer maximizes utility subject to

budget constraint: $c_0 + p'c \leq I$. Therefore, the individual utility is given by:

$V(p, I) \equiv I - p'd(p) + \sum_{i=1}^N u_i[d_i(p_i)]$. Denoting consumer surplus as:

$S(p) \equiv \sum_{i=1}^N u_i[d_i(p_i)] - p'd(p)$ we can rewrite the representative consumer welfare as:

$V(p, I) \equiv I + S(p)$.

On the production side there are N industries with sector specific (capital) inputs and labour. The total supply of labour has measure one. The *numeraire* good is produced with one unit of labour that the wage is equal to one. Each other good is produced from labour and factor specific input. The supply function of good i is denoted by $y_i(p_i)$. The returns to factor specific input i are equal to $\pi_i(p_i)$ and therefore by Hotelling’s lemma $\pi_i'(p_i) = y_i(p_i)$.

We analyze a small economy in which the international prices of goods are fixed at p_i^* . Each of N industries receives a specific tariff t_i^s , where $t_i^s > 0$ indicates a tariff in an import industry or a subsidy in an export industry. Obviously $t_i^s < 0$ means a subsidy in an import industry or a tariff in export industry. The tariff introduces a wedge between domestic and international price: $p_i = p_i^* + t_i^s$. Defining imports of each of i industry as: $m_i(p_i) = d_i(p_i) - y_i(p_i)$ (which are negative if there are exports), we can denote tariff revenue collected as $T(p) = \sum_{i=1}^N (p_i - p_i^*) m_i(p_i)$. The revenue is distributed by a pool subsidy of to all individuals. Then, summing up labour income, returns to specific factors and tax revenue we get the total social welfare: $W(p) = \sum_{i=1}^N W_i(p) = 1 + \sum_{i=1}^N \pi_i(p_i) + \sum_{i=1}^N t_i^s m_i + \sum_{i=1}^N S_i$.

Let us describe the role of lobbies in the economy. Each individual owns a unit of labour and at most one unit of specific factor. Some owners of specific factors form a lobby, so there is a subset $L \in \{1, 2, \dots, n\}$ of industries organized into lobbies. Let us denote α_i the fraction of people who own specific factor i . The purpose of each lobby i is to provide contributions (C_i) to the government in return for influencing the tariff/subsidy in sector i . The summing up of all indirect utilities of all individuals who belong to lobby i , and rearranging it, we get the welfare of lobby i equal to: $W_i = \pi_i + \alpha_i \left(1 + \sum_{j=1}^n t_j m_j^s + \sum_{j=1}^n S_j \right)$.

Therefore, the lobby's objective is to maximize: $W_i - C_i$. On the other hand the objective of the government is to maximize a combination of social welfare and contributions received:

$G = \beta W(p) + (1 - \beta) \sum_{i \in L} C_i$, where $\beta \in [0, 1]$ captures the weigh of welfare in government's objective.

Assuming that the interaction between lobbies and government takes the form of either "menu auction" or a Nash bargaining solution, the joint surplus of the society and lobbies can be written as: $\Omega = \beta W(p) + (1 - \beta) \sum_{j \in L} W_j$. Taking into account the definition of $W(p)$ we can rewrite Ω as: $\Omega = \beta + (1 - \beta) \alpha_L + \sum_{i=1}^n [\beta + (1 - \beta) I_i] \pi_i + \sum_{i=1}^n [\beta + (1 - \beta) \alpha_L] (t_i m_i + s_i)$

Where $\alpha_L \equiv \sum_{i \in L} \alpha_i$ represents the share of population that owns some specific factor, and I_i is a dummy that takes value one if $i \in L$ and zero otherwise.

The first order condition for Ω maximization over domestic prices (and tariffs) yields the following result:

$$t_i^s = \frac{I_i - \alpha_i}{\frac{\beta}{1-\beta} + \alpha_L} \cdot \frac{x_i}{m_i} \quad (1)$$

Where x_i is the output of good i . The equation (1) can also be expressed in terms of import penetration and import elasticity as follows:

$$\frac{t_i}{1+t_i} = \frac{I_i - \alpha_i}{\frac{\beta}{1-\beta} + \alpha_L} \cdot \frac{\frac{x_i}{m_i}}{e_i}, \quad (2)$$

where t_i is the *ad valorem* tariff, and e_i is the import demand elasticity for good i .

The main conclusion from the model indicates that for organized sectors the level of protection increases with x_i/m_i (inverse of import penetration), since $\alpha_L/(\beta/1-\beta) + \alpha_L > 0$. In other words, if domestic output (in relation to imports) is larger,

then the owners of the specific factors have more to gain from increased protection. Also, sectors with higher price elasticity should be less protected. This is because the deadweight loss is larger with higher import demand elasticity.

* * *

For empirical specification of the model Goldberg and Maggi (1999) moved the import demand elasticity to the left hand side of equation (2), while the error term is entered additively. Then the modified equation looks as follows:

$$\frac{t_i}{1+t_i} e_i = \frac{I_i - \alpha_i}{\frac{\beta}{1-\beta} + \alpha_L} \cdot \frac{x_i}{m_i} + \varepsilon_i = \gamma \frac{x_i}{m_i} + \delta \frac{x_i}{m_i} + \varepsilon_i, \quad (3)$$

where $\gamma = [-\alpha_L/(\beta/1-\beta) + \alpha_L]$ and $\delta = [1/(\beta/1-\beta) + \alpha_L]$

The Grossman-Helpman model implies that $\gamma < 0$, $\delta > 0$ and $\gamma + \delta > 0$. Having these two parameters it is possible to calculate implied value of β (weigh of welfare in government's objective function) and α_L (share of population represented by lobby).

