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Competition and Political Organization: Together or Alone in Lobbying for Trade Policy?
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ABSTRACT

This paper employs a novel data set on lobbying expenditures to measure the degree of within-sector political organization and to explore the determinants of the mode of lobbying and political organization across U.S. industries. The data show that sectors characterized by a higher degree of competition (more substitutable products and a lower concentration of production) tend to lobby more together (through a sector-wide trade association), while sectors with higher concentration and more differentiated products lobby more individually. The paper proposes a theoretical model to interpret the empirical evidence. In an oligopolistic market, firms can benefit from an increase in their product-specific protection measure, if they can raise prices and profits. They find it less profitable to do so in a competitive market where attempts to raise prices are more likely to reduce profits. In competitive markets firms are therefore more likely to lobby together thereby simultaneously raising tariffs on all products in the sector.

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1 Introduction

The influence of interest groups on policy making is under constant scrutiny. Recent legislative reforms like the Honest Leadership and Open Government Act of 2007 in the United States are partially a response to the perceived need for transparency and understanding of the activity of special interest groups (SIG's) and their lobbyists. Much public discussion and academic research alike revolve around the questions of whether lobbies affect legislation and how they accomplish such goal. A fundamental aspect of this process is to understand how special interest groups organize for the purpose of influencing the government and what characteristics facilitate the path to political organization and lobbying. However, even basic stylized facts or systematic empirical analysis on the choice of political organization are not available for the universe of U.S. industries. This paper reports a set of novel empirical regularities that counter standard theoretical intuition in the analysis of lobbying organization and contributes to its understanding by focusing on the role of market structure primitives in shaping incentives for collective action.

This paper has four goals. The first is to employ a practically untapped data source on federal lobbying expenditures to document the degree to which U.S. industrial sectors are politically organized for the purpose of lobbying (in particular for trade policy). To the best of our knowledge this is one of the very first efforts in directly documenting stylized facts of lobbying formation across a wide spectrum of U.S. industries. The data show that basically every U.S. industry engages in some form of lobbying and that sectors vary widely in the extent to which firms lobby jointly or individually. The second goal of this work is to show empirically what characteristics of sectors seem to favor political organization. We find that sectors that exhibit higher levels of product market competition and low levels of concentration tend to lobby jointly, that is, through sector-wide trade associations. This is surprisingly stark evidence against the view that in more competitive environments free-riding pressures should dominate, inducing political disintegration. The third goal of the paper is to propose a theoretical model that rationalizes why product market competition may actually lead to political organization. Although the model is developed for the case of trade policy, we believe its insight can be applied more broadly to understand the determinants of collective versus individual lobbying. Our fourth goal is to explore if there is a systematic correlation between mode of lobbying for trade policy and the level of protection in a sector.

Our point of departure is the literature on special interest politics which, in particular with regard to trade policy, focuses largely on the interaction between a set of interest groups repre-

senting sectors and the government. Interest groups are treated as unitary actors in many of the fundamental contributions in this literature, from the *political support function* approach in Hillman (1982), Hillman (1989) and the *political competition* approach as in Magee et al. (1989) to the common agency approach proposed by Grossman and Helpman (1994). The focus of these papers is to understand how the equilibrium trade policy is shaped, starting from the premise that firms in a sector or agents with interests in a given industry are or not politically organized. This aspect has been addressed in a number of papers, among which Mitra (1999), Hillman et al. (2001), Felli and Merlo (2006), and Pecorino (2001) that aim at endogenizing political organization. In the same spirit, Bombardini (2008) proposes a microfoundation of the decision of firms to participate in political activity.[1]

Almost any attempt to analyze the interaction among firms within a sector has to deal with the collective action problem (first described by Olson (1965)) of lobbying for an object, trade policy, that benefits all firms in the sector. This is a classic problem of private provision of a public good (Bergstrom et al. (1986))[2].

This paper aims at expanding our understanding of the organization of interest groups by first providing an empirical measure of political organization for the purpose of lobbying for trade policy. We exploit a database of federal lobbying expenditures in the U.S. made available by the Lobby Disclosure Act of 1995. This data set presents several advantages relative to the information employed by a large number of papers like Gawande and Bandyopadhyay (2000) and Goldberg and Maggi (1999), that test the predictions of the protection for sale model. Those papers make use of campaign contributions data to classify sectors into politically organized or not. The advantage of employing lobbying expenditures is that we know the issues targeted by lobbyists, while we do not know why Political Action Committees (PAC's) monetary contributions are given to politicians. Therefore, we can directly isolate the amount of lobbying expenditures by each sector with the objective of lobbying for trade policy. The second advantage is that lobbying expenditures represent quantitatively the most important channel of political influence. Annual lobbying reports display amounts at least ten times larger than campaign contributions totals in dollar terms. With few exceptions, such as Ansolabehere et al. (2002), Hansen et al. (2005), and de Figueiredo and Silver-

[1] The paper shows that the distribution of firms in the sector affects the equilibrium share of participation in political activity and an empirical specification based on this theory adds explanatory power to the Grossman and Helpman (1994) model, where sectors are either organized or not in a dichotomous way.

[2] Also analyzed by Gawande (1997) in the specific case of tariff protection.

man (2006), lobbying disclosure data have not been frequently employed in the literature and, to the best of our knowledge, the one we propose is a novel method to measure the degree of political organization. We show that sectors vary widely in the amount of lobbying expenditures made by trade associations as opposed to individual firms. In some sectors firms tend to lobby individually, while in other sectors firms tend to lobby jointly through a trade association.

The second contribution of the paper is to explore sector characteristics that are related to the mode of lobbying. The empirical analysis shows that more competitive sectors lobby to a greater degree through a trade association. In particular, we find that a higher elasticity of substitution among goods, a lower concentration and a larger capital to labor ratio are associated with a larger percentage of total lobbying expenditures made through trade associations.

The third contribution of the paper is to propose a theoretical framework that incorporates the basic features of the data and rationalizes the results found. We model a game among oligopolists where the goods produced are imperfect substitutes. We hypothesize that there is a domestic and a foreign producer for each good. Domestic producers have the option of lobbying for a tariff on the entire sector or for a tariff on the specific good that they produce[3]. When they lobby jointly through a trade association, they perceive their lobbying efforts to be benefitting other firms. Hence, one of the features of the model is sub-optimal lobbying in the trade association (Olson (1965)). This mechanism alone would induce firms to lobby for their product-specific tariff. Nevertheless, the imperfectly competitive nature of the sector creates a motive for firms to lobby together. Consider an attempt of one firm to lobby for an increase in its individual tariff. This increase in tariff translates into an increase in price and in profits only if consumers cannot substitute away from the good. If the product is very substitutable with other domestic varieties, if there are many other varieties available (a large number of firms and therefore a low concentration), or if domestic competitors have similar size, then the firm prefers all tariffs to be raised at the same time, which is accomplished with lobbying by the trade association. The model explains why high substitutability delivers a higher share of joint lobbying in an unambiguous way. The effect of heterogeneity and concentration are less straightforward because there is another effect going in the opposite direction, caused by the standard free-rider problem emphasized by Olson (1965), Bergstrom et al. (1986) and Gawande (1997). The free-rider problem is generally thought to worsen as the industry gets less concentrated. This effect is present in this model and tends to make an industry that is more

[3]See Hula (1999) for survey evidence that firms jointly lobby mostly for general laws.

concentrated more likely to lobby through a trade association. Whether the free-rider effect prevails or not depends on the parameters of the problem, as we discuss in the theoretical section of the paper.

This paper connects various strands of political economy literature. The idea that lower concentration in the product market might deliver more cooperation in lobbying for protection is already present in a paper by Pecorino (2001), who develops a model where firms in the sector face a collective action problem. There is an efficient level of protection, that maximizes the joint surplus of all firms in the sector, but the non-cooperative equilibrium entails a sub-optimal level of tariffs because of free riding. The paper builds an infinitely repeated game where the cooperative equilibrium, with the optimal level of protection, is supported by the threat of reverting to the non-cooperative equilibrium if a firm deviates. Pecorino shows that, because a higher number of firms causes the level of tariffs in the non-cooperative equilibrium to be lower, a less concentrated sector might find it easier to enforce the cooperative equilibrium. This result is in line with what we find in the data and is related to the theoretical result we present, although the mechanism is different. Moreover, it is not obvious how to justify the effect of the elasticity of substitution on political organization in the framework proposed by Pecorino. In a theoretical setting Gordon and Hafer (2008) analyze informational incentives to jointly lobby a regulatory agency. The empirical literature (see Hansen et al. (2005), and Potters and Sloof (1996), for a review), emphasizes the ambiguity of results connecting firm concentration to political influence, absent direct measures of political organization[4].

Besides providing a novel measure of political organization, we show empirically that sectors where firms lobby as a trade association obtain a higher level of protection relative to those where firms prevalently lobby individually.

The rest of the paper is organized as follows. Section 2 describes the data and presents the main stylized facts. Section 3 presents the model rationalizing these facts. Section 4 describes the effect of competition primitives on the equilibrium mode of lobbying and discusses the intuition. Section 5 discusses the effect of the mode of lobbying on the level of protection. Section 6 concludes.

[4]Potters and Sloof (1996) report that one of the reasons is that "there are also many interests which have no formal organization, or membershipdata are unavailable". In their recent study Hansen et al. (2005) investigate the choice of individual lobbying by a sample of Fortune 1000 firms.

2 Prima facie empirical evidence on the mode of lobbying

The objective of this section is to investigate the relationship between the extent of trade association lobbying and product market competition. We are interested in showing how the substitutability of goods within an industry and the degree of concentration within an industry affect the mode of lobbying and with what results for collective action.

To the best of our knowledge the evidence for an extensive number of sectors in the U.S. economy is lacking. We find this an interesting empirical question as the basic theoretical intuition for the relationship between exogenous structural/technological characteristics of a market (its industrial organization) and the incentives towards political organization is a priori ambiguous.

On the one hand, it seems reasonable to think of product market competition as a force towards political disintegration through strong incentives to undercut competitors and free ride. On the other hand, a high degree of product market competition may create higher payoffs from organized lobbying, induce stronger incentives towards political organization, and reduce costs of supporting homogenous policies for the sector.

2.1 The data

We now describe the data employed in the empirical section. A contribution of this paper is to assemble a large data set of lobbying expenditures for trade policy, the first one available in the trade literature to the best of our knowledge. The Lobby Disclosure Act (1995) and, more recently, the Honest Leadership and Open Government Act (2007) impose strict disclosure rules for every individual and firm lobbying government.[5] The LDA imposes disclosure requirement for lobbyists, which have to file registration and regular six-month reports indicating not only the amounts received by companies as compensation for their services, but also issues (among them international trade) and government agencies lobbied.[6]

Although substantial attention has been paid in the literature on trade policy and special interests to political contributions data, lobbying expenditures have not received substantial attention, mostly because of scarce availability and sparse access to the original source files. Lobbying

[5] The LDAdefines a lobbyist: "Any individual (1) who is either employed or retained by a client for financial or other compensation (2) whose services include more than one lobbying contact; and (3) whose lobbying activities constitute 20 percent or more of his or her services on behalf of that client during any three month period."

[6] Data available at Senate Office of Public Records.

expenditures are however particularly apt to the study of influence in politics, and particularly international trade, for several reasons. First, lobbyists must indicate the issue they are lobbying for in their reports (both in general and specific legislation), enabling the researcher to isolate lobbying money spent for specific policy areas. This is not information required or available in any form in campaign contributions reports, which are simply linked to donations supporting the election of a specific politician.

Second, lobbying expenditures are substantially larger than political contributions. In 2006 lobbying expenditures were over 2.59 billion dollars versus 345 million donated in campaign contributions for Senate and House combined in the congressional cycle 2005-2006. Third, the vast majority of lobbying expenditures are undertaken by firms and trade associations and not by individuals, underlying a clear economic motive in lobbying. This is in contrast with political contributions, where individual campaign donations, which may incorporate ideological and partisan motives (Ansolabehere et al. (2003)), can affect the precision of the measure.

We collect the following information from registration and bi-annual report forms available at the Senate Office of Public Records: 1) The name of the Client, that is the name of the firm or trade association paying for the lobbying services; 2) The name of the Registrant, that is the lobbying firm providing the services, and the name of each of the specific individual lobbyists engaged for each issue; 3) The Issue lobbied (out of 77 potential issues such as agriculture, aerospace, insurance, budget, etc.). All years from 1998 to 2008 are available, but we restrict our sample to the period 1999-2001.

Unfortunately, public information concerning lobbying clients (firms) lacks any form of standard company identifier and, to the best of our knowledge,a standard identifier of trade associations in the U.S. does not exist. We match firms and trade associations to sectors identifiers (4-digit level Standard Industrial Classification, SIC, or 3-digit SIC) individually using variety of sources including Compustat, the registration form itself (in the subsection General Description of Client's Business), company web sites, online business directories (Goliath, Manta, and Websters Online). Out of the $3,466$ unique client entries we were able to successfully identify and match to specific SIC codes $3,448$ of them, for a total of $111,156$ unique registrant-client-year-issue entries.[7] We then collapsed the data at the sector level, to obtain total lobbying expenditures, and lobbying

[7] The number of total unique client entries in the data set, including all 77 issues, is $29,831$. The total number of unique client-registrant-year-issue entries in the data is $312,908$.

expenditure by type of client (individual firm or trade association, both foreign and domestic) from which we construct $IndFrac_i$, the share of total lobbying expenditure done by individual firms in industry i. Particularly, the share of total lobbying expenditure done by individual firms as opposed to trade associations is a very accurate measure of the strength of collective action within a sector in the sense of Olson (1965). Interestingly the vast majority of U.S. sectors engages in some form of lobbying at some point in time. More than 84 percent of sectors engage in lobbying for the trade issue (which is one of the 77 issues listed by the SOPR) during the period 1998-2008.

