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 political organization within sectors and to explore the determinants of the mode of lobbying and political organization across US 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. Reforms like the recent 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 (SIGs) 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. However, even basic stylized facts 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 three 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 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 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 representing 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 data base 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. 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 is where most of the action seems to be. 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 Silverman (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

[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.

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 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

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

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].

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 concludes.

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.

[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.

To the best of our knowledge the evidence for an extensive number of sectors in the US 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 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.

[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.

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 US 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 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

[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 $312,908$.

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 Industrial 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 by considering mean and median of the fraction of lobbying done at the individual level is that a good fraction of sectors only experiences 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 measure of concentration (share of output produced by largest 4 firms); $\left(\frac{K}{L}\right)_i$ is capital to labor ratio in sector i. 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.

The nature of the dependent variable is such that censoring occurs naturally over the unit interval. For this is the 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 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%. 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%. 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.

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. Both higher elasticity of substitution parameters 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 and lower capital intensity of the sector strongly predict lower levels lobbying, suggesting that the same sectors where lobbying goes through trade associations also undertake less lobbying.

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.[8] 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

[8]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.

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.[9] 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:

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

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 $i = 1, ..., N$.[10] 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

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

[10] 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.

substitution among varieties, while for $\eta = 1$ all varieties are perfect substitutes. Another feature of interest is that the elasticity of demand for variety i with respect to other prices is increasing in N.[11] In this sense the number of varieties N affects the substitutability of differentiated goods in a fashion similar to η. 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. 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[12] $T + t_i$, which we discuss 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.[13] 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. Substituting the limit price (4) into the quantity equation (2) we find profits of domestic firm i as a function of tariffs:

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

[11] 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. Since the level of Q_i is decreasing in N at any given level of prices, the elasticity $\frac{dQ_i/Q_i}{dp_{-i}/p_{-i}}$ is increasing in N.

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

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

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. Replacing (5) in (3), we can express the indirect utility as a function of tariffs, $V(t_1, ..., t_N, T)$, 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.[14] 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:

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

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.[15] 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 streams of literature. On the one hand, we move away from the view that interest groups provide just money to politicians in

[14] 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.

[15] 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).

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 relate 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 the 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. We do not provide a microfoundation of the reason why $\tau \lesseqgtr \theta$, leaving it to future work to explore the effectiveness of different modes of lobbying.

3.2 Structure of the lobbying game

The structure of the game is sequential.[16] 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 $V(t_1, ..., t_N, T)$.

[16] 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.

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:

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

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

Proof. In Appendix. ■

Let us here provide 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:

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

Clearly the constraint is binding otherwise firms could decrease the amount of lobbying expenditures without affecting the government's decision and strictly gaining.

Firm i 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

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

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

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

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 $\sum_{i=1}^{N} l_i^* + \theta V(t_1^*, ..., t_N^*, T) = \theta V(0, ..., 0, T)$ and $l_i^* \leq -\theta \left[V(0, ..., t_i, ..., 0, T) - V(0, ..., 0, T) \right]$.

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 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: $l_i^* = -\frac{\theta}{N} \left[V(t_1^*, ..., t_N^*, T) - V(0, ..., 0, T) \right]$

Before moving to stage 1 of the game, it is worth remarking how Δ, that is 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. Further note that Δ depends negatively on the number of firms N. As N approaches infinity the desired level of individual tariffs goes to 0.

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.

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 any T otherwise it would benefit without modifying the government's behavior. From this binding constraint we can derive a function $T(L)$ with $L = \sum_{i=1}^{N} L_i$ that relates the amount of lobbying expenditures to the level of tariff T. Firm i problem is then to find the level of L_i that maximizes profits net of lobbying expenditures, given the lobbying expenditures by other firms:

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

Because of perfect substitutability between t_i and T and the presence 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 $T > 0$).

So there are two cases to distinguish, the case of $t_i = 0$ and the case of $t_i > 0$. Let us start with the case of $t_i = 0$. The problem for firm i simplifies to the following:

$$\max_{T} \; \pi_i (0, ..., T) + \tau \left[V (0, ..., T) - V (0, ..., 0) \right] + \sum_{j \neq i} L_j \tag{10}$$

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 we 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.