The main problem with empirical verification refers to possible endogeneity of the import penetration ratio. The other practical difficulty is the question of correct selection of organized sectors. Therefore, Goldberg and Maggi (1994) estimated also, using maximum likelihood method, the other two equations.[‡] The first of the additional equations is a hypothetical inverse of import penetration function in the following form:

$$\frac{x_i}{m_i} = \xi'_1 Z_{1i} + \mu_{1i}, \quad (4)$$

where Z_1 consists of sector characteristics which includes share of physical capital, inventories, engineers, skilled labour, semiskilled labour, land and subsoil. With the introduction of these variables Goldberg and Maggi (1999) depart from the original G-H model. The other equation estimates political organization of an industry and looks as follows:

$$I_i^* = \xi'_2 Z_{2i} + \mu_{2i} \quad (5)$$

where Z_2 consists of sector characteristics which include seller concentration, buyer concentration, seller number of firms, buyer number of firms, minimum efficient scale, capital stock, geographic concentration, unionization and industry unemployment rate.

The construction of political organization dummy (I_i) is based on political action committee (PAC) campaign contributions for 1981-82 and 1983-84 congressional elections. The threshold level of \$100 million was applied. The industries providing contributions above that level were treated as being organized.[§] The sensitivity analysis made by Goldberg and Maggi (1999) demonstrated that the empirical results do not depend on this particular threshold. In all equations (3, 4 and 5) the error terms (i.e. ε , μ_1 and μ_2) are assumed to have normal distribution.

[‡] In fact, there was an additional equation in the model of Goldberg and Maggi (1999), related to the level of non-tariff protection.

[§] Indeed, in the original model, an industry paying a contributions shall be treated as organized. It was impossible to apply this concept directly since all industries pay some contributions.

The results of empirical work by Goldberg and Maggi are encouraging. The basic specification estimated value of $\gamma = -0.0093$ and that of $\delta = 0.0106$; thus both are broadly in line with predictions of G-H model. The implied values of β equals 0.986, which means that the consumer welfare is almost 100 times higher in government's objective function than the political contributions. In the other specification β equals 0.981 (but is statistically smaller than one), which is only slightly less optimistic.

Overview of other empirical studies

There is already a large sample of empirical studies of Grossman-Helpman model. The study prepared by Grether, De Melo and Olarreaga (2002) referred to political economy of trade policy in Mexico. Other work by Mitra, Thomkos, Ulubasoglu (2002) analyzed pattern of protection in Turkey and McCalman (2004) studied determinants of protection in Australia. Finally Tavares (2003) analyzed the determinants of common external tariff in the European Union.

The major problem in most studies is the lack of data on political action committee campaign contributions, which could serve as the proxy for a sectoral political organization. This sort of data is unavailable in countries other than U.S. It also seems that some authors did use real values of import penetration and not the estimated ones, despite the problem of possible endogeneity, which was analyzed by Goldberg-Maggi.

In some cases (e.g. McCalman) the political organization variable was estimated using a probit model. In the same study a set of instruments were divided into two groups: those that affect the probability of being politically organized, and those that account for comparative advantage, having possible impact on sectoral import penetration.

Probably the most extensive list of industry-specific variables was compiled by Tavares (2003 a), largely inspired by the work of Grether, De Melo and Olarreaga (2001). Tavares was aiming at explaining the pattern of tariff protection in the European Union. The other large set of variables was proposed by McCalman (2004).

The specification of variables used in empirical studies can be, somewhat arbitrary, grouped into two broad categories of industry characteristics, having impact on political organization and import penetration.

The set of variables affecting the probability that sector is **politically organized** can itself be divided into two groups:

1. Industry specific **institutional variables**, which are analyzed in the empirical studies, include (with following expectations regarding their impact on tariffs):

- Political action committee campaign contributions made during congressional elections (higher contribution reflects better organization of the lobby) was used by Goldberg and Maggi (1999)
- Degree of unionization: Higher level of workers' participation in trade unions (significant shares of employment) will induce higher wages and more protection (Mitra, Thomakos, Ulubasoglu (2002) and Grether, De Melo, Olarreaga (2001));
- The institutional context: If firms in a given industry are spread across all the country, then their influence on the government's decision-making process should be stronger as they would exert their influence through different associations. The variable was used by Grether, De Melo, Olarreaga (2001)
- An industry was treated as politically organized, if a Tariff Board report in Australia was prepared on it between 1960 and 1969. The reports adopted did have impact on tariff changes in the industry (McCalman, 2004).