We collected the sectorial characteristics data from a variety of sources. From the National Bureau of Economic Research Manufacturing Industry Productivity Database we obtain the total employment and physical capital stock measures employed to compute the capital/labor ratios at the sectorial level (averaged over the 1986-96 period). From the same source we also obtain total shipments. We obtain elasticities of substitution, $Elast_i$, from Broda and Weinstein (2006), which we use in their original format and we also discretized in three tercile-specific dummies (low, medium and high elasticity of substitution) in order to partially control for measurement error in the estimates. We also follow the literature (Goldberg and Maggi (1999)) in not allowing correction in the empirical analysis for the fact that the variable is estimated. $Conc_i$ is our preferred measure of concentration (share of output produced by largest 4 firms), number of establishments, and total shipments are available from the 1997 Economic Census (Release Date: 12/17/2002). The controls for geographic and political concentration are obtained from Busch and Reinhardt (1999). These controls are particularly apt for our study, since they not only measure geographic concentration, but also distinguish between industries whose activities are geographically clustered from industries whose clusters also fall within the same political district (and hence potentially have more political clout). The data on the number of tariff lines per harmonized system code at the 8 and 10 digit are from Feenstra et al. (2002).

We report summary statistics in Table 1. Concerning our main variable of interest $IndFrac_i$, one can notice that a good fraction of sectors displays high levels of individual lobbying. Indeed, the density of $IndFrac_i$ is bimodal. The fraction of sectors with a fraction above 90 percent of total lobbying done at the trade association level roughly varies between 15 and 20 percent depending on the set of available covariates (the table reports summary statistics for the smallest sample for which all covariates are available, corresponding to specification (6) in Table 2). The fraction of sectors with a fraction above 90 percent of lobbying done at the individual level roughly

varies between 40 and 55 percent. On average a dichotomous variable for the sector lobbying predominantly at the trade association versus individual level would accurately describe two thirds of our sample. Another important figure to notice is that for the period 1999-2001 the total amount of lobbying expenditure for international trade were on average $\$630,000$ per sector, almost twice as the aggregate campaign contributions for Senate and House combined in the congressional cycle 2005-2006. This gives an idea of the economic relevance of focusing on lobbying expenditure for trade policy. For completeness we also report summary statistics concerning measures of protection and our complete set of measures of product market competition.

2.2 Empirical evidence

Let us define the following variables for i indicating a 4-digit Standard Industrial Classification sector: $IndFrac_i$ share of total lobbying expenditure done by individual firms in sector i; $Elast_i$ elasticity of substitution or dummy for low, medium and high elasticity of substitution (from Broda and Weinstein (2006)); $Conc_i$ is a measure of concentration (share of output produced by largest 4 firms). The specification that we estimate is:

$$IndFrac_i = \rho_0 + \rho_1 Elast_i + \rho_2 Conc_i + X_i + \nu_i \tag{1}$$

where the control set is indicated by X_i and includes capital to labor ratio and average firm size, which can also be interpreted as proxy for product market competition in the sector and other variables discussed later.

The nature of the dependent variable is such that censoring occurs naturally over the unit interval. For this reason we estimate (1) using a Tobit two-sided censoring in all specifications. All the standard errors are heteroskedasticity robust.

In Table 2 we report estimates of the reduce-form specification (1) both in the form of marginal effects on the latent variable (upper panel) and marginal effects on the observed variable (lower panel). The first set of estimates provides insight on the size of theoretical effect on the latent unobserved variable, while the marginal effects in the lower panel quantify the effect conditional on observing the censored realization of the left-hand-side variable.

We begin by imposing $\rho_2 = 0$ in order to study the simple correlation of elasticity of substitution and mode of lobbying. Column (1) of Table 2 reports the estimates of the relationship between the share of total lobbying expenditure done by individual firms in industry i, $IndFrac_i$, and dummies

variables for medium and low elasticity of substitution in the sector (leaving low elasticity as contrast group). From a quantitative standpoints the effects are sizable. Using the marginal effects on the latent variable (upper panel of Table 2) column (1) shows that going from high/medium to low elasticity produces an increase in the fraction of lobbying done at firm level increases by 28.2%. Starting from the mean elasticity of substitution, a decrease by one standard deviation in the elasticity produces an increment of $IndFrac$ of about 3%. Using the marginal effects (lower panel of Table 2) column (1) shows that going from high/medium to low elasticity produces an increase in the fraction of lobbying done at firm level increases by 5.5%. The estimates are smaller in the lower panel has they are rescaled for the probability of $IndFrac$ falling in the unit interval. In column (2) we re-estimate (1) with the restriction $\rho_2 = 0$ but using a continuous variable for elasticity of substitution with similar results. Starting from the mean elasticity of substitution a decrease by one standard deviation in the elasticity produces an increment of $IndFrac$ of about 0.6%.

There is also widespread evidence of a positive degree of correlation between standard product market concentration measures ($Conc_i$) and the share of total lobbying expenditure done by individual firms in industry. We employ the fraction of total shipments covered by the top four firms , the capital/labor ratio (as proxy for entry barriers in the sector) and average firm size in the industry. Columns (3)-(5) report a statistically significant degree of positive correlation between concentration and political dispersion (i.e. lack of predominantly association-based lobbying) when imposing $\rho_1 = 0$.

We then include all product market competition proxies (both $Elast_i$ and $Conc_i$) in the final columns of Table 2, in columns (6) and (7) where we employ dummy variables and continuous variables for the elasticity of substitution. Higher elasticity of substitution parameters, lower concentration and lower capital intensity of the sector strongly predict higher lobbying through trade associations, as opposed to individual lobbying. F-tests, not reported, strongly reject the null of no explanatory power for our set of measures of competition. In the final two columns of Table 2 we also report the reduced-form correlations between all the measures of competitions and the total amount of resources spent in lobbying in the sector. Interestingly the effects of higher elasticity of substitution parameters of the sector strongly predicts lower levels of lobbying, suggesting that the same sectors where lobbying goes through trade associations also undertake less lobbying.[8]

[8]The unconditional correlation between $IndFrac_i$ and total lobbying expenditure is positive, but small (in Table

In Table (3) we introduce a set of controls to specification (1) for robustness. In the specification we include two Herfindhal indexes for political and geographic concentration; the logarithm of total shipments in the sector; the number of HS8 tariff lines; a SIC level-1 fixed effect covering the 2000-groups of manufacturing industries.[9] Although limited, this set of covariates captures a wide spectrum of systematic determinants of lobbying efforts across-sectors. In particular, the omission of sector size or its geographic dispersion could be well biasing the estimates in Table 2. A very reassuring feature of Table 3 is the increase in the size of the estimated marginal effects when the set of controls is added. Given the relative exogeneity of the technological and structural sectorial characteristics approximating for product market competition, the omission of relevant variables correlated with competition seems to be the main potential confounding factor in interpreting ρ_1 and ρ_2. However, a clear indication of the potential relevance of omitted variables would be the presence of substantial drops in the size of ρ_1 and ρ_2 whenever alternative controls were added, as this would indicate that elasticity of substitution and competition were likely capturing variation pertinent to alternative factors. This could likely happen when employing even a small but diverse spectrum of controls such ours.[10] At the opposite, we find larger effects, suggesting that omission of variables does not appear to be a first order concern for our reduced-form estimates.

3 The model

3.1 Set up

Consider an economy with a measure one of consumers, each supplying one unit of labor. Preferences of the representative consumer are described by the following utility function:

$$U = \alpha \sum_{i=1}^{N} Q_i - \frac{\beta}{2}(1-\sqrt{\eta}) \sum_{i=1}^{N} Q_i^2 - \frac{\beta}{2}\sqrt{\eta}\left(\sum_{i=1}^{N} Q_i\right)^2 + q_0,$$

2 sample it is 0.17).

[9] Included in the 2000 group for Manufacturing are: Food And Kindred Products; Tobacco Products; Textile Mill Products; Apparel And Other Finished Products Made From Fabrics And Similar Materials; Lumber And Wood Products, Except Furniture; Furniture And Fixtures; Paper And Allied Products; Printing, Publishing, And Allied Industries; Chemicals And Allied Products; Petroleum Refining And Related Industries.

[10] We checked the robustness of our specification to a much wider set of controls, including employment, input costs, productivity, etc., with similar results.

where q_0 is consumption of a homogeneous good, chosen as numeraire (with an international and domestic price of one), and Q_i is consumption of a variety of differentiated good, with $i = 1, ..., N$.[11] The parameters of the utility function, α and β are positive, while $0 \leq \eta \leq 1$. We assume throughout that the demand for all goods is positive. Given these preferences the demand for each variety i is:

$$Q_i = \frac{1}{\beta}\left(\frac{\alpha}{1+(N-1)\sqrt{\eta}} - \frac{1}{1-\sqrt{\eta}}p_i + \frac{\sqrt{\eta}}{\left(1-\sqrt{\eta}\right)\left(1+(N-1)\sqrt{\eta}\right)}\sum_{i=1}^{N} p_i\right). \tag{2}$$

where p_i is the price of variety i. For analytical convenience we choose the parameterization proposed by Singh and Vives (1984), where η describes the substitutability among varieties. As η increases, demand for variety i becomes more elastic with respect to all prices, but it becomes relatively more elastic with respect to the prices of varieties other than i. For $\eta = 0$ there is no substitution among varieties, while for $\eta = 1$ all varieties are perfect substitutes. One feature of interest is that the derivative of demand for variety i with respect to other prices is increasing in N.[12] In this sense the number of varieties N affects the substitutability of differentiated goods in a fashion similar to η. Furthermore this effect is stronger the larger η is. Demand for the homogeneous good is $q_0 = I - \sum_{i=1}^{N} p_i Q_i$, where I is income. Under these preferences, indirect utility V takes the form:

$$V = I + \frac{\left(1-\sqrt{\eta}+N\sqrt{\eta}\right)\sigma_p - p^2\sqrt{\eta} + 2\alpha\left(\sqrt{\eta}-1\right)p + N\alpha^2\left(1-\sqrt{\eta}\right)}{2\beta\left(1-\sqrt{\eta}\right)\left(N\sqrt{\eta}-\sqrt{\eta}+1\right)}, \tag{3}$$

where $\sigma_p = \sum_{i=1}^{N} p_i^2$ and $p = \sum_{i=1}^{N} p_i$.

The numeraire good is produced under constant returns to scale using one unit of labor per unit of output and supplied by a competitive sector. We assume that the production of the numeraire good is positive, so that the wage is equal to one and that this good does not bear any tariffs or subsidies. The production of differentiated goods is undertaken by domestic and foreign firms. Each variety Q_i is produced by only two firms: one domestic and one foreign. In this economy therefore each domestic firm faces the competition of a foreign rival that produces an identical product. All firms bear a constant marginal cost of ϕ units of labor per unit of the differentiated good. On top of the production cost, foreign firm i can be charged a specific tariff[13] $T + t_i$, which we discuss

[11] We follow Ottaviano, Tabushi and Thisse (2002) and Melitz and Ottaviano (2008) in modelling product differentiation through a quadratic utility function. Like in these papers, the choice is driven by analytical tractability.

[12] To show this we can rewrite (2) as $Q_i = \frac{1}{\beta}\left(\frac{\alpha}{1+(N-1)\sqrt{\eta}} - \frac{N\sqrt{\eta}-2\sqrt{\eta}+1}{\left(1-\sqrt{\eta}\right)\left(N\sqrt{\eta}-\sqrt{\eta}+1\right)}p_i + \frac{\sqrt{\eta}(N-1)}{\left(1-\sqrt{\eta}\right)\left(1+(N-1)\sqrt{\eta}\right)}p_{-i}\right)$ where p_{-i} is $\sum_{j\neq i} p_j/(N-1)$. It is easy to verify that $\frac{dQ_i}{dp_{-i}}$ is increasing in N and that $\partial^2\left(\frac{dQ_i}{dp_{-i}}\right)/\partial N\partial\eta > 0$.

[13] We follow the literature in focusing on specific tariffs, as ad valorem tariffs are analytically less tractable.

below. We assume Bertrand competition among all producers of the differentiated goods. In the presence of positive tariffs, Bertrand competition among producers of identical goods guarantees that the domestic firm will choose a limit price

$$p_i = \phi + T + t_i \tag{4}$$

as long as this is below the equilibrium price that would prevail in the absence of foreign competitors.[14] We assume throughout that we are operating at a level of tariffs such that limit pricing prevails. Imports of differentiated goods are always zero in this model.[15] Substituting the limit price (4) into the quantity equation (2) we find profits of domestic firm i as a function of tariffs:

$$\pi_i\left(t_1,...,t_N,T\right) = \frac{\left(T+t_i\right)\left[\left(\alpha-\phi-T\right)\left(1-\sqrt{\eta}\right)+t\sqrt{\eta}-\left(1-\sqrt{\eta}+N\sqrt{\eta}\right)t_i\right]}{\beta\left[1+\eta+\left(N-2\right)\sqrt{\eta}-N\eta\right]}$$

where $t = \sum_{i=1}^{N} t_i$. Having calculated profits, we can find income I by adding up profits across firms and labor income, which is one because both the population and the wage are equal to one:

$$I = 1 + \sum_{i=1}^{N} \pi_i \tag{5}$$

There are no tariff revenues in this economy because of limit pricing and no imports. Replacing (5) in (3), we can express the indirect utility as a function of tariffs, $V\left(t_1,...,t_N,T\right)$, by substituting the limit price (4) in the resulting expression for V.