Let us now consider the case of $t_i > 0$ and then verify when it is an equilibrium for firms to only lobby alone. 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:

$$\max_{T} \; \pi_i (0, ..., \Delta) + \frac{\theta}{N} \left[V (0, ..., \Delta) - V (0, ..., T) \right] + \tau \left[V (0, ..., T) - V (0, ..., 0) \right] + \sum_{j \neq i} L_j \tag{11}$$

Problem (11) reduces therefore to maximizing over T the expression $\left(\tau - \frac{\theta}{N} \right) V (0, ..., T)$. It is easy now 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. In particular we are going to discuss the characterization of the equilibria as function of two parameters considered to describe the level of product market competition in the economy, the degree of substitutability η and of concentration, N.

4 Competition and the mode of lobbying

4.1 Substitutability

In order to simplify the characterization of the equilibrium and see how it depends on the substitutability parameter η we confine the analysis to the case with $N = 2$. Define δ as the share of trade association lobbying expenditure $\overline{L}$ by firm 1.

Proposition 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.*

Diagram 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 types of equilibria.

[DIAGRAM 1 HERE]

Proof. In Appendix. ■

Proposition 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 not ambiguous, 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 (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 might 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. The role of this proposition is to show that in this model the olsonian intuition that less concentrated sectors are less likely to organize politically might fail.

Proposition 4 *For any given η and $\tau > \theta$ the equilibrium mode of lobbying follows one of three patterns:*

1. *All firms lobby alone for $N < \overline{N}$, all firms lobby together for $N > \overline{\overline{N}}$. For N such that $\overline{N} \leq N \leq \overline{\overline{N}}$ there is multiplicity of equilibria in the mode of lobbying: either all firms lobby together or all firms lobby alone.*

2. All firms lobby alone for all values of N

3. All firms lobby together for all values of N

Proof. In Appendix. ■

It is instructive to build some intuition for the result in Proposition 4. The Competition effect can be easily seen graphically by plotting for specific values the marginal benefits for firm i of an increase in t_i ($\frac{\partial \pi_i}{\partial t_i}$) and an increase in T ($\frac{\partial \pi_i}{\partial T}$). A rise in N makes the marginal benefit of t_i decline faster than the marginal benefit of T.[17]

[GRAPH 2 HERE]

This effect tends to deliver the result that lobbying Together prevails for large N unless the marginal costs of the two policy instruments move in the opposite way. The marginal cost for T, given by $\tau \frac{\partial V}{\partial T}$, is increasing in N very steeply for low values of N and then levels off. This is because as N increases the love for variety makes it more expensive to place a tariff on a set of goods, the differentiated ones, which are now more valuable. The marginal cost of t_i , $\theta \frac{\partial V}{\partial t_i}$, decreases with N because it protects a smaller share of all goods, as shown in the graph below.

[GRAPH 3 HERE]

A high value of τ emphasizes the steep section of $\frac{\partial V}{\partial T}$ making it less desirable for firms to lobby jointly when N is low. This is clearly not a mechanism that we think is particularly relevant empirically. The Competition Effect would be delivered by the shape of the marginal benefits alone, which is the part we would like to emphasize.

4.3 Concentration: Heterogeneous Firms

It is not feasible to provide a general characterization of the equilibrium under firm heterogeneity, therefore we restrict the analysis to the case of $N = 2$. The standard way of introducing asymmetry in size among firms is to assume cost heterogeneity, but under Bertrand competition with limit pricing, the firm's own cost does not determine its size. Therefore we introduce asymmetry in

[17] Clearly the marginal benefit per unit of T is larger than the marginal benefit of t_i because the former is a tariff on all products and therefore provides a higher degree of protection. The cost will accordingly be larger. Nevertheless the issue here is how these quantities move with N.