2. The **production structure** of the industry, which can have an impact on the level of political organization of the industry:

- The number of firms in the industry (smaller number of firms alleviates the free rider problem in coordinating a lobby, thus increasing the level of protection). This variable was used by Tavares (2003 a) and McCalman (2004).
- Industrial concentration (e.g. herfindahl index) should be highly correlated with the tariff structure, according to theoretical predictions. Likewise, highly concentrated sectors tend to receive higher tariffs (Grether, De Melo, Olarreaga (2001) and McCalman (2004).
- The employment share of the sector in the country's total employment: The larger the industry seeking protection, the greater is the incentive to join in the tariff-setting process. The argument cited by Grether, De Melo, Olarreaga (2001) and McCalman (2004).
- The level of FDI inflow to the sector. There two arguments developed by Grether, De Melo, Olarreaga (2001) why, in developing countries, tariffs may be higher in sectors with large shares of FDI:

- Owners of foreign capital may have access to a better lobbying technology. Probably multinational companies have a larger experience of lobbying in different countries which they can adapt to the host government.
- Governments may be more sensitive to FDI interests than to the interests of nationals. This may be so from the fact that foreign companies may be more credible in the lobbying game than domestic producers.

On the other hand there is a large list of variables, used in empirical studies, reflecting the **comparative advantage** of the industry. These variables can have impact on import penetration and on possible political organization, as well. They can be divided in two subgroups:

1. The **factor intensity** characteristics, representing a comparative advantage of the industry
 - the labour intensity. The more labour-intensive an industry, the more labour votes it has. The variable is usually measured by the labour cost share. This argument was cited by Grether, De Melo, Olarreaga (2001)
 - The wage per worker. Disadvantaged industries, having low wages, often receive more protection. An industry is disadvantaged if it is a low-skill and hence low-wage industry (Trefler 1993) and McCalman (2004).
 - A high capital/labour ratio industries receive lower protection (Grether, De Melo, Olarreaga (2001) and McCalman (2004).
 - Human capital/labour ratio (e.g. number of professional and technical employees/workers). Sectoral abundance of human capital in a developed country is treated as an indicator of existence of comparative advantage of an industry (McCalman 2004).
2. The **trade characteristics**, reflecting revealed comparative advantage of the industry.
 - declining industries (those with large increases in import penetration) tend to obtain more protection (Hillman, 1982, or Brainard and Verdier, 1994). They tend to receive more protection so as to reduce adjustment costs (Grether, De Melo, Olarreaga, 2001). In a dynamic context, the compensation effect predicts that slow-growing industries will lobby more as the opportunity cost of lobbying will be lower.
 - the import penetration ratio (the higher the import penetration, the more will the affected industry lobby for protection, so as to decrease competition and maintain its

market share (Trefler 1993)). The problem of possible endogeneity of the import penetration has already been discussed.

- The level of intra-industry trade. Industries seeking protection, with lower the intra-industry trade, will find their task harder if they have to counter not only consumer dissatisfaction, but also producers who purchase their goods as intermediates (Marvel and Ray, 1983).
- The share of exports in the industry's production. The export-oriented industries do not require protection either because they face no import competition or because, with intra-industry trade, protection will provoke unwanted foreign retaliation (Trefler, 1993).

The large number of variables used reflects difficulties in finding suitable measures and limited availability of some statistical data in analyzed countries. In our empirical part we will concentrate only on some of those variables, which are available for Poland.

Poland's trade policy in 1990's

The opening up of Polish economy was an important element of economic transformation. The trade liberalization started in January 1990 when zloty became convertible and almost all-domestic prices were released from administrative control. Majority of non-tariff measures were eliminated at that time. The new customs code, introduced in January of 1990, was compatible with international norms. The tariff description, the rules of customs' valuation, and the anti-dumping procedures were in principle in line with the GATT articles. The average level of tariffs was 8.9 per cent *ad valorem* in the beginning of 1990. But the tariff structure was not fully adapted to requirements of the market economy, and was somewhat arbitrary.

At that time Poland's tariffs were not subject to the discipline of the GATT and the government had freedom to manoeuvre in shaping its tariff structure. Poland had no legal constraint in the form "bound" tariff schedule, although it was a GATT member since 1967. A former communist country had a unique reciprocity formula in the Protocol of accession to GATT. In exchange for the MFN status among GATT members', Poland committed itself to increase the value of its imports from the members of GATT by at least seven percent annually. This commitment became impossible to fulfil by the mid 1970's. But formally

nothing has been changed until the creation of the WTO in 1994. Therefore tariff changes were feasible in beginning of 1990.**

On August 1, 1991, the new customs tariff came into force. The new tariff adopted commodity nomenclature applied by the European Community (EC). It covered 10,000 tariff items and the level of duties was substantially raised. Average nominal (unweighted) customs rates calculated on the basis of MFN were raised from 11.65 to 17.02.†† The change was feasible because Polish tariffs were unbound in the GATT.

"The increase was motivated by the need to increase fiscal revenues, and by the desire to afford a degree of protection to Polish producers competing with imports. Among products that were granted high protection were particularly "sensitive" agricultural goods, such as butter and meat, automobiles and electronics."‡‡ It shows that the notion of sensitive product was not clearly defined at that time. The government administration had a limited knowledge of what the reasonable tariff pattern should be§§. On the other hand the pressure groups were quite weak or not existent at that time. Therefore, the influence of domestic lobbies should not have been significant at that time.