Producers of differentiated goods not only interact in the product market, but also decide on whether to organize politically to influence the level of tariffs, on which their profits depend.

In this economy the government is a unitary agent that has the ability to set tariffs.[16] The government's objective function includes aggregate welfare as well as services provided by lobbyists which we assume are proportional to the lobbying expenditures made by firms:

$$G = V\left(t_1,...,t_N,T\right) + \frac{1}{\tau}L + \frac{1}{\theta}l \tag{6}$$

[14] In a model with Bertrand competition and differentiated products, the symmetric equilibrium price would be $p_i = \frac{\alpha\left(1-\sqrt{\eta}\right)+\phi\left(1-2\sqrt{\eta}+N\sqrt{\eta}\right)}{N\sqrt{\eta}-3\sqrt{\eta}+2}$, $\forall i$.

[15] The stark feature of no imports can be avoided by adopting Cournot competition. Although we have solved the model under this mode of competition the algebra is cumbersome and the qualitatively features are unchanged, so we present the version with Bertrand competition, despite its unappealing prediction of zero imports.

[16] Richer models of lobbying that incorporate a more realistic view of government have been explored by Helpman and Persson (2001) and Hauk Jr (2005). These models take into account that policy decisions are made by legislatures operating under majority rule and emphasize the effect of lobbying on different political systems.

where L is the amount spent on lobbying by the trade association and l is the aggregate amount spent on lobbying by individual firms.

In Grossman and Helpman (1994), and the related literature, the government is assumed to care about welfare and political contributions, which are useful to the incumbent politicians because they increase the probability of re-election. In this paper we study lobbying expenditures, which are not directly channeled to the politician, but to lobbyists. According to a large amount of anecdotal evidence lobbyists provide many services to politicians such as producing documents, drafting legislation, providing expert testimony and even organizing campaign events.[17] There are many papers formally analyzing the role of informational lobbying in policy making (Grossman and Helpman (2001), Potters and Van Winden (1990), Potters and Winden (1992) and Austen-Smith (1993)). In this paper we take an approach that is in between these two strands of literature. On the one hand, we move away from the view that interest groups provide just money to politicians in exchange for policies and recognize that lobbyists provide other useful services to politicians such as information. On the other hand, we do not formalize the game in terms of a signalling game, primarily because we would not have a way of directly relating it to the data. Indeed, a drawback of signalling models is that they are very hard to test empirically. For the purpose of this paper we accept that lobbying services describe part of the interaction between politicians and interest groups, but we limit ourselves to a reduced form that links the amount of lobbying activity and the utility of politicians.

Expression (6) allows the trade-off between the amount of lobbying services and aggregate welfare to depend on the source of lobbying services. This is meant to capture the fact that trade associations might be more or less effective at lobbying the government than individual firms. If τ is low relative to θ then trade association lobbying is more effective than individual firm lobbying and viceversa if $\tau > \theta$. We do not provide a microfoundation of the reason why $\tau \lessgtr \theta$, leaving it to future work to explore theoretically the effectiveness of different modes of lobbying.

[17] The evidence on the matter is widespread and it is not uncommon to find quotes such as *"Mr. McCain has accepted corporate contributions for pet projects and relied heavily on lobbyists to help run his campaigns and Senate office."* (New York Times, April 25, 2008).

3.2 Structure of the lobbying game

The structure of the game is sequential.[18] The timing of the game is the following:

Stage 1 (Lobbying together): Each firm i simultaneously sets L_i (contributions to trade association lobbying expenditures). The trade association makes a take-or-leave offer (T, L) to the government, with $L = \sum_{i=1}^{N} L_i$. The government accepts or rejects the offer.

Stage 2 (Lobbying alone): given the sector-wide tariff negotiated by the trade association T, each firm i simultaneously makes a take-or-leave offer (t_i, l_i) to the government. The government accepts or rejects the offers.

Stage 3: Production and consumption take place

We solve the game backward starting from stage 3. We have already described the interaction among firms in the product market and we have found the variables that are relevant for the previous stages of the game, profits $\pi_i(t_1, ..., t_N, T)$ and aggregate welfare $V(t_1, ..., t_N, T)$.

3.3 Lobbying alone

At stage 2, T has been determined and individual firms consider whether to lobby to increase the tariff on their own product. This means we are limiting the strategy space for each individual firm i to t_i. Throughout we are going to impose that $t_i \geq 0$ and $l_i \geq 0$ (individual firms cannot "undo" T and reduce the tariff on their own product). At this stage the government problem is to accept or reject the offers made by individual firms. In particular the government might accept any subset of the offers, so we need to understand whether we can limit the set of equilibrium strategies of the government. Let us denote the set of firms whose offers are accepted by N_A. Thanks to symmetry we can order firms so that the first N_A are the ones whose offers are accepted. Then the government problem is the following:

$$\max_{N_A} V(t_1, ..., t_{N_A}, 0, ..., 0, T) + \frac{1}{\tau} L + \frac{1}{\theta} \sum_{i \in N_A} l_i$$

Lemma 1 *In equilibrium all offers are accepted, i.e.* $N_A = N$.

Proof. In Appendix. ■

[18] We have characterized the solution for the simultaneous game as well and, although the tariff levels are the same, the equilibrium mode of lobbying depends on parameters in a slightly different way. Nevertheless the basic results of comparative statics with respect to the degree of substitutability and the number of firms are the same. Overall, the main difference is that the simultaneous game allows a larger set of parameters where joint lobbying prevails.

Let us provide here the intuition for this Lemma, with all the details relegated to the Appendix. Imagine that there is only one firm, firm 1, whose offer is accepted by the government. Firm 1 asks for tariff t and offers $l_1 = -\theta\left(V\left(t,0,...,0,T\right) - V\left(0,...,0,T\right)\right)$. If firm 1 finds this profitable then firm 2, identical to firm 1, will have even higher incentives to ask for the same tariff t, since the government will need a lower amount of lobbying expenditures to be compensated. This is because the first tariff on an individual variety produces a large distortion in relative prices, while the tariff on the second product does not distort them as much and so on. This means that if any firm has incentive to make an offer that will be accepted (and for θ low enough there will always be a tariff that is small enough to be worth obtaining), then all firms will have an incentive to make offers that will be accepted. So the government never finds accepting only one offer to be optimal, if all firms ask for the same tariff t and offer no more than l_1 (if one of them did, the government would be strictly better off accepting that offer only).

Lemma 1 and the fact that firms make take-or-leave offers imply that the only constraint firms have to take into account when choosing (t_i, l_i) is that they must keep the government indifferent between free trade and accepting all offers:

$$\sum_{i=1}^{N} l_i + \theta V\left(t_1,...,t_N,T\right) = \theta V\left(0,...,0,T\right) \tag{7}$$

Constraint (7) is binding otherwise firms could decrease the amount of lobbying expenditures without affecting the government's decision and strictly gain.

Firm i's problem is therefore to maximize profits minus lobbying expenditures, taking as given the set of (t_j, l_j) for $j \neq i$ and subject to constraint (7). Isolating l_i we can rewrite the maximization problem as follows:

$$\begin{aligned} & \max_{t_i, l_i} \ \pi_i\left(t_1,...,t_N,T\right) - l_i \\ s.t. \quad l_i + \sum_{j \neq i} l_j &= -\theta\left[V\left(t_1,...,t_N,T\right) - V\left(0,...,0,T\right)\right] \end{aligned}$$

We can derive l_i from the constraint and substitute it in the objective function, obtaining the following maximization problem:

$$\max_{t_i} \ \pi_i\left(t_1,...,t_N,T\right) + \theta\left[V\left(t_1,...,t_N,T\right) - V\left(0,...,0,T\right)\right] + \sum_{j \neq i} l_j$$

Notice that this implies that the firm will choose the tariff t_i that maximizes the joint surplus of the government and the firm itself, given the tariff and lobbying expenditures of all other firms.

We take the first order conditions for all firms and solve for the Nash equilibrium tariff levels and lobbying expenditures.

Proposition 2 *The equilibrium in the subgame at stage 2 entails a unique level of individual tariffs* t_i^**: Given* T*,*

$$t_i^* = \max\{0, -T + \Delta\}$$

where $\Delta = \frac{(\alpha-\phi)\left(1-\sqrt{\eta}\right)}{2+\theta+\sqrt{\eta}(N-3-\theta)}$*. Lobbying expenditures* l_i^* *are such that* $\sum_{i=1}^{N} l_i^* + \theta V\left(t_1^*, ..., t_N^*, T\right) = \theta V\left(0, ..., 0, T\right)$ *and* $l_i^* \leq -\theta\left[V\left(0, ..., t_i, ..., 0, T\right) - V\left(0, ..., 0, T\right)\right]$*.*

The indeterminacy of lobbying expenditures is a common characteristics of this class of games (such as Grossman and Helpman (1994)) where the government has an objective function linear in lobbying expenditures and utility of consumers is quasi-linear. In order to proceed to Stage 1 we need to make assumptions that restrict the level of equilibrium lobbying expenditures. The presence of identical firms suggests as reasonable the assumption of symmetry in the lobbying expenditures, which we make here.

Assumption 1 - The amount of lobbying expenditure at Stage 2 is identical across firms: $l_i^* = -\frac{\theta}{N}\left[V\left(t_1^*, ..., t_N^*, T\right) - V\left(0, ..., 0, T\right)\right]$

Before moving to stage 1 of the game, it is worth remarking how Δ, which represents the incentive to lobby individually for protection beyond the level achieved by the trade association, depends negatively on the substitutability parameter. As η approaches 1 the desired level of individual tariff Δ declines because every attempt to raise individual prices translates into a smaller increase in profits. Moreover, notice that Δ depends negatively on the number of firms N. As N approaches infinity the desired level of individual tariffs goes to 0 because any attempt to raise the individual tariff causes consumers to divert spending to the larger set of competing varieties.

3.4 Lobbying together

At stage 1 of the game firms decide how much to contribute to the lobbying expenditures by the trade association representing the sector. We adopt a very stylized and somewhat mechanical view of the trade association. We see the trade association as a 'technology' that transforms lobbying expenditures into a common tariff T at a rate τ that might be different from θ. The timing of the game and the strategy space for the firms will deliver free-riding in the sense that the level of T achieved is not the cooperative level. This is a desired feature in our view because free-riding is one

of the fundamental aspects of the trade off between individual and joint lobbying. This is meant to capture the idea that firms evaluate whether to contribute to their own tariff or to the sector-wide tariff. While, in some cases, they might prefer all tariffs to be raised simultaneously, when they contribute a dollar to lobbying expenditures of the trade association, they perceive its return to be spread over all goods and therefore they tend to contribute less. If the trade association achieved the cooperative level of T then there would be no need for firms to lobby for their individual t_i.

Each firm i contributes L_i to the trade association. The trade association makes a take-or-leave offer to the government (T, L). The government problem is to accept or not the offer. The government will accept the offer if the offer makes it at least as well off as the status quo (free trade):

$$L + \tau V(0, ..., 0, T) \geq \tau V(0, ..., 0, 0) \tag{8}$$

The trade association will lower L until constraint (8) binds for a given T otherwise it would benefit without modifying the government's behavior. From this binding constraint we can derive a function $T(L)$ that relates the amount of lobbying expenditures to the level of tariff T. Firm i's problem is then to find the level of L_i that maximizes profits net of lobbying expenditures, given the lobbying expenditures by other firms, denoted by $L_{-i} = \sum_{j \neq i} L_j$:

$$\max_{L_i} \ \pi_i(t_1(T), ..., T) - l_i(T) - L_i \tag{9}$$

$$\text{with } T = T(L_i + L_{-i}) \tag{10}$$

Because of perfect substitutability between t_i and T and the assumption of symmetry, this problem entails corner solutions. Either all firms lobby alone ($t_i > 0 \ \forall i$ and $T = 0$) or they all lobby together ($t_i = 0 \ \forall i$ and $T > 0$). Section 7.2 in the Appendix provides a rigorous description of the equilibrium. Here we briefly describe the outcomes under the two modes of lobbying.

If $t_i = 0$ then the problem for firm i simplifies to the following:

$$\max_{T} \ \pi_i(0, ..., T) + \tau [V(0, ..., T) - V(0, ..., 0)] + L_{-i} \tag{11}$$

which delivers a unique solution in the tariff level:

$$\overline{T} = \frac{\alpha - \phi}{2 + N\tau}$$

Notice that this level of tariff is privately efficient from the point of view of firm i because it maximizes the joint surplus of the firm and the government. This is an extreme level of free-riding,

which could be relaxed, but serves as a stark benchmark, for the reasons discussed above. While the tariff level $\overline{T}$ is uniquely determined, along with the total amount of lobbying expenditure $\overline{L}$, the amount of individual lobbying expenditures L_i cannot be pinned down. How firms share $\overline{L}$ is relevant for the incentives of firms to deviate from joint lobbying, as described in the sections below.