the cost of the foreign competitors. As a foreign competitor becomes more efficient, the limit price decreases, therefore increasing quantity sold by the domestic firm. Although this is a less conventional way of introducing heterogeneity, we emphasize that this extension is introducing asymmetry in the returns to lobbying, with the larger firm having a larger marginal benefit of raising tariffs than the small firm, and this purpose is served well by this modification of the model. We assume firm 1 faces a foreign competitor with a lower cost ϕ/λ with $\lambda > 1$ and therefore produces a larger quantity of goods. As λ increases the asymmetry between the two firms increases along with concentration. We are interested in what happens to the likelihood of joint lobbying when λ, and therefore concentration, increases. Analogously to the impact of N on the mode of lobbying, an increase in concentration due to λ has two effects, the Free-Riding Effect and the Competition Effect. According to the Free-Riding Effect, as firm 1 becomes larger, it internalizes a higher fraction of the total return to increasing the common tariff T, so it has a higher incentive to lobby for it. This effect is along the lines of Olson (1965), where concentration reduces free-riding and increases the private provision of a public good (the common tariff T). According to the Competition Effect, when p_2 is much higher than p_1 (firm 2 is much smaller than firm 1) firm 1 prefers to increase only its own price rather than increasing both.[18] Therefore the incentive to lobby for t_1 is stronger when the difference in size between firm 1 and firm 2 is larger.

Although this is a simple modification of the model, the full characterization of the equilibrium is very cumbersome because we have to take into account the possibility of several corner solutions. It is however possible to show that the model can deliver a case in which, if lobbying together is the exclusive equilibrium mode of lobbying, then this happens when firms are relatively more similar in size, i.e. concentration is low. When the large firm increases in size, we can show that it has an incentive to start lobbying individually.

Proposition 5 *If $\theta \geq 2\tau$ then lobbying together with $L_1 > 0$, $L_2 = 0$, $t_1 = t_2 = 0$ is an the equilibrium mode of lobbying if and only if $\lambda < \overline{\lambda}$, where $\overline{\lambda} > 1$ always exists for η, α sufficiently*

[18] The marginal benefit for firm 1 from increasing p_1 is high when p_2 is high:

$$\frac{\partial \pi_1}{\partial p_1} = \frac{p_2\sqrt{\eta} - 2p_1 + \alpha\left(1 - \sqrt{\eta}\right) + \phi}{\beta\left(1 - \eta\right)}$$

while the marginal benefit from increasing p_2 is low when p_1 is low:

$$\frac{\partial \pi_1}{\partial p_2} = \frac{\sqrt{\eta}\left(p_1 - \phi\right)}{\beta\left(1 - \eta\right)}.$$

small.

Proof. In Appendix. ■

Under asymmetry there are many more patterns of equilibrium mode of lobbying, so we can only determine that for $\lambda > \overline{\lambda}$ at least one of the two firms lobbies alone. In particular it can be the case that firm 1 lobbies for both the common tariff and its own individual tariff, while firm 2 does not lobby for either. Notice that, differently from the symmetric case, the same firm can lobby both for the common tariff T and for its individual tariff t at the same time.

5 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 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.

One question that we have left unexplored in this paper is whether the mode of lobbying has any effect on policy outcomes, in the case of trade policy the level of protection. In related research we find that, controlling for the total level of lobbying expenditures, the larger the share of lobbying expenditures by the trade association, the higher the level of protection. This 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.

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6 Appendix

6.1 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 $\pi_2(t_1, t_1, ..., T) - \pi_2(t_1, 0, ..., T) + \theta [V(t_1, t_1, ..., T) - V(t_1, 0, ..., T)] > \pi_1(t_1, 0, ..., T) - \pi_1(0, 0, ..., T) + \theta [V(t_1, 0, ..., T) - V(0, 0, ..., T)]$.[19] 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.

6.2 Proof of Proposition 3

Part 1 of the proposition has already been shown. In order to understand the 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. In what follows, to shorten notation, we indicate as $V(x)$ the aggregate welfare when the overall tariff level on all goods is x.