The **preferential** tariff liberalization started in 1994. In 1991, Poland signed (simultaneously with Czechoslovakia and Hungary) the Europe Agreement (EA) with the EC.*** The commercial part of the EA came into force by 1992. The EC and Poland started to create free trade area (FTA) for non-agricultural products since March 1994 over a maximum period of ten years. The FTA was not applied to agricultural products. In the case of European Union's (EU) imports this liberalization has taken five years and was completed by the end of 1997. For its part, Poland carried out a one-off tariff reduction involving 246 products by 10 percentage points, since 1992. The timetable of tariff liberalization of Polish imports was extended in time. Majority of reductions for other industrial products (43% of Polish imports in 1993) was implemented in equal steps from 1995 until 1999. The liberalization of tariffs on cars and vehicles was postponed till 2002.

** Position of Poland was different from that one of Hungary or Czechoslovakia. These two countries were also GATT members under communist regime, but had standard schedules of concessions. Their tariffs were "bound" at the beginning of economic transition.

†† When duty suspensions were also taken into consideration the average level was raised from 5.82 to 16.83 per cent *Poland's Foreign Trade Policy 1993-1994* (1994), p. 63.

‡‡ Kierzkowski, Okolski, Wellisz (1993), p. 56.

§§ The opinion expressed by professor Stanislaw Wellisz, who acted, in the beginning of 1990's, as an economic adviser to Polish government.

*** *Europe Agreement* (1994).

The EA contained some safeguard clauses. The most important is probably the so-called Restructuring Clause (art. 28 of EA) which could have been applied only by Polish side in the form of temporary increased import duties. "These measures may only concern infant industries, or certain sectors undergoing restructuring or facing serious difficulties, particularly where these difficulties produce important social problems." This wording fits quite well to politically organized sectors.

Poland signed a similar free trade agreement with EFTA countries (Austria, Finland, Island, Liechtenstein, Norway, Switzerland, Sweden). The agreement covered mainly trade in non-agricultural products. EFTA members eliminated most import duties in 1993. Poland gradually liberalized its tariffs and quantitative restrictions on EFTA imports by 1999 (except for steel, petroleum products, and automobiles).

Poland, along with the Czech Republic, Hungary and the Slovak Republic, established also CEFTA (Central European Free Trade Area) in 1992. Afterwards Slovenia 1996, Romania and Bulgaria joined the CEFTA. The CEFTA Agreement established a free-trade area by 2001, and was based on a system of bilateral liberalization schedules between members that adopt a framework of common rules. CEFTA covered all goods, except for a few agricultural products. Thus, by the end of 1990's almost all Polish duties on non-agricultural imports from European countries have been eliminated. The share of these countries exceeded 65% of Poland's total imports.

The **non-preferential (MFN, conventional)** liberalization of Poland's trade policy towards non-European countries started in 1995. The country took part in the GATT Uruguay Round as the only state having the formal status of a developed country without any "bound" customs duties. After submitting its initial offer on tariff concessions Poland had bilateral negotiations with several countries. Poland's main commitments on trade in goods in the Uruguay Round were: (i) to bind, for the first time, close to 94% of its tariffs; (ii) reduce tariffs by 38% on industrial products and 36% on agricultural goods over six years; and (iii) limit domestic support to agriculture by 20% in value terms by the year 2000, and cut agricultural export subsidies by 36% in value and 21% in volume.^{†††} The simple average bound MFN Polish tariff rate for non-agricultural products was reduced from 16.73 to 9.89 per cent. Thus, in 1995 Poland's special terms of accession to the GATT became irrelevant.

^{†††} *Trade Policy Review Poland, Report by the Secretariat, 2000, p.24.*

The tariff structure was determined, almost from scratch, in early 1990s by governmental decisions and it seems that the interest groups probably did not have very strong influence on the process. The organizations of producers (chambers) were just being established. However, the trade unions were quite powerful. Afterwards the level of import duties was gradually reduced over next years. The scope of reductions was quite impressive in the case of preferential duties. We show some anecdotal evidence that the tariff changes were influenced by lobbies' pressure.

In January 1992, shortly after signing the Europe Agreement, Poland raised MFN customs duties for motor vehicles from 15 to 35 percent. At the same time the duty free quota (for 30000 vehicles) for automobile imports from the EU was granted. These trade policy changes were in coincidence with large FDI of the leading European motor car company in Poland^{†††}. India challenged these measures in GATT in November 1994 under Article I (MFN clause) and XXIV (formation of FTA). Consultations took place in order to find a solution satisfying both parties.^{§§§} At the end Poland compromised, and agreed for opening a temporary (two-year) tariff quota for small passenger cars originating in developing countries. Such a solution allowed for a formal settlement of the trade dispute on the WTO forum.

The other notable examples of changes in trade policy in the second half of 1990's involve the application of restructuring clauses by Poland^{****}. In 1994, for the first time, the clause was applied to imported telecommunication equipment from the EU members. According to the government the decision resulted from the necessity of restoring the profitability of telecommunication equipment manufacturing in Poland, which was based on imports of components for this equipment. The restructuring clause was also used in 1996 to oil-refining products. Poland extended the period of reducing customs duties on oil-refining products until 2001 (according to the original timetable, customs duties were to be brought down to 0 percent at the beginning of 1999).^{††††} The restructuring clause, was applied for the third time, in 1997. Poland decided then to maintain tariffs at 9% in order to protect its restructuring of steel industry, despite the time-table of liberalization under Europe Agreement. The clause was applied on steel products imported from Czech Republic and Slovakia, Hungary and Slovenia as well. One can reasonably guess that the application of

^{†††} According to Grether, De Melo, Olarreaga (2001) FDI had an impact on the pattern of tariff structure in Mexico.