If $t_i > 0$ then the overall tariff on all goods is Δ. If we substitute $t_i + T = \Delta$ in the objective function (9), along with the expression for l_i and the constraint (8) taken as binding we can rewrite the problem as:

$$\max_{T} \ \pi_i(0, ..., \Delta) + \frac{\theta}{N}\left[V(0, ..., \Delta) - V(0, ..., T)\right] + \tau\left[V(0, ..., T) - V(0, ..., 0)\right] + L_{-i} \qquad (12)$$

Problem (12) reduces therefore to maximizing over T the expression $\left(\tau - \frac{\theta}{N}\right) V(0, ..., T)$. It is easy to verify that this is a linear problem that delivers corner solutions. Either T is set to 0 or it is increased to a point at which firms no longer have incentives to lobby individually. If $\tau < \frac{\theta}{N}$ then lobbying by the trade association is very effective and $t_i = 0$. If $\tau > \frac{\theta}{N}$ then we need to consider other parameters of the problem to determine the equilibrium mode of lobbying and the tariff level. We refer to section 7.2 in the appendix for a full description of the equilibrium. In the following sections we discuss the characterization of the equilibrium as function of two parameters that describe the level of product market competition in the economy, the degree of substitutability, η, and the level of concentration, N.

4 Competition and the mode of lobbying

4.1 Substitutability

We present here an immediate corollary to proposition 8, which characterizes the equilibrium in terms of Δ. The following corollary describes the equilibrium in terms of the substitutability parameter η, one of the determinants of Δ and one of the parameters we are interested in. In order to provide intuition we confine the analysis to the case with $N = 2$, referring the reader to the general proposition in the appendix. Define δ as the share of trade association lobbying expenditure $\overline{L}$ by firm 1.

Corollary 3 *With $N = 2$, the equilibrium in the lobbying game depends on η, τ and θ:*

1. *If $\tau \leq \frac{\theta}{2}$ then all firms lobby together with $T^* = \overline{T} = \frac{\alpha - \phi}{2(1+\tau)}$*

2. *If* $\tau > \frac{\theta}{2}$, *there exist* $\overline{\eta}$ *and* $\overline{\overline{\eta}}$ *such that:*

   (a) *if* $\eta < \overline{\eta}$ *then all firms lobby alone and* $t_i^* = \Delta = \frac{(\alpha-\phi)\left(1-\sqrt{\eta}\right)}{2-\sqrt{\eta}+\theta\left(1-\sqrt{\eta}\right)}$

   (b) *if* $\overline{\eta} \leq \eta < \overline{\overline{\eta}}$ *then there are multiple equilibria in the mode of lobbying and the level of lobbying expenditures. In one equilibrium all firms lobby alone with* $t_i^* = \Delta$. *In the other equilibrium all firms lobby together with* $T^* = \overline{T}$ *and* $\underline{\delta}(\eta) \leq \delta \leq \overline{\delta}(\eta)$.

   (c) *if* $\eta \geq \overline{\overline{\eta}}$ *then all firms lobby together with* $T^* = \overline{T}$ *and* $0 \leq \delta \leq 1$

3. $\underline{\delta}(\eta)$ *is decreasing in* η *and* $\overline{\delta}(\eta)$ *is increasing in* η.

Figure 1 illustrates the equilibrium in Proposition 2 for $\tau > \frac{\theta}{2}$. Notice that there exists an η^* such that for $\eta < \eta^*$, $\Delta > \overline{T}$ and for $\eta \geq \eta^*$, $\Delta \leq \overline{T}$, but such value of η turns out not to be a qualitative threshold for the equilibrium mode of lobbying.

Proof. In Appendix. ■

Corollary 3 establishes that industries characterized by high substitutability among products are more likely to organize into a trade association, while industries where products are differentiated are expected to lobby individually. This is because the more substitutable products are, the lower the increase in profit an increase in t_i induces, making lobbying for T a better alternative. The next section analyzes how concentration affects the equilibrium mode of lobbying.

4.2 Concentration: Homogeneous Firms

This section shows how a higher degree of competition in the form of a larger number of firms N can lead to lobbying together as the equilibrium. As opposed to the case of the substitutability parameter, where the relationship between mode of lobbying and product differentiation is unambiguous, here the number of firms has two effects on the mode of lobbying. The first, which we refer to as Free-Riding Effect, has been described in a number of papers about the collective action problem, starting with Olson (1965). As N increases, the free-riding problem in the trade association becomes more severe because each firm is smaller and internalizes less the benefits of an increase in T. This effect makes an industry characterized by a small concentration less likely to lobby jointly. The second, which we refer to as Competition Effect, is similar to the one described in the previous section. As the number of firms N increases, an attempt by one firm to increase its product-specific tariff causes a smaller increase in profits. This is not just because the firm

itself is smaller and therefore the increase in profits is smaller, but because as the price of one variety increases consumers can choose among many other varieties. If we take the symmetric case (identical prices p), the shape of the demand function for Q_i, as in equation (2), reveals that as N increases, the coefficient in front of prices of other varieties increases, while the coefficient in front of the price for variety i is constant. This means that the demand for Q_i becomes more elastic to the prices of other varieties with an increase in N. The Competition Effect makes an increase in the individual tariff less profitable relative to an increase in T and therefore can make joint lobbying more likely as the number of firms rises. This section illustrates the parameter conditions under which the Competition Effect is stronger than the Free-Riding Effect. The full characterization of the equilibrium is cumbersome and not informative about the role of N because many of the cases depend on the value of η which we have discussed in the previous section. We provide it in Section 7.4 in the Appendix. We report here a key part of the proposition, which shows that in this model the olsonian intuition that less concentrated sectors are less likely to organize politically might fail.

Remark 4 *For $\theta < \tau < \frac{\mu}{2}$ with $\mu = \frac{\sqrt{\eta}}{1-\sqrt{\eta}}$, concentration affects the equilibrium mode of lobbying according to the following pattern: there exist $\widetilde{N}^1$ and $\widetilde{N}^2$ with $\widetilde{N}^1 < \widetilde{N}^2$ such that all firms lobby alone for $N < \widetilde{N}^1$, all firms lobby together for $N > \widetilde{N}^2$ and there are multiple equilibria for $\widetilde{N}^1 \leq N \leq \widetilde{N}^2$.*

We can build intuition for this result around two key conditions. First, the cost of lobbying together τ has to be high enough relative to the cost of lobbying alone θ to justify the presence of lobbying alone as an equilibrium. Second, there are conditions on the parameters for this cost advantage of lobbying alone to be eroded as N increases. This is the case if η is large. As varieties are more substitutable an increase in their number makes demand faced by an individual firm even more sensitive to prices. Therefore an attempt to raise the individual tariff will cause them to substitute to other varieties, making lobbying individually progressively less attractive with an increase in N. This produces the result.

5 Evidence on the effect of the mode of lobbying on tariffs

One question that we have left unexplored in the paper is whether the mode of lobbying has any effect on policy outcomes, in the case of trade policy the level of protection. In this section we present some evidence that the mode of lobbying has an effect on the level of protection granted to

a sector. In the model whether different modes of lobbying have an impact on protection depends simply on the parameters τ and θ. The lower τ is relative to θ, the more effective resources spent on lobbying together are relative to lobbying individually, because the government values lobbying expenditures from trade associations more than from individual firms. We do not provide a theoretical foundation for the differential impact of the two modes of lobbying, which could be the focus of future research, but limit ourselves to investigate this effect empirically. The empirical specification that we employ is the following:

$$Protection_i = \beta_0 + \beta_1 Elast_i + \beta_2 Conc_i + \beta_3 IndFrac_i + \beta_4 ImpElast_i + \beta_5 ImpPenet_i + \xi_i$$

where $Protection_i$ is either tariffs or non-tariff barriers (NTB's)[19] in sector i, $ImpElast_i$ is the elasticity of imports in sector i and $ImpPenet_i$ is import penetration in sector i. This specification does not derive directly from the model, but it takes into account that the level of protection should be negatively impacted by the degree of substitutability (η in the model) and positively related to the level of concentration. Since the model is too simple and does not describe the general case of many asymmetric firms, we approximate the relations between these variables in a linear way. The parameters β_1 and β_2 therefore do not have any structural interpretation, although the model clearly predicts their sign. To test whether the mode of lobbying impacts the the level of protection we include $IndFrac_i$ as a regressor. We include also two variables that Trefler (1993) has shown to have an impact on tariffs and NTB's: import penetration[20] and import elasticity.[21]

Since the variables that affect the mode of lobbying in the model also affect the level of protection, we need to find a source of exogenous variation to identify the effect of $IndFrac_i$. We propose to employ geographical and political concentration as an instruments for the mode of lobbying. The logic is that geographically concentrated sectors should find it easier to form a trade association to lobby the government. We also follow Trefler (1993), Gawande and Bandyopadhyay (2000) and Goldberg and Maggi (1999) in recognizing that import penetration is in turn affected by tariffs and therefore employ determinants of comparative advantage as instruments, in particular the capital

[19] Weighted tariffs for the year 1999 and are taken from Feenstra et al. (2002). Coverage ratios are built from the TRAINS data set maintained by UNCTAD. Coverage ratios are the fraction of products within each SIC sector coverege by one or more non-tariff measures (non-tariff measures are applied most often at the HS10 level, so we count the number of products within each SIC category that are covered). Weighted coverage ratios are similar but attach a weight to each product equal to its share of imports.

[20] Import penetration data for the year 1999 are from Feenstra et al. (2002) .

[21] Import elasticities are from Kee et al. (2004).

to labor ratio, the skilled to unskilled labor ratio and material to labor ratio.[22]

The results of the OLS and instrumental variable regressions are reported in Table 4. The main finding is that, ceteris paribus, the higher the share of individual lobbying in total lobbying expenditure, the lower tariffs and NTB's are. The result is present in both the OLS and 2SLS regressions, but is stronger in the latter. Quantitatively the effects are substantial. In the baseline 2SLS specifications a one standard deviation increase in the share of trade association lobbying (0.4) produces and increase of 37.7% in the level of unweighted NTB's (column 4), of 31.5% in the level of weighted NTB's (column 5) and an increase in tariffs of 5.4%.

The interpretation of this result according to the model is that the politician's weight on trade associations expenditures is higher than the weight on individual firms lobbying expenditures, that is τ is smaller than θ. For the model to be consistent with all empirical findings, this parameter configuration should be compatible with the parameter restrictions required by the results on substitutability and concentration. As for substitutability, the model requires τ to be larger than $\frac{\theta}{N}$ for joint lobbying to be more likely as substitutability among products η increases (if $\tau < \frac{\theta}{N}$ then lobbying together is always the only mode of lobbying regardless of η). This restriction is compatible with $\tau < \theta$. As for the result of the effect of concentration on joint lobbying, the evidence is more problematic because an increase in N makes joint lobbying more likely only in the case of $\tau > \theta$. Since we observe that, empirically, as concentration decreases joint lobbying is more likely the model would require τ to be larger than θ. There are two reasons to consider this contrasting evidence not a serious flaw of the model. First, we are inferring the relative magnitude of τ and θ from an equation that is not structurally related to the model. Second, the theoretical result on the effect of concentration on the mode of lobbying should be taken more as an illustration that the olsonian intuition *can* fail, rather than identifying precisely the instances in which it does or does not fail.

As for the rest of Table 4, we find the expected sign on the relationship between protection and the remaining variables. Both import elasticity and the elasticity of substitution among products within the sector are negatively related to protection and concentration is shown to increase protection. The sign of the coefficient on the import penetration variable is negative. This finding is in line with the Grossman and Helpman (1994) theoretical prediction that sectors that are politi-

[22] The data is from the NBER Manufacturing Industry Productivity Database. Capital is capital stock, skilled labor is the number of non-production workers, unskilled labor is the number of production workers, and materials is the expendiure on materials, including energy and fuels. All variables are an average over the period 1986-96.

cally organized should receive a level of protection that is negatively related to import penetration because of the higher distortion created in these sectors.[23]

The evidence indicates that firms that manage to lobby jointly through a trade association have a higher return on their lobbying efforts. In future work we plan to explore why trade associations are more effective than individual firms in obtaining favorable legislation. One possible explanation is based on theories of informational lobbying. If one accepts that a trade association has preferences that are more aligned with the government than individual firms, then the amount of lobbying expenditure required to obtain a certain level of protection is lower. Another possible explanation is that politicians find information provided by trade associations lobbyists more useful than that provided by individual firms.

An interesting implication of this finding is that sectors that have high elasticity of substitution might end up with higher protection than other sectors because they have a higher incentive to lobby through the trade association and lobbying through the trade association is more effective. This could partially explain why sectors such as agriculture, where products are relatively homogeneous, receive high degrees of protection: the direct effect of the elasticity of substitution would be to lower tariffs granted, but the indirect effect of favoring joint lobbying might increase tariffs so that the net effect can be positive.