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 $D_1(\eta)$:

$$D_1(\eta) = \pi_1\left(\overline{T}\right) - \frac{1}{2}\overline{L} - \pi_1(\Delta) - \frac{1}{2}\theta\left[V(\Delta) - V\left(T'\right)\right] \tag{12}$$

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[20], it is negative at $\eta = 0$ and positive for $\eta \to 1$ hence it crosses the

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

[20] 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.

horizontal axis only once, thus determining the location of $\overline{\eta}$. For $\eta > \overline{\eta}$ staying in the trade association with $\delta = \frac{1}{2}$ is an equilibrium.

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 $D_2(\eta)$:

$$D_2(\eta) = -\pi_1(\Delta) - \frac{1}{2}\theta\left[V(\Delta) - V(0)\right] + \pi_1\left(\overline{T}\right) + \tau\left[V\left(\overline{T}\right) - V(0)\right] \tag{13}$$

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 $\overline{\overline{\eta}}$. For $\eta > \overline{\overline{\eta}}$ 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.[21] 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 $\underline{\delta}(\eta)$.

6.3 Proof of Proposition 4

Analogously to the proof of proposition 3, we will find the lowest value of N for which joint lobbying is an equilibrium and the highest value of N for which individual lobbying is an equilibrium. Starting from joint lobbying and equal share of lobbying expenditures we consider the possibility of firm 1 deviating at stage 1 and not paying $\frac{1}{N}\overline{L}$ (foreseeing that all 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 $D_3(N)$:

$$D_3(N) = \pi_1\left(\overline{T}\right) - \frac{1}{N}\overline{L} - \pi_1(\Delta) - \frac{1}{N}\theta\left[V(\Delta) - V\left(T'\right)\right] \tag{14}$$

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

where T' is the tariff that the trade association can negotiate with $L = \frac{N-1}{N}\ \overline{L}$. We can show that $D_3(N)$ crosses the horizontal axis at most once and it is increasing at that point[22], thus determining the location of $\overline{N}$. If η is very high then $\overline{N}$ might be below 2 which indicates that there is no value of N for which lobbying alone is the unique equilibrium mode of lobbying.

In order to find the values of N for which lobbying together is the only equilibrium mode of lobbying 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 $D_4(N)$:

$$D_4(N) = -\pi_1(\Delta) - \frac{1}{N}\theta\left[V(\Delta) - V(0)\right] + \pi_1\left(\overline{T}\right) + \tau\left[V\left(\overline{T}\right) - V(0)\right] \tag{15}$$

We can show that $D_4(N)$ crosses the horizontal axis at most once and is increasing at that point, thus determining the location of $\overline{\overline{N}}$.[23] For $N > \overline{\overline{N}}$ lobbying Alone is never an equilibrium. For η very low $D_4(N)$ never intersects the horizontal axis and therefore there are no values of N for which lobbying together is the unique equilibrium mode of lobbying.

6.4 Proof of Proposition 5

We first show that if $t_1 = t_2 = 0$, then only the larger firm contributes to the trade association. This is a well-known result in the literature on private provision of public goods. The agent that has a higher valuation for the public good pays for the entire cost of the good. By contradiction, say both firms lobbied together in equilibrium (and $t_1 = t_2 = 0$). Since the marginal cost of increasing T is the same for both firms, a positive amount of lobbying expenditures for both firms implies that the marginal benefit has to be the same for the two firms. Profits of the two firms as functions of T are:

$$\pi_1 = \frac{\left[\phi\left(1-\frac{1}{\lambda}\right) - T\right]\left[\left(\frac{1}{\lambda} - \sqrt{\eta}\right)\phi + \left(1-\sqrt{\eta}\right)(T-\alpha)\right]}{\beta(1-\eta)} \tag{16}$$

$$\pi_2 = \frac{T\left[(\alpha - T)\left(1-\sqrt{\eta}\right) - \left(1 - \frac{\sqrt{\eta}}{\lambda}\right)\phi\right]}{\beta(1-\eta)} \tag{17}$$

The difference in the marginal benefit of an increase in T is given by the following expression:

$$\frac{\partial \pi_1}{\partial T} - \frac{\partial \pi_2}{\partial T} = \frac{2}{\beta\lambda}\phi\frac{\lambda - 1}{1-\eta}$$

[22] Again, algebraic expressions are not instructive, but are available from the authors.