^{§§§} WTO Document: WT/DS/19/2, dated 11 September 1996.

^{****} Michalek (2005).

^{††††} *Poland's Foreign Trade Policy, 1995-1996*, p.58-59.

restructuring clauses resulted from efficient lobbying, since this was almost explicitly foreseen by article 28 of the Europe Agreement.

The third, and the most spectacular case involves the application of various import reducing measures applied to imported gelatine. The main lobbyist was Mr. K. Grabek, the owner of three out of four factories producing gelatine in Poland and being the sixth richest person in Poland in 1999. He managed to get support from press and many influential politicians. Due to his lobbying the sanitary norm for gelatine became more restrictive in 1993, the variable levies were introduced in 1995, and duties were increased (from 15 to 56 per cent) in 1995. Finally, the total import ban on gelatine was imposed in 1998, under the claiming that imported gelatine - if produced from bones of animals suffering from mad-cow disease - can be dangerous to human health^{****}.

What was therefore the role of lobbying in early 1990's? According to sociological questionnaire surveys made in 1993, the role of lobbies in Polish Parliament was quite important. The Members of the Parliament believed that the second task of the MP is to represent interest groups (11.1 percent of replies), and third to "organize the economy" (10.5 per cent of replies). On the other hand they believed that the organized interest groups did have important impact on political decisions taken by other MPs (13,0 percent of replies) ^{§§§§}. Can we trace the impact of organized groups on Poland's government objectives using the methodology from Goldberg and Maggi study?

In the next part of the paper we will present an empirical study of the endogenous tariff policy in Poland in mid 1990's. The selection of the period is not accidental. As we argued the trade policy was still autonomous in early 1990s, but the flexibility in tariff formation slowly decreased in the late 1990s, when Europe Agreement and Uruguay Round duty reduction commitments were gradually implemented. We also believe that the tariffs, like in the original G-H model, better reflect the pattern of protection, in comparison to non-tariff measures. The critical study of analysis of non-tariff measures, in the framework of G-H model, was elaborated by Imai, Katayama and Krishna (2005).

^{****} Jasiocki, Moleda-Zdziech and Kurczewska (2000), p. 99-101.
Wesołowski ed. (1998), p. 140 and 182.

Estimation technique and data

In our study we adopt a modified version of the empirical specification proposed by Goldberg and Maggi. The original paper estimates equation (3) in a maximum likelihood framework. Since both variables, inverse import penetration and industry organisation dummy may be affected by the level of tariffs, there might be an endogeneity problem. This is resolved by using instruments for both variables in question. In our case, the data on the industry contributions were unavailable, since in the 1990s there was no official way for the industry to contribute to political campaign. However, as the anecdotic evidence above shows, there were cases where trade policy was changed, obviously as a result of some interest groups pressure. In the absence of direct measures of industry organisation, we have used similar variables to those used in literature, as a proxy for industry organization. These variables include: Herfindahl concentration indices, capital-labour ratio (as we may expect that labour intensive industry may exert more pressure on the government), export intensity (since export industries may be specifically promoted by government policy) and share of government subsidies in the total value of sales.

The last variable requires some comments, since it has not been used in the other empirical studies. On the one hand, subsidies could be treated as a variable equivalent to import duties, measuring the “remuneration” paid by the government to an industry in exchange for contributions. On the other hand, the receipt of subsidies by a given industry can reflect the level of political organization; organized sectors, where interest groups are stronger, can probably receive higher pecuniary benefits. In Poland, chambers of producers were not well organized, but trade unions were powerful, being able to influence governments’ decisions. That is why we treat unit subsidies as a measure which can explain the level of industry organization.

We construct four versions of the variable I (one for each of the variables above) in the following way: it takes the value of 1 if the variable in question for a given industry is higher than the average for the given year and it takes the value of zero otherwise. Using the proxied variable is probably less prone to the endogeneity problem as using the contributions directly (also, Maggi and Goldberg in their sensitivity study, used non-instrumented I in the regression and obtained similar results).

Where the endogeneity problem is more severe is the inverse import penetration that may be heavily affected by the tariff on the left hand-side of the equation. Also, what the Grossman and Helpman model cares about is trade flows that stem from the Heckscher-Ohlin

type of comparative advantage. We construct the inverse import penetration ratio in the same fashion as Maggi and Goldberg. In order to avoid the endogeneity problem, we regress the actual inverse import penetration ratio on capital-labour ratios, the value of investment, stock of capital, wage level and employment level. Therefore, we estimate two versions of the first stage model with employment included and excluded – since both capital and employment are already included in the capital-labour ratio (see Table 3 of Appendix). This way we can project the theoretical inverse import penetration as a reflection of comparative advantage stemming from factor endowments. The full model has the following form, similar to equation (3) of the Goldberg and Maggi study :

$$\frac{t_i}{1+t_i} e_i = \gamma \frac{x_i}{m_i} + \delta I \frac{x_i}{m_i} + \varepsilon_i \quad (6)$$

$$\frac{x_i}{m_i} = \xi' Z_i + \mu_i \quad (7)$$

where t_i is the tariff, e_i is the elasticity of import demand, $\frac{x_i}{m_i}$ is the inverse penetration ratio,

Z_i is the vector of instruments listed above, ε_i and μ_i are error terms. We estimate equation (7) by OLS and include the projected inverse import penetration ratio on the right hand-side of equation (6), which we estimate by OLS. The specifications and results for both versions (models) of equation (7) are given in the Table 3 of Appendix.