6 Concluding remarks

This paper presents a direct new measure of the degree of political organization of U.S. industries for the purpose of lobbying the federal government for trade policy employing the whole universe of lobbying reports at the Senate Office of Public Records. The paper documents that more

[23] Trefler (1993) finds a positive effect of import penetration on tariffs, but our result should not be read as in contrast with his finding. Grossman and Helpman (1994) predict that the sign should be negative for politically organized sectors and positive for politically unorganized sectors and various tests of their tariff equation (Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000)) have confirmed this prediction. Naturally, if one does not distinguish between two groups then the coeffcient is expected to be negative or positive depending on the share of politically organizes sectors. We do not have a structural tariff equation analogous to Grossman and Helpman (1994) and we do not make the distinction between politically organized and not politically organized since according to our data all sectors lobby for trade, although with different strength and the distinction is in reality not so stark (see Bombardini (2008)). Therefore our regression result should be read similarly to Trefler (1993), in that it the coefficient represent an average of positive and negative effects.

competitive and less concentrated sectors are more likely to organize politically and lobby together as a trade association. The stylized facts we present contrast with the interpretation of free riding as the prevalent force shaping political organization and collective action (Olson, 1965). We argue that the choice of mode of lobbying that we observe in the data is consistent with a model incorporating market interaction among firms within an imperfectly competitive setting. Examples in which product market competition induces political organization arise naturally in our model. Individual lobbying becomes less and less useful in settings where price increases induce large profit losses or in settings where the size or the number of competitors is large. This contrasts with the Olsonian view that sees individual lobbying and free riding becoming more and more likely in settings where the size or the number of competitors is large. The main contribution of the paper is to show empirically and theoretically that competition forces do not necessarily imply political disintegration.

Finally, we also explore the policy implications of differences in the mode of lobbying for trade policy. We find that the mode of lobbying correlates with the level of protection in a large cross-section of U.S. sectors and, particularly, that sectors with more lobbying done through trade associations obtain higher tariffs and higher non-tariff measures.

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7 Appendix

7.1 Proof of Lemma 1

By contradiction, say only $N_0 < N$ offers are accepted. Without loss of generality let us assume that $N_0 = 1$ and that the offer accepted is by firm 1. If this is an equilibrium it means that the lobbying expenditure is enough to compensate the government for the loss of welfare, $l_1 = -\theta [V(t_1, 0, ..., T) - V(0, 0, ..., T)]$ and that $\pi_1(t_1, 0, ..., T) - l_1 \geq \pi_1(0, 0, ..., T)$. In order to prove that firm 2 will have an incentive to lobby for a tariff $t_2 \geq t_1$, it is sufficient to show that $\pi_2(t_1, t_1, ..., T) - l_2 \geq \pi_2(t_1, 0, ..., T)$ with $l_2 = -\theta [V(t_1, t_1, ..., T) - V(t_1, 0, ..., T)]$. We can show that $\pi_2(t_1, t_1, ..., T) - \pi_2(t_1, 0, ..., T) + \theta [V(t_1, t_1, ..., T) - V(t_1, 0, ..., T)] > \pi_1(t_1, 0, ..., T) - \pi_1(0, 0, ..., T) + \theta [V(t_1, 0, ..., T) - V(0, 0, ..., T)]$.[24] The right-hand side of this inequality is positive by assumption and this proves that firm 2 will also have an incentive to lobby for the same tariff t_1. This contradicts the statement that having only one firm's offer accepted is an equilibrium.

7.2 Equilibrium in the lobbying game

Section 3.4 claims that the symmetric game admits only equilibria where firms either lobby together or lobby alone, but do not do both. We here present a formal derivation and proposition.

In what follows we drop the subscript i when it does not lead to ambiguity and adopt the notation $\pi(x)$ for profits and $V(x)$ for indirect utility function when x is the symmetric tariff on all differentiated goods. From (9) and (11) firm i problem at stage 1 can be re-written as:

$$\begin{aligned} & \max_{L \geq L_{-i}} f(T(L)) \text{ or equivalently} \\ & \max_{T \geq T_{-i}} f(T) \\ \text{where } T_{-i} &= T(L_{-i}) \qquad (13) \\ \text{and } f(T) &= \begin{cases} f_1(T) = \pi(\Delta) + \frac{\theta}{N}[V(\Delta) - V(T)] + \tau[V(T) - V(0)] + L_{-i} & if \quad T \leq \Delta \\ f_2(T) = \pi(T) + \tau[V(T) - V(0)] + L_{-i} & if \quad T > \Delta \end{cases} \end{aligned}$$

If we use the specific functional forms for $\pi(\cdot)$ and $V(\cdot)$ then we can rewrite $f(T)$ (omitting the constants L_{-i}) as:

$$\begin{aligned} f_1(T) &= \frac{1}{K}\left[(\alpha - \phi)\Delta - \left(1 + \frac{\theta}{2}\right)\Delta^2 - \frac{1}{2}(N\tau - \theta)T^2\right] \\ f_2(T) &= \frac{1}{K}\left[(\alpha - \phi)T - \left(1 + \frac{N\tau}{2}\right)T^2\right] \end{aligned}$$

where $K = \beta\left[1 + (N-1)\sqrt{\eta}\right]$. One can easily check that $f_1(\Delta) = f_2(\Delta)$ and that $f_2(T)$ is maximized at $\overline{T} = \frac{\alpha - \phi}{2 + N\tau}$. We indicate by T^* the optimal choice of T by firm i and from now on we disregard the constant K since it does not affect the maximization problem. We can easily reject that there is an equilibrium with $T^* > \overline{T}$, so we can focus on the region $T_{-i} \leq T \leq \overline{T}$ to find the optimum.

Case 1 - If $N\tau < \theta$ then $f_1(T)$ is increasing in T for $T > 0$. It is easy to verify that $\Delta < \overline{T}$ and the solution to the maximization problem is $T^* = \overline{T}$. In equilibrium firms only lobby together. Figure A1 illustrates this case graphically.

Case 2 - If $N\tau > \theta$ then $f_1(T)$ is decreasing in T for $T > 0$, as Figure A2 illustrates graphically.

[24] The algebraic expressions are cumbersome and not instructive, but available upon requests from the authors.

Lemma 5 *Δ is decreasing in η.*

Proof. The derivative of Δ with respect to η is negative. ■

Lemma 6 *For a given T, f_1 is increasing in Δ and f_2 is constant in Δ.*

Proof.

$$\begin{aligned}\frac{\partial f_1(T)}{\partial \Delta} &= (\alpha-\phi)-(2+\theta)\Delta \\ &= (\alpha-\phi)\left[1-\frac{2+\theta-\sqrt{\eta}(2+\theta)}{2+\theta-\sqrt{\eta}(1+\theta)}\right]>0\end{aligned}$$

■

Now let us define $\widehat{T}=\widehat{T}(\Delta)$ such that $f_1\left(\widehat{T}\right)=f_2\left(\overline{T}\right)$ and correspondingly $\widehat{L}$ such that $\widehat{T}=T\left(\widehat{L}\right)$. Let us define $T'=T\left(\frac{N-1}{N}\overline{L}\right)$ where $\overline{T}=T\left(\overline{L}\right)$:

$$T'=\frac{\alpha-\phi}{2+N\tau}\sqrt{\frac{N-1}{N}}.$$

Also define Δ' such that $\widehat{T}(\Delta')=T'$:

$$\Delta'=\frac{\alpha-\phi}{2+\theta}\left(1-\frac{\sqrt{N(N\tau-\theta)(2+\theta-N\theta+N^2\tau)}}{N(2+N\tau)}\right)$$

and Δ'' such that $\widehat{T}(\Delta'')=0$:

$$\Delta''=\frac{\alpha-\phi}{2+\theta}\left(1-\sqrt{\frac{N\tau-\theta}{N\tau+2}}\right)$$

Figure A3 shows how to determine Δ' and Δ'' graphically.

Proposition 7 *When $N\tau>\theta$, the solution T^* of the maximization problem is:*

1. *If $\Delta<\Delta''$ then $T^*=\overline{T}$*
2. *If $\Delta\geq\Delta''$ then: (a) $T^*=T_{-i}$ if $T_{-i}\leq\widehat{T}(\Delta)$; (b) $T^*=\overline{T}$ if $T_{-i}>\widehat{T}(\Delta)$.*

Proof. From the definition of $f(T)$ it is straightforward to verify that we have a boundary solution at $T^*=T_{-i}$ if $f_1(T_{-i})>f_2\left(\overline{T}\right)$ and $T^*=\overline{T}$ otherwise. ■

In order to convey the intuition for this proposition we illustrate case 1 in Figure A4, case 2(a) in Figure A5 and case 2(b) in Figure A6.

Proposition 8 *When $N\tau>\theta$ the subgame-perfect Nash equilibrium of the lobbying game is:*

1. *If $\Delta<\Delta''$ then firms lobby together with $T^*=\overline{T}$*
2. *If $\Delta''<\Delta\leq\Delta'$ then there are multiple equilibria*

(a) *Firms lobby alone with* $T^* = 0$ *and* $t_i^* = \Delta$ *(this equilibrium Pareto dominates the following).*

(b) *Firms lobby together with* $T^* = \overline{T}$ *if their choices are in region* A_Δ *with:*

$$A_\Delta = \left\{ (L_1, ..., L_N) \mid \max\left\{0, (1-(N-1)\,\delta_\Delta)\,\overline{L}\right\} < L_i < \delta_\Delta \overline{L}, \sum_i L_i = \overline{L} \right\}$$

where $\delta_\Delta = \frac{\overline{L}-\widehat{L}}{\overline{L}}$ *and lobby alone if not.*

3. If $\Delta > \Delta'$ *then firms lobby alone with* $T^* = 0$ *and* $t_i^* = \Delta$.

Proof.

1. This part follows directly from proposition 7

2. We have two cases:

   (a) Choosing $T^* = 0$ is a Nash equilibrium for all firms. Consider the strategy of $L_i = 0$ then $L_{-i} = 0$. According to proposition 7 since $\widehat{T}(\Delta) \geq 0 \Longrightarrow T^* = 0$ which confirms that the strategy of $L_i = 0$ is optimal. Also $f_1(0) > f_2\left(\overline{T}\right)$, so the payoff would be higher for all firms if they could coordinate on this equilibrium (rather than the equilibrium in point 2.b). Since the government is indifferent in both cases this equilibrium Pareto dominates the lobbying together equilibrium in point 2.b.

   (b) If L_i's are in region A_Δ then $L_i < \overline{L} - \widehat{L} \Longrightarrow L_{-i} > \widehat{L} \Longrightarrow T_{-i} > \widehat{T}(\Delta)$ then according to proposition 7 firms choose $T^* = \overline{T}$ and they lobby together. Also in this case $\Delta < \overline{T}$ and they will not lobby alone in stage 2. If L_i's are not in region A_Δ, then there exists and index i such that $L_i > \overline{L} - \widehat{L} \Longrightarrow L_{-i} \leq \widehat{L} \Longrightarrow T_{-i} \leq \widehat{T}(\Delta)$, then according to proposition 7 firms choose $T^* = T_{-i} \Longrightarrow T_i = 0 \Longrightarrow L_i = 0$ which is a contradiction with $L_i > \overline{L} - \widehat{L}$. Note that we need $\Delta \leq \Delta'$ because if $\Delta > \Delta'$ then $\widehat{T}(\Delta) > T'$ since f_1 is decreasing in Δ. Then $\widehat{L} > \frac{N-1}{N} L \Longrightarrow \delta_\Delta < \frac{1}{N}$. This would imply that A_Δ is an empty set and this case is not of interest.

3. Since we restricted the choice of T^* to $0 \leq T^* \leq \overline{T}$, then $0 \leq L^* \leq \overline{L}$. Suppose $T^* > 0$ and so $L^* > 0$. Suppose firm i is the one paying the largest share of L^*. Therefore $L_i \geq \frac{L^*}{N} \Longrightarrow L_{-i} \leq \frac{N-1}{N} L^* \leq \frac{N-1}{N} \overline{L} \Longrightarrow T_{-i} \leq T'$. Then, since $\Delta > \Delta'$ and f_1 is increasing in Δ, we get $T_{-i} \leq \widehat{T}(\Delta)$. So, according to proposition 7, $T^* = T_{-i}$ or $L^* = L_{-i}$ or $L_i = 0$ which is in contradiction with $L_i \geq \frac{L^*}{N}$. Therefore $T^* = 0$ and $L^* = 0$, which implies that all firms lobby alone.

■

7.3 Proof of Proposition 3

Although the formal proof of this corollary is a straightforward application of proposition 8[25], we give here a heuristic proof. To shorten notation we employ the same abbreviations adopted above for $\pi(x)$ and $V(x)$. Part 1 of the corollary is straightforward. In order to understand the

[25] Since Δ is a monotonicly decreasing function of η and Δ' and Δ'' are not functions of η then one can state proposition 8 in terms of η, η' and η''.

characterization of the equilibrium for $\tau > \frac{\theta}{2}$ we need to consider profitable deviations by the individual firm as a function of the parameter of interest η.

For part 2, first we need to determine the lowest level of η for which lobbying together is sustainable. The easiest way of supporting joint lobbying is when $\delta = \frac{1}{2}$. Starting from joint lobbying and equal share of lobbying expenditures we consider the possibility of firm 1 deviating at stage 1 and not paying $\frac{1}{2}\overline{L}$ (foreseeing that both firms will increase the level of individual lobbying expenditures at stage 2). Denote the difference in payoffs between staying in the trade association and deviating as $D_1(\eta)$:

$$D_1(\eta) = \pi_1\left(\overline{T}\right) - \frac{1}{2}\overline{L} - \pi_1(\Delta) - \frac{1}{2}\theta\left[V(\Delta) - V\left(T'\right)\right] \tag{14}$$

where T' is the tariff that the trade association can negotiate with $L = \frac{1}{2}\ \overline{L}$. We can show that $D_1(\eta)$ is increasing in η[26], it is negative at $\eta = 0$ and positive for $\eta \to 1$ hence it crosses the horizontal axis only once, thus determining the location of η'. For $\eta \geq \eta'$ staying in the trade association with $\delta = \frac{1}{2}$ is an equilibrium, while for $\eta < \eta'$ the only equilibrium is to lobby alone.