[23] Again, algebraic expressions are not instructive, but are available from the authors.

It is easy to verify that for any level of T the marginal benefit of the large firm is higher as long as $\lambda > 1$. So it cannot be the case that both firms contribute to the trade association lobbying expenditure in equilibrium, that is the large firm (firm 1) will pay for the entire amount of L.

We begin by showing the level of the common tariff chosen by firm 1 in this type of equilibrium (with $L_1 > 0$, $L_2 = 0$, $t_1 = t_2 = 0$). Firm 1 solves a maximization problem analogous to (10). We refer to the equilibrium common tariff as $\overline{T}$. We need to verify that no firm has an incentive to deviate from the common tariff. This requires computing the optimal t_1 when $t_2 = 0$ and $T = \overline{T}$, t_1^0, and verifying that it is nonpositive (and similarly t_2^0 for firm 2). The general expressions are straightforward to compute but not particularly instructive and available upon request. We can show that $t_1^0 > t_2^0$, so firm 1 is the most likely to deviate and start lobbying alone[24]. It is then sufficient to focus on the behavior of t_1^0. At $\lambda = 1$ the expression becomes:

$$t_1^0(\lambda = 1) = \frac{(\alpha - \phi)\left(\sqrt{\eta}\,(\theta - 2\tau - 1) + 2\tau - \theta\right)}{2(1+\tau)(2+\theta)},$$

which, for η low enough, is negative. Similarly for η low enough, we also have that:

$$\frac{\partial t_1^0}{\partial \lambda} = \frac{((2+\theta)\,\tau - \eta\,(1+\theta)\,(1+\tau) + \sqrt{\eta}\,(\theta - \tau))\phi}{2(1+\tau)(2+\theta)\lambda^2\left(1 - \sqrt{\eta}\right)} > 0,$$

implying that the incentive of firm 1 to lobby alone increase in λ.To show that there exists a finite $\overline{\lambda}$ such that firm 1 starts lobbying alone for $\lambda > \overline{\lambda}$ it is sufficient to show that:

$$\begin{aligned}\lim_{\lambda\to\infty} t_1^0 \;=\; & -\frac{\alpha\left(\theta + \eta\,(-1+\theta-2\tau) - 2\tau + \sqrt{\eta}\,(1 - 2\theta + 4\tau)\right)}{2(1+\tau)(2+\theta)\left(1-\sqrt{\eta}\right)} \\ & + \frac{\phi\left(\sqrt{\eta}\,(1-\theta+3\tau) + \theta\,(1+\tau) - \eta\,(2 + (3+\theta)\,\tau)\right)}{2(1+\tau)(2+\theta)\left(1-\sqrt{\eta}\right)}\end{aligned}$$

is positive. This is true for η and α low enough. This proves the proposition.

[24] The difference between t_1^0 and t_2^0 is:

$$\frac{(2+\theta+(1+\theta)\sqrt{\eta})(\lambda-1)\phi}{\lambda(2+\theta)} > 0.$$

Table 1: Summary Statistics

Statistics	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	Average Firm Size	Fraction of value of shipmts. actd by top 4
Obs.	285	285	285	285	285	285	285	285
Mean	0.63	0.42	0.20	0.66	4.89	91.24	0.05	40.38
Median	0.26	0.15	0.02	0.96	3.41	58.68	0.02	37.70
St. Dev	0.91	0.64	0.65	0.40	5.46	97.71	0.21	18.80
Min	0.00	0.00	0.00	0.00	1.20	6.28	0.00	0.00
Max	6.09	3.63	4.66	1.00	63.70	781.24	3.25	100.00

Notes: Lobbying Amounts and Firm Size are in USD$ Millions. Elasticity of Substitution data are from Broda and

Table 2: Differentiation, Competition and Political Organization. Unconditional Results.