Data on both the conventional (MFN)^{****} tariffs and tariffs applied towards the EU countries^{††††} for Poland for most of the 1990s comes from the Foreign Trade Data Center (CIHZ). This data uses the 8 digit Combined Nomenclature aggregation, which we aggregate into the 3-digit NACE using a Eurostat Concordance table. We use the Polish import data from Eurostat's Comext Database as weights. The output, export, import, subsidies, capital, labour, wage data comes from Polish Central Statistical Office (GUS). Data on Herfindahl indices were calculated using the micro-level GUS data in possession of National Bank of Poland. The data on import demand elasticities were unavailable for Poland. The study often used in the literature is the Shiells, Stern and Deardorff (1986). However, since not only it provides elasticities for a different economy and period but also uses SITC 3-digit

**** Conventional tariffs are “bound” duties applied to imports from all the WTO members.

†††† Very similar tariffs were also applied to imports from EFTA and CEFTA members states.

classification, we have decided to set the elasticity of import demand for all sectors at -1. Our final dataset includes data for 87 NACE rev. 1.1 3 digit sectors for the period of 1996-1999.

Estimation results

We have estimated the system of equations (6) and (7) using two alternative versions of equation (6). The first stage results for both models are listed in the appendix. Since the variation of tariffs over time is rather low, we have decided not to use the fixed effects panel estimation. Instead we do a pooled OLS for all periods and for each period separately. The results of estimation in four different specifications (and model 1 as first stage regression) for MFN tariffs are presented in Table 1. The estimation for preferential EU duties are given on the Appendix.

Table 1 Estimation results using model 1 as first stage

Periods	X/M		I*X/M (concentration)	N	alpha_1	beta
All	-0.0000684	[5.24]***	0.0000975 [4.49]***	347	0.70	0.99990
1996	-0.0001301	[4.14]***	0.0001642 [2.27]**	87	0.79	0.99984
1997	-0.0000867	[2.97]***	0.0001184 [1.83]*	87	0.73	0.99988
1998	-0.0000548	[2.56]**	0.0000854 [1.93]*	87	0.64	0.99991
1999	-0.0000540	[2.14]**	0.0000687 [2.24]**	86	0.79	0.99993
Periods	X/M		I*X/M (export)	N	alpha_1	beta
All	-0.0000600	[4.53]***	0.000068 [3.21]***	347	0.88	0.99993
1996	-0.0001055	[3.51]***	0.0000757 [0.87]	87	1.39	0.99992
1997	-0.0000896	[2.89]***	0.0000791 [1.57]	87	1.13	0.99992
1998	-0.0000688	[2.80]***	0.0000713 [2.04]**	87	0.96	0.99993
1999	-0.0000326	[1.45]	0.0000458 [1.42]	86	0.71	0.99995
Periods	X/M		I*X/M (K/L)	N	alpha_1	beta
All	-0.0000435	[3.75]***	0.0000963 [2.41]**	347	0.45	0.99990
1996	-0.0001123	[3.81]***	0.0001764 [1.76]*	87	0.64	0.99982
1997	-0.0000677	[2.51]**	0.0004070 [1.55]	87	0.17	0.99959
1998	-0.0000469	[2.24]**	0.0000714 [1.32]	87	0.66	0.99993
1999	-0.0000164	[0.87]	0.0000638 [0.88]	86	0.26	0.99994
Periods	X/M		I*X/M(subsidies)	N	alpha_1	beta
All	-0.0001094	[6.68]***	0.0001177 [5.87]***	347	0.93	0.99988
1996	-0.0001903	[3.91]***	0.0001399 [2.32]**	87	1.36	0.99986
1997	-0.0001792	[4.79]***	0.0001837 [4.09]***	87	0.98	0.99982
1998	-0.0000995	[3.71]***	0.0001100 [3.22]***	87	0.90	0.99989
1999	-0.0000749	[2.80]***	0.0000925 [3.03]***	86	0.81	0.99991

Absolute value of t statistics in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Estimation of all four specifications of industry organization gives correct parameter estimates in most of the periods. As stated before, the original Grossman-Helpman model

requires the following to be true: $\gamma < 0$, $\delta > 0$ and $\gamma + \delta > 0$. In most cases, we find strong support for the first two hypotheses. In all periods it is true for specifications using industry concentration and subsidies levels as a proxy for industry organisation. In the case of export intensity and capital and labour ratio, we find only limited support for the second relation. In most cases we find only weak support for the third relation (the sum of two coefficients is not statistically greater than zero).