Second, we need to determine the highest level of η for which lobbying alone is sustainable. That is we start from individual lobbying and consider a deviation in which firm 1 unilaterally contributes the entire lobbying expenditure of the trade association $\overline{L}$ (foreseeing that this will eliminate individual lobbying in the second stage). Denote the benefit from such deviation as $D_2(\eta)$:

$$D_2(\eta) = -\pi_1(\Delta) - \frac{1}{2}\theta\left[V(\Delta) - V(0)\right] + \pi_1\left(\overline{T}\right) + \tau\left[V\left(\overline{T}\right) - V(0)\right] \tag{15}$$

We can show that $D_2(\eta)$ is increasing in η, it is negative at $\eta = 0$ and positive for $\eta \to 1$ hence it crosses the horizontal axis only once, thus determining the location of η''. For $\eta > \eta''$ lobbying alone is never an equilibrium.

For part 3, we calculate $\overline{\delta}(\eta)$ as the maximum share of $\overline{L}$ paid by firm 1 that makes joint lobbying feasible. That is we find δ that makes firm 1 indifferent between paying its share of $\overline{L}$ and not paying it, anticipating individual lobbying in stage 2:

$$\pi_1\left(\overline{T}\right) - \delta\overline{L} = \pi_1(\Delta) + \frac{1}{2}\theta\left[V(\Delta) - V\left(T'\right)\right]$$

where T' is the tariff that the trade association can negotiate with $L = (1-\delta)\ \overline{L}$. Once an expression for $\overline{\delta}(\eta)$ is found, it is easy to show that it is increasing in η.[27] Because of symmetry one can reproduce the argument for the maximum share of $\overline{L}$ by firm 2, $1-\delta$, that makes joint lobbying feasible and show that this increasing in η. This is equivalent to having a decreasing function $\underline{\delta}(\eta)$.

7.4 Full characterization of the effect of concentration

For the next proposition it is convenient to define the following variable $r = \frac{\mu}{\tau}$ and $\mu = \frac{\sqrt{\eta}}{1-\sqrt{\eta}}$. The full characterization of the effect of concentration is given by:

Proposition 9 *The equilibrium mode of lobbying depends on N according to the following pattern:*

[26] This simply requires taking the derivative of $D_1(\eta)$ with respect to η which involves long and not instructive expressions. Calculations are available from the authors upon request.

[27] The expression for $\overline{\delta}(\eta)$ and its derivative are long and not instructive, but available upon request from the authors.

1. *If $\tau > \theta$ and*

   (a) *$r < 1$ then firms only lobby alone for all N*

   (b) *$1 < r < 2$ then firms lobby alone for $1 < N < \widetilde{N}^2$ and there are multiple equilibria for $N > \widetilde{N}^2$*

   (c) *$r > 2$ then firms lobby alone for $1 < N < \widetilde{N}^1$, there are multiple equilibria for $\widetilde{N}^1 < N < \widetilde{N}^2$ and firms lobby together for $N > \widetilde{N}^2$*

2. *If $\frac{\theta}{N} < \tau < \theta$ and*

   (a) *$r < 1$ then firms lobby together for $\frac{\theta}{\tau} < N < \widetilde{N}^1$, there are multiple equilibria for $\widetilde{N}^1 < N < \widetilde{N}^2$ and firms lobby alone for $N > \widetilde{N}^2$*

   (b) *$1 < r < 2$ then:*

      i. *firms lobby together for $\frac{\theta}{\tau} < N < \widetilde{N}^1$ and there are multiple equilibria for $N > \widetilde{N}^1$*

      ii. *or firms lobby together for $\frac{\theta}{\tau} < N < \widetilde{N}^1$, there are multiple equilibria for $\widetilde{N}^1 < N < \widetilde{N}_2^2$, firms lobby alone for $\widetilde{N}_2^2 < N < \widetilde{N}_1^2$ and there are multiple equilibria for $N > \widetilde{N}_1^2$*

   (c) *$r > 2$ then:*

      i. *Firms only lobby together for all N*

      ii. *or firms lobby together for $\frac{\theta}{\tau} < N < \widetilde{N}_2^1$, there are multiple equilibria for $\widetilde{N}_2^1 < N < \widetilde{N}_1^1$ and firms lobby together for $N > \widetilde{N}_1^1$*

      iii. *or firms lobby together for $\frac{\theta}{\tau} < N < \widetilde{N}_2^1$, there are multiple equilibria for $\widetilde{N}_2^1 < N < \widetilde{N}_2^2$, firms lobby alone for $\widetilde{N}_2^2 < N < \widetilde{N}_1^2$, there are multiple equilibria for $\widetilde{N}_1^2 < N < \widetilde{N}_1^1$, firms lobby together for $N > \widetilde{N}_1^1$*

3. *If $\tau < \frac{\theta}{N}$ then firms lobby together for all N*

Proof. Conceptually this proposition is a reformulation of proposition 8 in terms of the number of firms. The equilibrium mode of lobbying therefore depends on the relationship between Δ, Δ' and Δ''. It is easy to verify that $\Delta(N)$, $\Delta'(N)$ and $\Delta''(N)$ are all decreasing functions of N. They can exhibit different behaviors according to parameters τ, θ and η. For $N \to \infty$ one can easily show that $\frac{\Delta'}{\Delta} \to \frac{\mu}{\tau}$, $\frac{\Delta''}{\Delta} \to \frac{\mu}{\tau}$, $\frac{\Delta'}{\Delta''} \to 2$, so asymptotically, firms lobby together for $r < 1$, lobby alone for $r > 2$ and we have multiple equilibria for $1 < r < 2$. For low values of N, depending on parameters, $\Delta(N)$ can start from below $\Delta'(N)$ and $\Delta''(N)$, from between them or above them, so as N increase we observe different equilibrium modes of lobbying. We provide here a sketch of the proof.[28] We start by defining some variables: $y(N) = \frac{2+\theta}{2+N\tau}$, $R = \Delta\frac{2+\theta}{\alpha-\phi}$, $R' = \Delta'\frac{2+\theta}{U}$, $R'' = \Delta''\frac{2+\theta}{U}$, $\overline{R} = \overline{T}\frac{2+\theta}{U}$, $u = 2+\tau$, $v = 2+\theta$, $y^* = \frac{v}{u}$.

1. To prove point 1.a consider that for $0 < r < 1$ it is always the case that $R'' \leq R' < R$. This implies that we only have lobbying alone. To prove point 1.b and 1.c we are going to state without proof that when $r > 1$ the two curves R and R' intersect at a unique $\tilde{y}^2$, such that $R(y) < R'(y)$ for $0 < y < \tilde{y}^2$ and $R(y) > R'(y)$ for $\tilde{y}^2 < y < y^*$. Furthermore, when $r > 2$ the two curves R and R'' intersect at a unique $\tilde{y}^1$, such that $R(y) < R''(y)$ for $0 < y < \tilde{y}^1$

[28] Complete details are available from the authors upon request.

and $R(y) > R''(y)$ for $\tilde{y}^1 < y < y^*$. Finally, if $1 < r < 2$ then $R(y) > R''(y)$ for all y. It is possible to verify that $\tilde{y}^1 < \tilde{y}^2$. To summarize:

$$
\begin{array}{cccc}
If \;\; 1 < r < 2 & & & \\
R''(y) < R(y) < R'(y) & for & 0 < y < \tilde{y}^2 & \text{Multiple equilibria} \\
R''(y) < R'(y) < R(y) & for & \tilde{y}^2 < y < y^* & \text{Alone}
\end{array}
$$

$$
\begin{array}{cccc}
If \;\; 2 < r & & & \\
R(y) < R''(y) < R'(y) & for & 0 < y < \tilde{y}^1 & \text{Together} \\
R''(y) < R(y) < R'(y) & for & \tilde{y}^1 < y < \tilde{y}^2 & \text{Multiple equilibria} \\
R''(y) < R'(y) < R(y) & for & \tilde{y}^2 < y < y^* & \text{Alone}
\end{array}
$$

which is equivalent to points 1.b and 1.c stated in terms of y.

2. To prove point 2 it is possible to show that for $0 < r < 1$ there is a unique $\tilde{y}^2$ such that $R'(y) < R(y)$ for $y < \tilde{y}^2$ and $R'(y) > R(y)$ for $y > \tilde{y}^2$. It is also possible to show that for $r > 1$ either $R'(y) > R(y)$ for $0 < y < 1$ or there are two roots $\tilde{y}_1^2$ and $\tilde{y}_2^2$ such that:

$$
\begin{array}{rcll}
R(y) & < & R'(y) & \text{for } 0 < y < \tilde{y}_1^2 \\
R(y) & > & R'(y) & \text{for } \tilde{y}_1^2 < y < \tilde{y}_2^2 \\
R(y) & < & R'(y) & \text{for } \tilde{y}_2^2 < y < 1
\end{array}
$$

Furthermore, it is possible to show that for $0 < r < 2$ there is a unique $\tilde{y}^1$ such that $R(y) > R''(y)$ for $y < \tilde{y}^1$ and $R(y) < R''(y)$ for $y > \tilde{y}^1$. For $r > 2$:

$$
\begin{array}{ll}
If \;\; y^* > \frac{4}{3} & R(y) < R''(y) \quad for \;\; 0 < y \leq 1 \\
If \;\; y^* < \frac{4}{3} & \begin{cases}
r \notin \left(2, \frac{y^*}{2}\left(1 + \sqrt{\frac{y^*}{y^*-1}}\right)\right) & R(y) < R''(y) \qquad for \;\; 0 < y \leq 1 \\
r \in \left(2, \frac{y^*}{2}\left(1 + \sqrt{\frac{y^*}{y^*-1}}\right)\right) & \begin{cases}
R(y) < R''(y) & for \;\; 0 < y \leq \tilde{y}_1^1 \\
R''(y) < R(y) & for \;\; \tilde{y}_1^1 < y \leq \tilde{y}_2^1 \\
R(y) < R''(y) & for \;\; \tilde{y}_2^1 < y \leq 1
\end{cases}
\end{cases}
\end{array}
$$

To summarize:

$If \;\; 0 < r < 1$			
$R''(y) < R'(y) < R(y)$	for	$0 < y < \tilde{y}^2$	Alone
$R''(y) < R(y) < R'(y)$	for	$\tilde{y}^2 < y < \tilde{y}^1$	Multiple equilibria
$R(y) < R''(y) < R'(y)$	for	$\tilde{y}^1 < y < 1$	Together
$If \;\; 1 < r < 2$			
$R''(y) < R(y) < R'(y)$	for	$0 < y < \tilde{y}^1$	Multiple equilibria
$R(y) < R''(y) < R'(y)$	for	$\tilde{y}^1 < y < 1$	Together
	or		
$R''(y) < R(y) < R'(y)$	for	$0 < y < \tilde{y}_1^2$	Multiple equilibria
$R''(y) < R'(y) < R(y)$	for	$\tilde{y}_1^2 < y < \tilde{y}_2^2$	Alone
$R''(y) < R(y) < R'(y)$	for	$\tilde{y}_2^2 < y < \tilde{y}^1$	Multiple equilibria
$R(y) < R''(y) < R'(y)$	for	$\tilde{y}^1 < y < 1$	Together
$If \;\; 2 < r$			
$R(y) < R''(y) < R'(y)$	for	$\tilde{y}^1 < y < 1$	Together
	or		
$R(y) < R''(y) < R'(y)$	for	$0 < y < \tilde{y}_1^1$	Together
$R''(y) < R(y) < R'(y)$	for	$\tilde{y}_1^1 < y < \tilde{y}_2^1$	Multiple equilibria
$R(y) < R''(y) < R'(y)$	for	$\tilde{y}_2^1 < y < 1$	Together
	or		
$R(y) < R''(y) < R'(y)$	for	$0 < y < \tilde{y}_1^1$	Together
$R''(y) < R(y) < R'(y)$	for	$\tilde{y}_1^1 < y < \tilde{y}_1^2$	Multiple equilibria
$R''(y) < R'(y) < R(y)$	for	$\tilde{y}_1^2 < y < \tilde{y}_2^2$	Alone
$R''(y) < R(y) < R'(y)$	for	$\tilde{y}_2^2 < y < \tilde{y}_2^1$	Multiple equilibria
$R(y) < R''(y) < R'(y)$	for	$\tilde{y}_2^1 < y < 1$	Together

3. To prove point 3 consider that if $\tau < \frac{\theta}{N}$ then $\Delta < \overline{T}$, therefore all firms lobby together.