Table 2 Estimation results using model 2 as first stage

Periods	X/M		I*X/M (concentration)	N	alpha	l	beta
All	-0.0000661	[7.09]***	0.0001179 [5.02]***	347	0.56		0.99988
1996	-0.0001197	[4.84]***	0.0002697 [2.80]***	87	0.44		0.99973
1997	-0.0000800	[3.77]***	0.000232 [2.13]**	87	0.34		0.99977
1998	-0.0000621	[3.39]***	0.0001179 [2.47]**	87	0.53		0.99988
1999	-0.0000543	[4.03]***	0.0000724 [2.72]***	86	0.75		0.99993
Periods	X/M		I*X/M (export)	n	alpha	l	beta
All	-0.0000732	[6.55]***	0.0000586 [3.49]***	347	1.25		0.99994
1996	-0.0001493	[4.70]***	0.000113 [2.43]**	87	1.32		0.99989
1997	-0.0001112	[3.98]***	0.0000846 [2.20]**	87	1.31		0.99992
1998	-0.0000851	[3.56]***	0.0000729 [2.30]**	87	1.17		0.99993
1999	-0.0000517	[3.55]***	0.000041 [1.65]	86	1.26		0.99996
Periods	X/M		I*X/M (K/L)	n	alpha	l	beta
All	-0.0000547	[5.93]***	0.0000740 [2.35]**	347	0.74		0.99993
1996	-0.0001046	[4.18]***	0.0001234 [1.18]	87	0.85		0.99988
1997	-0.0000789	[3.85]***	0.0006050 [2.92]***	87	0.13		0.99940
1998	-0.0000548	[2.98]***	0.0000816 [1.50]	87	0.67		0.99992
1999	-0.0000414	[3.12]***	0.0000172 [0.45]	86	2.41		0.99998
Periods	X/M		I*X/M (subsidies)	n	alpha	l	beta
All	-0.0000683	[7.04]***	0.0000896 [4.54]***	347	0.76		0.99991
1996	-0.0001024	[3.78]***	0.0000249 [0.39]	87	4.11		0.99998
1997	-0.0000966	[4.24]***	0.0001185 [2.66]***	87	0.82		0.99988
1998	-0.0000732	[3.77]***	0.0000996 [2.82]***	87	0.73		0.99990
1999	-0.0000527	[3.97]***	0.0000750 [2.69]***	86	0.70		0.99993

Absolute value of t statistics in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

We can recover the structural parameters of the Grossman and Helpman model. As above: $\gamma = -\alpha_L / [(\beta/1-\beta) + \alpha_L]$ and $\delta = 1 / [(\beta/1-\beta) + \alpha_L]$. After simple algebraic manipulation, we get: $\alpha_L = -\frac{\gamma}{\delta}$ and $\beta = \frac{1+\gamma}{1+\gamma+\delta}$. The calculated coefficients are listed in last two columns of Table 1. We can see that both α_L and β are in most cases within the [0,1] range.

Results from estimations using model 2 as first stage regression are listed in Table 2. All four specifications provide satisfactory results in terms of significance and signs of the explanatory variables. All three relations stemming from theory are satisfied (only weakly in the case of third relation), in most of the cases. However, the variability of calculated α_L and β values is visibly larger. In some cases (such as all estimations using capital-labour ratio), α_L takes values beyond the desired threshold.

All above estimations were performed, as already indicated, using the conventional MFN tariff rate. We have also tried to use the preferential rate applied to import from the EU as the explanatory variable. The respective regression results are listed in the appendix in tables 4 and 5. We can see that the Grossman and Helpman model finds very weak support using these data. Coefficient often have wrong signs and interpretation of the model is very limited. It may reflect the fact that the government's autonomy in preferential trade policy (and possible influence of lobbies) was much more limited in comparison to MFN duties.

What stems from the G-H model concerning determination of Polish trade policy? The estimated coefficients for the weight that the government attaches to social welfare (β) are close to 1 in all cases under consideration. However, this estimate is **statistically** different from one (the test using Delta method rejects the hypothesis of equality to 1 at least 5% significance in most cases). This is a higher weight than in the original Maggi and Goldberg estimation (around 0.98). The parameter α_L suggests that the large fraction of the population (at least 50%) is represented by a lobby. What it suggests is that lobbies had a smaller influence on trade policy than in the case of the United States, but this influence is still significant. Such low parameter estimates (while significant) stems from the fact, that overall tariff level is quite low (average tariff during the period under consideration is 12 percent for MFN duties and close to 2 percent for preferential tariffs). We could use some rescaling factor (as in original Maggi and Goldberg), however, the meaning of coefficients becomes unclear.

Conclusions

The model of endogenous trade policy determination by Grossman and Helpman has had many empirical implementations in the literature. Our version deals with the problem of Polish trade policy in the late 1990s. We have used the instrumental variable approach to estimate the model taking into account endogeneity of the regressors. Herfindahl index and unit subsidy level seem to be the best proxies for the industry organization level. The latter

variable was used basing on the presumption that the sectors which are better organized can receive higher pecuniary benefits.

Our results are in line with the predictions of the theory. Most of our regressions support the theory and we find support for the significance of lobbies in formation of trade policy in Poland. The Grossman and Helpman model seems to work much better in the case of MFN than for preferential tariffs. There is some anecdotic evidence that lobbies had influenced Polish trade policy several times, and this evidence is confirmed in our calculations. The importance of the lobbies is, however, significantly lower than in the case of the United States, which is in line with our expectations.