■

Table 1: Summary Statistics

Statistics	Tariff (Import Weighted)	Non-Tariff Measure (Unweighted)	Non-Tariff Measure (Import Weighted)	Total Amount Lobbied (Domestic)	Firm Total Amount Lobbied (Domestic)	Trade Assn. Amount Lobbied (Domestic)	Fraction of Total Lobbied by Firms (IndFrac)	Elas. Of Substituion (1990-2001)	K/L	Fraction of value of shipmts. actd by top 4	Average Firm Size
Obs.	286	286	286	286	286	286	286	286	286	286	286
Mean	0.03	0.23	0.31	0.62	0.42	0.19	0.67	4.88	91.83	40.45	0.05
Median	0.02	0.04	0.04	0.26	0.15	0.02	0.96	3.41	59.12	37.72	0.02
St. Dev	0.04	0.31	0.41	0.92	0.65	0.65	0.40	5.45	98.19	18.79	0.21
Min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	6.48	0.00	0.00
Max	0.19	1.00	1.00	6.53	3.63	4.66	1.00	63.70	783.26	100.00	3.25

Notes to Table 1: Tariff data are from Feenstra, Romalis, and Schott (2002). Non-tariff mesures (weighted and unweighted) are constructed from TRAINS-WITS, see text for details. Lobbying Amounts and Firm Size are in US$ Millions from the Senate Office of Public Records, see text for data construction. Elasticity of Substitution data are from Broda and Weinstein (2006). All economic SIC 4 level Controls in this table are from BEA and US Census Bureau with the exception of capital-labor ratio (Tot. real capital stock/Total Employment) from the NBER Manufacturing Industry Productivity Database.

Table 2: Differentiation, Competition and Political Organization.

Marginal Effect on Latent	Fraction of Total Lobbied by Firms	Fraction of Total Lobbied by Firms	Fraction of Total Lobbied by Firms	Fraction of Total Lobbied by Firms	Fraction of Total Lobbied by Firms	Fraction of Total Lobbied by Firms	Fraction of Total Lobbied by Firms	log Total Amount Lobbied	log Total Amount Lobbied
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MEDIUM SIGMA	-0.275					-0.343		1.15	
	[0.098]***					[0.098]***		[0.968]	
HIGH SIGMA	-0.182					-0.245		3.543	
	[0.093]*					[0.099]**		[0.938]***	
Sigma		-0.006					-0.01		-0.021
		[0.002]***					[0.005]**		[0.006]***
Fraction of value of shipmts. by top 4			0.007			0.003	0.004	0.008	0.012
			[0.002]***			[0.002]	[0.002]*	[0.022]	[0.022]
K/L				0.002		0.002	0.001	0.005	0.007
				[0.000]***		[0.000]***	[0.000]***	[0.005]	[0.006]
Average Firm Size					0.522	0.231	0.204	-0.144	0.468
					[0.465]	[0.229]	[0.197]	[1.138]	[1.205]
Marginal Effect									
MEDIUM SIGMA	-0.0571					-0.0745		0.00196	
	[0.0207]***					[0.0237]***		[0.00167]	
HIGH SIGMA	-0.0359					-0.0530		0.00605	
	[0.0186]*					[0.0217]**		[0.00165]***	
Sigma		-0.00118					-0.0022		-0.00004
		[0.00039]***					[0.0011]**		[0.00001]***
Fraction of value of shipmts. by top 4			0.0014			0.0007	0.0008	0.00001	0.00002
			[0.0004]***			[0.0005]	[0.0005]*	[0.00004]	[0.00004]
K/L				0.00030		0.0003	0.0003	0.00001	0.00001
				[0.00008]***		[0.0001]***	[0.0001]***	[0.00001]	[0.00001]
Average Firm Size					0.1006	0.0496	0.0423	-0.00025	-0.00077
					[0.0905]	[0.0492]	[0.0407]	[0.00194]	[0.00198]
Left-censored	1	1	1	2	2	1	1	96	96
Right-censored	131	131	142	144	142	123	123	.	.
Observations	324	324	346	339	346	286	286	382	382

Notes to Table 2: Tobit estimator with robust standard errors in brackets. Marginal effects on the latent variable reported in the upper panel. Marginal effects on the realized dependent variable in the lower panel. * significant at 10%; ** significant at 5%; *** significant at 1%. The omitted group for the elasticity of substitution dummies (SIGMA) is the low percentile (<33%) dummy. All economic SIC 4 level Controls are from BEA and US Census Bureau with the exception of capital-labor ratio from the NBER Manufacturing Industry Productivity Database.

Table 3: Differentiation, Competition and Political Organization. Robustness.

	Fraction of Total Lobbied by Firms	Fraction of Total Lobbied by Firms	Fraction of Total Lobbied by Firms	Fraction of Total Lobbied by Firms	Fraction of Total Lobbied by Firms	Fraction of Total Lobbied by Firms	Fraction of Total Lobbied by Firms	log Total Amount Lobbied	log Total Amount Lobbied
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
MEDIUM SIGMA	-0.409					-0.413		0.318	
	[0.102]***					[0.101]***		[1.044]	
HIGH SIGMA	-0.303					-0.328		2.653	
	[0.103]***					[0.102]***		[0.985]***	
Sigma		-0.01					-0.01		-0.022
		[0.005]**					[0.005]**		[0.007]***
Fraction of value			0.006			0.005	0.005	0.037	0.04
of shipmts. by top 4			[0.003]**			[0.003]*	[0.003]**	[0.023]	[0.023]*
K/L				0.001		0.001	0.001	0.008	0.009
				[0.001]**		[0.001]	[0.001]	[0.008]	[0.008]
Average Firm Size					0.046	0.423	0.194	-2.585	-1.451
					[0.453]	[0.694]	[0.529]	[4.897]	[5.304]
Geo Concentration	-0.212	-0.275	0.038	-0.092	-0.117	-0.073	-0.119	2.347	0.129
	[0.361]	[0.367]	[0.372]	[0.373]	[0.372]	[0.361]	[0.367]	[3.761]	[3.898]
Pol Conc Herf	-0.475	-0.433	-1.866	-1.257	-0.612	-2.192	-2.12	-15.273	-14.053
	[0.994]	[1.022]	[1.146]	[1.077]	[1.101]	[0.987]**	[1.099]*	[11.205]	[11.250]
log Tot. Sales	0.057	0.059	0.036	0.032	0.049	0.023	0.029	0.804	0.858
	[0.034]*	[0.035]*	[0.036]	[0.036]	[0.039]	[0.036]	[0.037]	[0.394]**	[0.392]**
No. HS8 Tariff Lines	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	0.009	0.011
	[0.000]	[0.000]*	[0.000]**	[0.000]***	[0.000]*	[0.000]*	[0.000]**	[0.006]	[0.007]
SIC 1 Dummy (2000)	0.499	0.447	0.466	0.406	0.455	0.47	0.421	1.211	1.367
	[0.083]***	[0.083]***	[0.081]***	[0.086]***	[0.083]***	[0.084]***	[0.084]***	[0.913]	[0.933]
Observations	246	246	249	249	249	246	246	334	334

Notes to Table 3: Tobit estimator with robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. The omitted group for the elasticity of substitution dummies (SIGMA) is the middle percentile (33%) dummy. Political and Geographic Concentration measures are from Busch and Reinhardt (1999). All economic SIC 4 level Controls are from BEA and US Census Bureau. Number of HS8 tariff lines is computed from Schott (2006).

Table 4: Trade Policy and Political Organization. OLS and Instrumental Variable Regressions.

	Non-Tariff Measure (Unweighted)	Non-Tariff Measure (Import Weighted)	Tariff (Import Weighted)	Non-Tariff Measure (Unweighted)	Non-Tariff Measure (Import Weighted)	Tariff (Import Weighted)	Non-Tariff Measure (Unweighted)	Non-Tariff Measure (Import Weighted)	Tariff (Import Weighted)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	OLS	OLS	OLS	2SLS	2SLS	2SLS	2SLS	2SLS	2SLS
Fract. of Individual	-0.115	-0.114	-0.010	-0.943	-0.781	-0.137	-1.245	-1.176	-0.078
Lobbying	[0.069]*	[0.054]**	[0.006]*	[0.270]***	[0.203]***	[0.034]***	[0.573]**	[0.469]**	[0.042]*
Import Penetration	0.044	0.064	0.033	-0.471	-0.311	-0.093	-0.282	-0.455	-0.099
	[0.106]	[0.079]	[0.011]***	[0.563]	[0.437]	[0.063]	[0.589]	[0.499]	[0.048]**
MEDIUM SIGMA	0.104	0.061	0.010	-0.036	-0.052	-0.011	-0.285	-0.273	-0.016
	[0.059]*	[0.047]	[0.005]**	[0.080]	[0.063]	[0.011]	[0.146]*	[0.120]**	[0.011]
HIGH SIGMA	0.146	0.089	0.002	0.112	0.062	-0.004	-0.074	-0.085	-0.012
	[0.057]**	[0.044]**	[0.004]	[0.071]	[0.055]	[0.010]	[0.107]	[0.096]	[0.009]
Fraction of value	0.000	-0.001	0.000	0.003	0.001	0.000	0.006	0.004	0.000
of shipmts. by top 4	[0.001]	[0.001]	[0.000]***	[0.002]	[0.001]	[0.000]	[0.002]***	[0.002]**	[0.000]
Import Elasticity	-0.004	-0.003	0.000	-0.005	-0.004	0.000	-0.003	-0.002	0.000
	[0.001]***	[0.001]***	[0.000]	[0.002]**	[0.002]**	[0.000]	[0.002]	[0.002]	[0.000]
log Tot. Employment							0.103	0.064	0.003
							[0.060]*	[0.049]	[0.005]
log Tot. Sales							0.022	0.011	-0.012
							[0.055]	[0.046]	[0.005]**
No. HS8 Tariff Lines							0.000	0.000	0.000
							[0.001]	[0.001]	[0.000]*
SIC 1 Dummy (2000)							0.502	0.391	0.009
							[0.189]***	[0.163]**	[0.015]
Observations	267	267	267	267	267	267	233	233	233
Hansen J-Stat. p-value				0.35	0.15	0.04	0.75	0.97	0.36

Notes to Table 4: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. Excluded instrument set for 2SLS estimates includes: Geographic Concentration; Political Concentration Herf. index; Materials (including Electricity & Fuels)/Production Workers; Tot. real capital stock/Prod. Workers; Non Prod. Workers/Prod. Workers. Total sales, Real capital stock, Materials, Structures and Equipment are in logs of $ millions. Total employment and production workers are in logs of 1000s. Materials (including Electricity & Fuels), Production Workers, Tot. real capital stock are from the NBER Manufacturing Industry Productivity Database. The omitted group for the elasticity of substitution dummies (SIGMA) is the low percentile (<33%) dummy. Political and Geographic Concentration measures are from Busch and Reinhardt (1999).

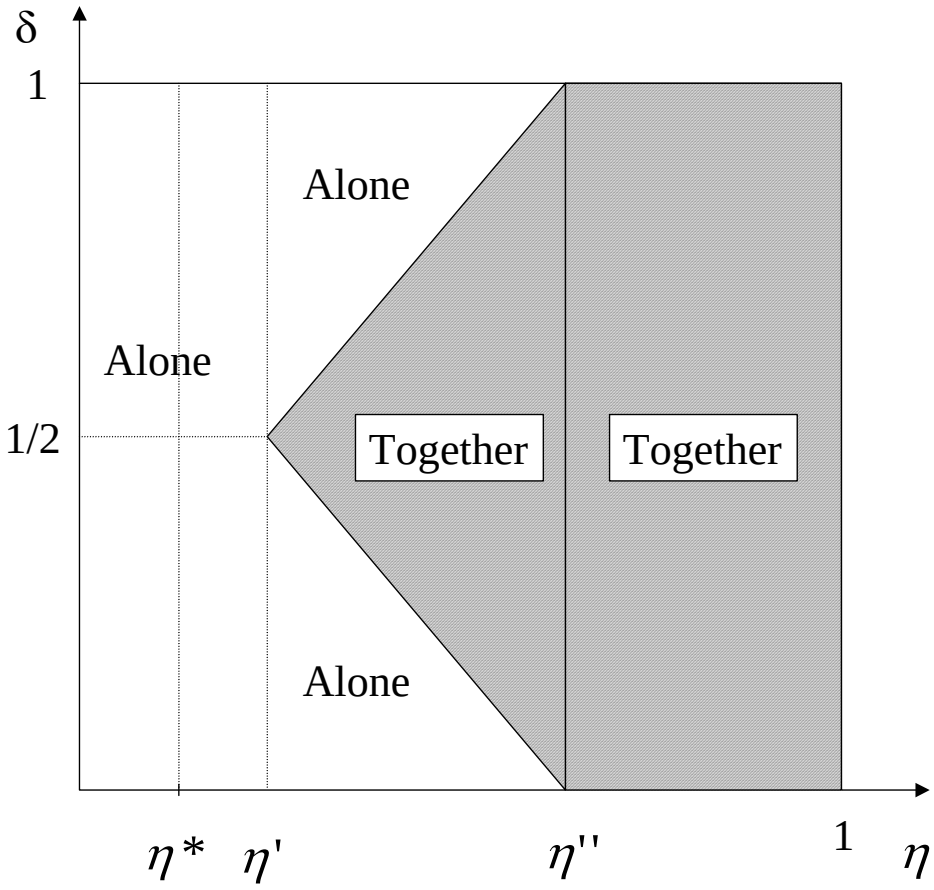

Figure 1

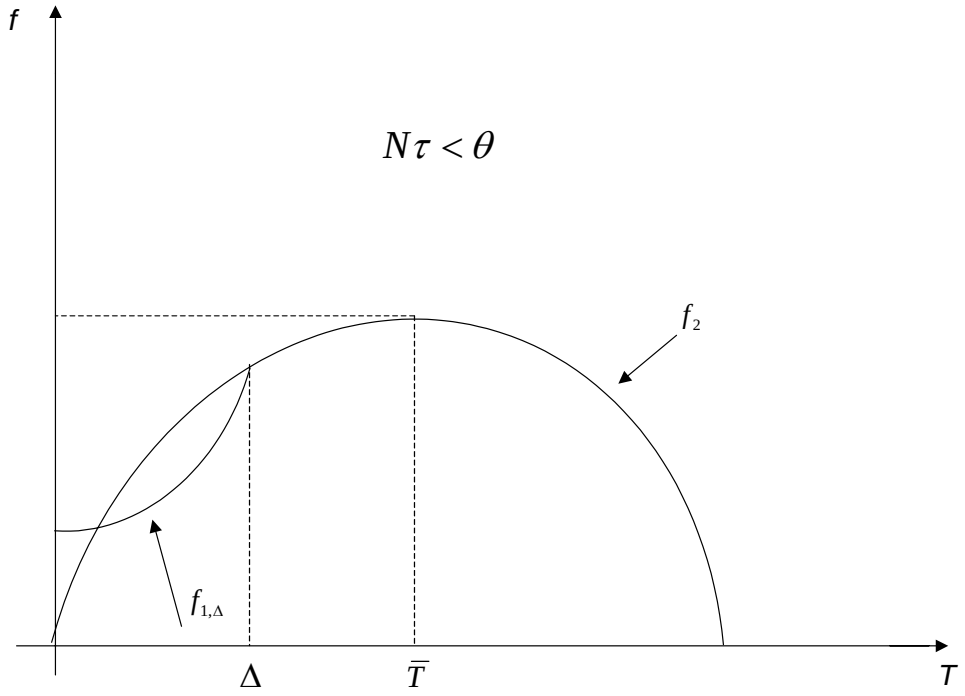

Figure A1

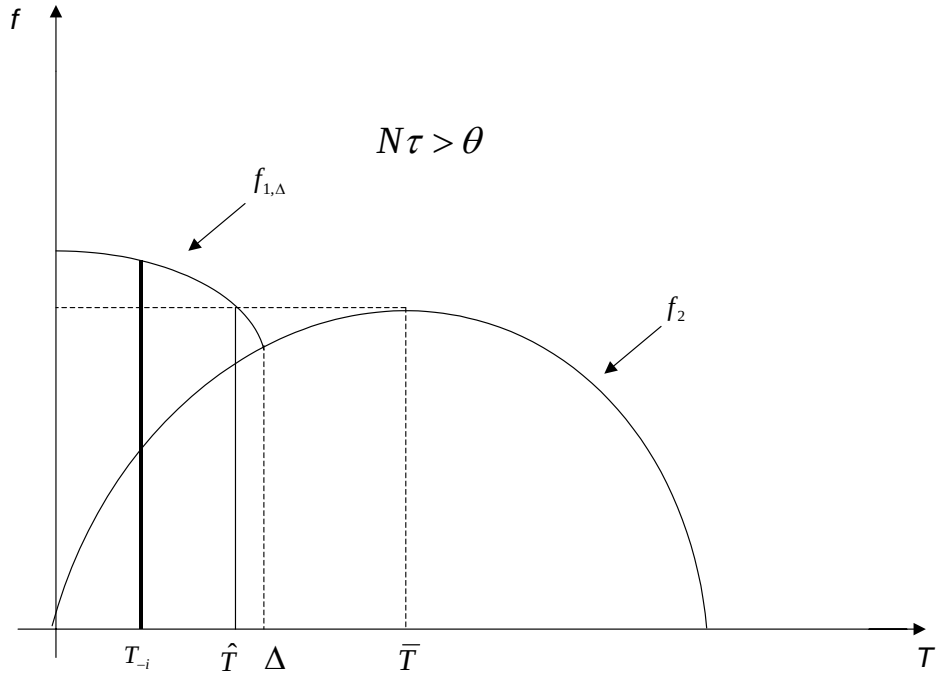

Figure A2

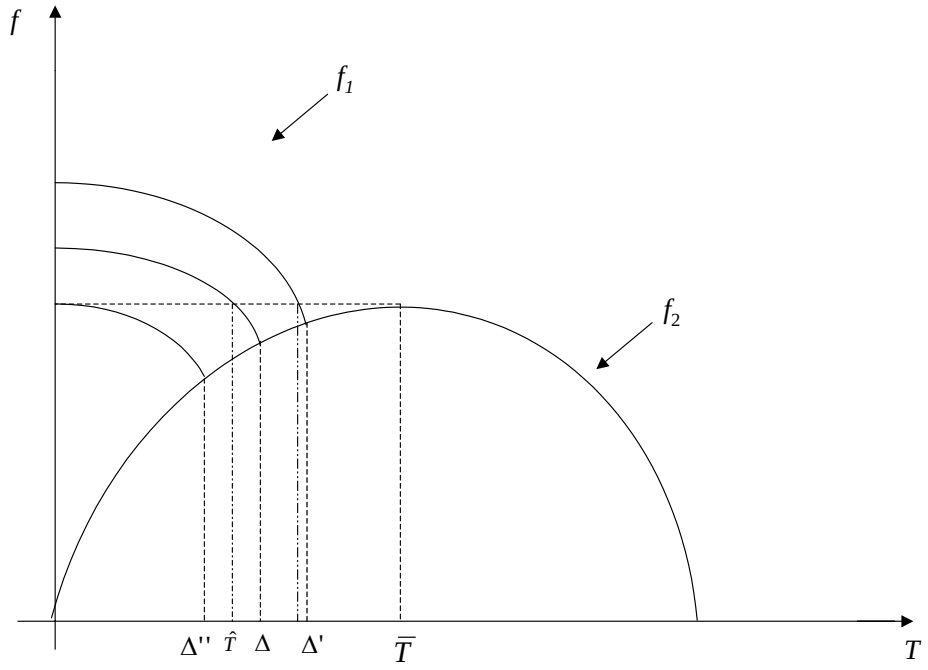

Figure A3

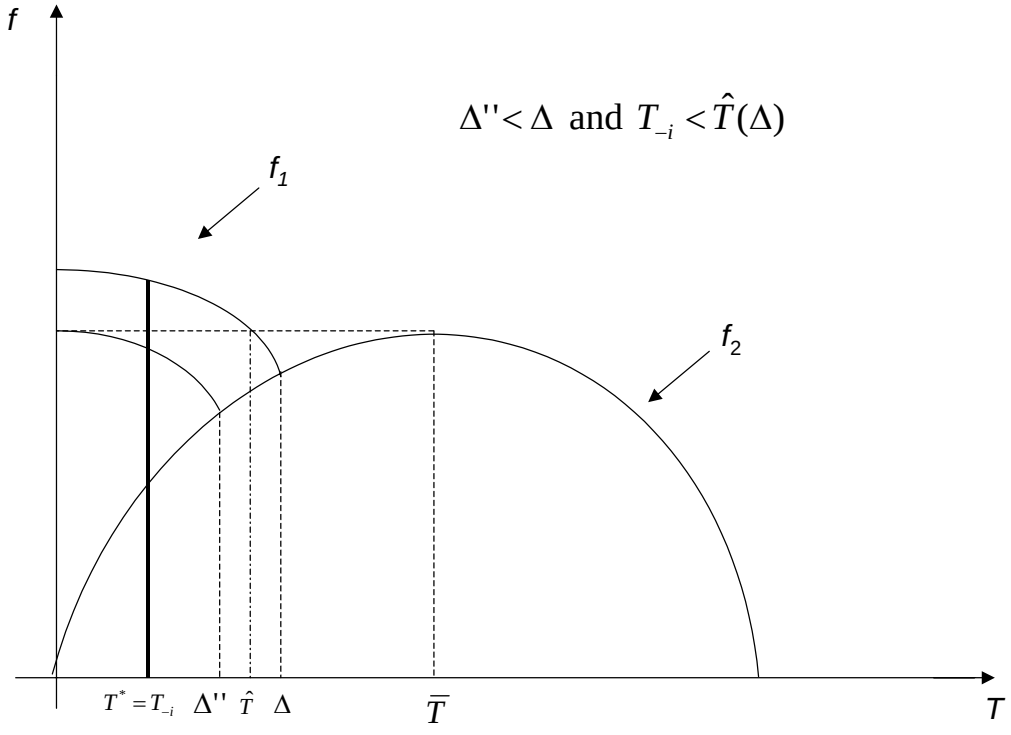

Figure A4

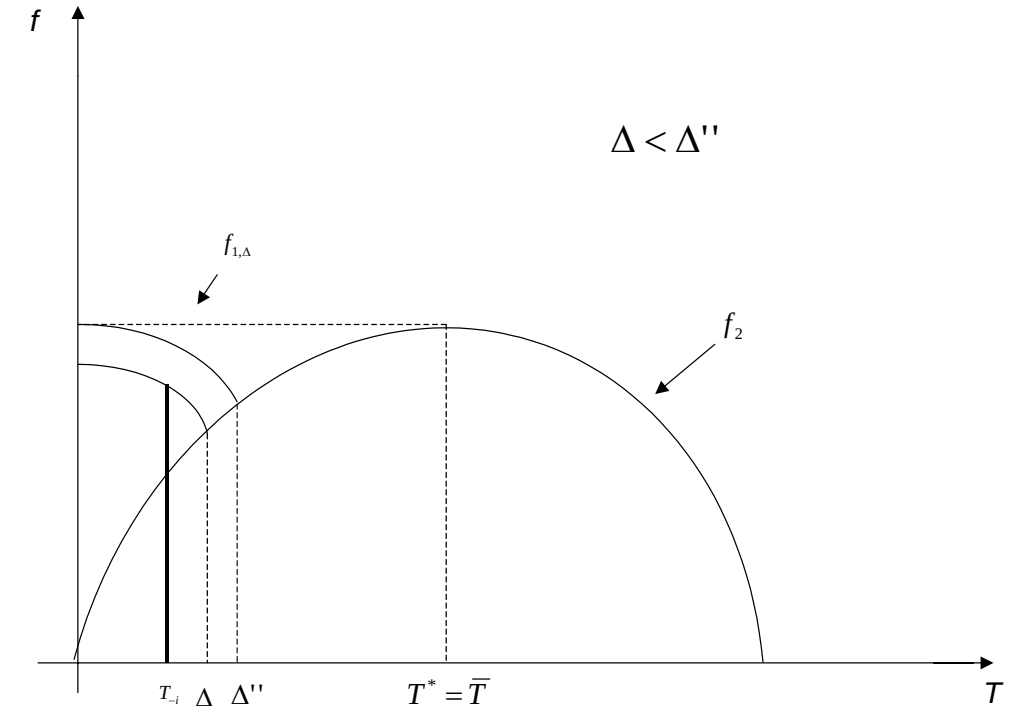

Figure A5

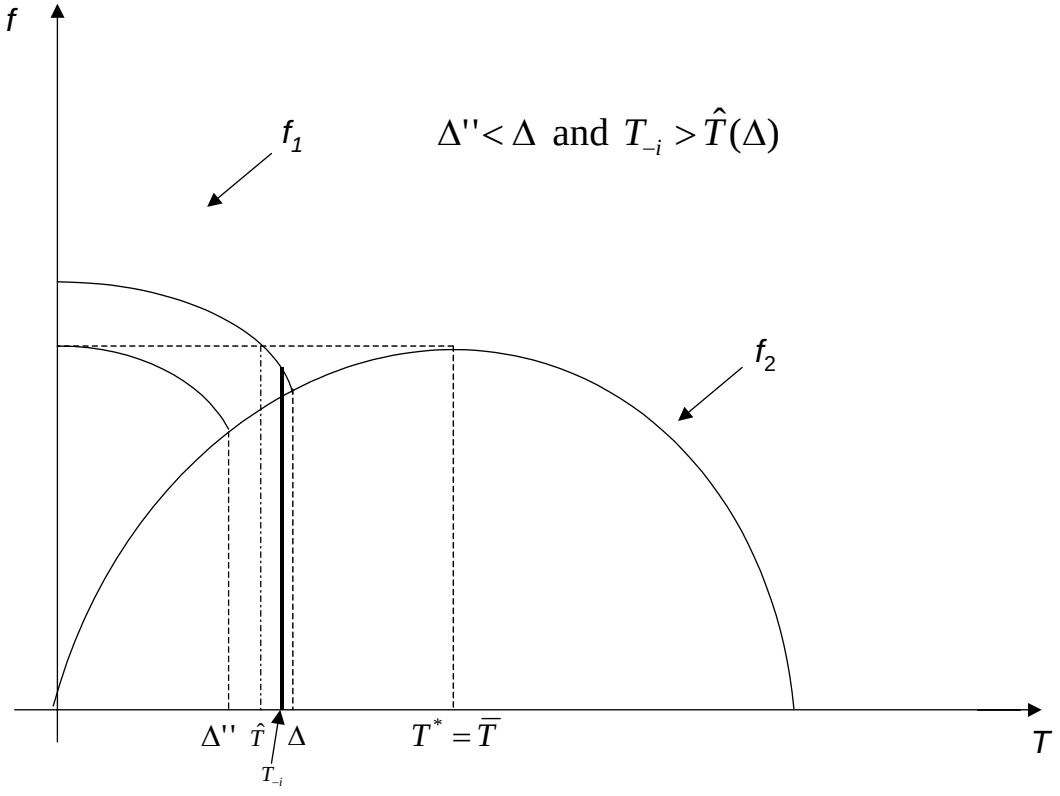

Figure A6