Appendix

Table 3 First stage estimation results

variable	model 1	model 2
K/L	-4.3391136 [3.31]***	-0.2474879 [0.16]
capital	0.0001044 [1.48]	-0.0000789 [1.02]
investment	0.0005759 [3.06]***	0.0005238 [2.88]***
wage	-0.0003787 [1.08]	-0.0012071 [3.22]***
employment		0.006694 [5.05]***
Constant	49.1476305 [0.92]	-105.2548 [1.76]*
Observations	351	351

Absolute value of t statistics in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4 Estimation results using model 1 as first stage (EU tariff)

Periods	X/M		I*X/M (concentration)	n	alpha	l	beta
All	-0.0000164	[1.86]*	0.0000181 [1.25]	348	0.91		0.99998
1996	-0.0000452	[2.13]**	0.0000824 [1.69]*	88	0.55		0.99992
1997	-0.0000375	[2.28]**	0.000046 [1.26]	88	0.82		0.99995
1998	-0.0000295	[3.77]***	0.0000105 [0.65]	87	2.81		0.99999
1999	-0.0000067	[1.05]	-0.0000373 [4.99]***	85	-0.18		1.00004
Periods	X/M		I*X/M (export)	n	alpha	l	Beta
All	0.0000106	[1.23]	-0.0000616 [4.53]***	348	0.17		1.00006
1996	-0.0000131	[0.68]	-0.0001538 [2.75]***	88	-0.09		1.00015
1997	0.0000035	[0.22]	-0.0001073 [4.11]***	88	0.03		1.00011
1998	-0.0000097	[1.15]	-0.0000425 [3.54]***	87	-0.23		1.00004
1999	-0.0000151	[2.72]***	-0.0000356 [4.66]***	85	-0.42		1.00004
Periods	X/M		I*X/M (K/L)	n	alpha	l	Beta
All	-0.0000149	[1.97]**	0.0000683 [2.65]***	348	0.22		0.99993
1996	-0.0000376	[1.90]*	0.0001032 [1.54]	88	0.36		0.99990
1997	-0.0000307	[2.05]**	0.0002522 [1.73]*	88	0.12		0.99975
1998	-0.0000317	[4.27]***	0.0000364 [1.90]*	87	0.87		0.99996
1999	-0.0000308	[6.16]***	0.0000216 [1.17]	85	1.43		0.99998
Periods	X/M		I*X/M (subsidies)	n	alpha	l	Beta
All	0.0000217	[1.92]*	-0.0000511 [3.75]***	348	0.42		1.00005
1996	-0.0000221	[0.66]	-0.0000104 [0.25]	88	-2.13		1.00001
1997	0.0000178	[0.82]	-0.0000761 [2.91]***	88	0.23		1.00008
1998	-0.0000004	[0.04]	-0.0000493 [4.16]***	87	-0.01		1.00005
1999	-0.0000007	[0.10]	-0.0000411 [5.35]***	85	-0.02		1.00004

Absolute value of t statistics in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5 Estimation results using model 2 as first stage (EU tariff)

Periods	X/M		I*X/M (concentration)	n	alpha	l	Beta
All	-0.0000081	[1.19]	0.0000116 [0.71]	348	0.70		0.99999
1996	-0.0000403	[2.33]**	0.0000865 [1.30]	88	0.47		0.99991
1997	-0.0000224	[1.81]*	0.0000984 [1.57]	88	0.23		0.99990
1998	-0.0000204	[2.88]***	-0.0000068[0.37]	87	-3.00		1.00001
1999	-0.0000006	[0.15]	-0.0000468[6.51]***	85	-0.01		1.00005
Periods	X/M		I*X/M (export)	n	alpha	l	Beta
All	0.0000108	[1.34]	-0.0000378[3.27]***	348	0.29		1.00004
1996	-0.0000210	[0.95]	-0.0000265[0.82]	88	-0.79		1.00003
1997	0.0000083	[0.52]	-0.0000536[2.42]**	88	0.15		1.00005
1998	-0.0000099	[1.09]	-0.0000219[1.83]*	87	-0.45		1.00002
1999	-0.0000040	[0.77]	-0.0000239[3.07]***	85	-0.17		1.00002
Periods	X/M		I*X/M (K/L)	n	alpha	l	Beta
All	-0.0000108	[1.69]*	0.0000589 [2.82]***	348	0.18		0.99994
1996	-0.0000376	[2.23]**	0.0000837 [1.19]	88	0.45		0.99992
1997	-0.0000221	[1.84]*	0.0002829 [2.32]**	88	0.08		0.99972
1998	-0.0000244	[3.56]***	0.0000341 [1.68]*	87	0.72		0.99997
1999	-0.0000149	[3.21]***	0.0000163 [1.38]	85	0.91		0.99998
Periods	X/M		I*X/M (subsidies)	n	alpha	l	Beta
All	0.0000078	[1.14]	-0.0000602[4.54]***	348	0.13		1.00006
1996	-0.0000220	[1.22]	-0.0000627[1.47]	88	-0.35		1.00006
1997	0.0000035	[0.28]	-0.0000954[3.85]***	88	0.04		1.00010
1998	-0.0000036	[0.57]	-0.0000680[5.82]***	87	-0.05		1.00007
1999	0.0000002	[0.06]	-0.0000584[8.90]***	85	0.00		1.00006

Absolute value of t statistics in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

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