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
MEDIUM SIGMA	-0.282					-0.352		1.195	
	[0.100]***					[0.099]***		[0.968]	
HIGH SIGMA	-0.185					-0.254		3.471	
	[0.094]*					[0.100]**		[0.932]***	
Sigma		-0.006					-0.01		-0.021
		[0.002]***					[0.005]*		[0.007]***
Fraction of value of shipmts. by top 4			0.002			0.004	0.004	0	0.003
			[0.000]***			[0.002]	[0.002]*	[0.021]	[0.022]
K/L				0.008		0.002	0.001	0.01	0.013
				[0.002]***		[0.000]***	[0.000]***	[0.004]**	[0.004]***
Average Firm Size					0.926	0.24	0.21	-0.771	-0.337
					[0.425]**	[0.235]	[0.200]	[1.352]	[1.357]
Marginal Effect									
MEDIUM SIGMA	-0.0549					-0.0750		0.00203	
	[0.0206]***					[0.0232]***		[0.00167]	
HIGH SIGMA	-0.0359					-0.0540		0.00590	
	[0.0184]*					[0.0217]**		[0.00164]***	
Sigma		-0.00113					-0.0021		-0.00003
		[0.00038]***					[0.0011]*		[0.00001]***
Fraction of value of shipmts. by top 4			0.0015			0.0007	0.0008	0.00000	0.00001
			[0.0004]***			[0.0005]	[0.0005]**	[0.00004]	[0.00004]
K/L				0.00031		0.0003	0.0003	0.00002	0.00002
				[0.00008]***		[0.0001]***	[0.0001]***	[0.00001]**	[0.00001]***
Average Firm Size					0.178	0.0506	0.0427	-0.00131	-0.00055
					[0.0827]**	[0.0496]	[0.0405]	[0.00230]	[0.00223]
Left-censored	1	1	1	2	2	1	1	97	97
Right-censored	130	130	141	143	141	122	122	.	.
Observations	323	323	338	345	345	285	285	382	382

Notes: 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.

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
MEDIUM SIGMA	-0.413					-0.419		0.387	
	[0.105]***					[0.103]***		[1.042]	
HIGH SIGMA	-0.301					-0.33		2.557	
	[0.105]***					[0.104]***		[0.974]***	
Sigma		-0.01					-0.01		-0.021
		[0.005]*					[0.005]**		[0.007]***
Fraction of value of shipmts. by top 4			0.007			0.005	0.005	0.028	0.031
			[0.002]***			[0.003]*	[0.003]**	[0.023]	[0.023]
K/L				0.001		0.001	0.001	0.017	0.018
				[0.001]**		[0.001]	[0.001]	[0.005]***	[0.005]***
Average Firm Size					0.51	0.393	0.145	-7.628	-7.031
					[0.335]	[0.728]	[0.554]	[3.980]*	[4.106]*
Geo Concentration	-0.283	-0.344	-0.066	-0.217	-0.2	-0.145	-0.19	2.775	0.698
	[0.374]	[0.382]	[0.379]	[0.382]	[0.383]	[0.371]	[0.377]	[3.755]	[3.888]
Pol Conc Herf	-0.529	-0.469	-1.981	-1.26	-0.895	-2.316	-2.214	-13.878	-12.778
	[1.088]	[1.118]	[1.243]	[1.162]	[1.162]	[1.062]**	[1.181]*	[11.313]	[11.420]
log Tot. Sales	0.066	0.07	0.05	0.048	0.05	0.03	0.037	0.958	1.01
	[0.035]*	[0.036]*	[0.036]	[0.037]	[0.039]	[0.038]	[0.039]	[0.401]**	[0.403]**
No. HS8 Tariff Lines	0.000	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	0.007	0.009
	[0.000]	[0.000]*	[0.000]**	[0.000]***	[0.000]**	[0.000]**	[0.000]***	[0.006]	[0.007]
SIC 1 Dummy (2000)	0.487	0.436	0.447	0.383	0.436	0.45	0.401	0.938	1.057
	[0.086]***	[0.085]***	[0.082]***	[0.089]***	[0.085]***	[0.086]***	[0.086]***	[0.897]	[0.904]
Observations	245	245	248	248	248	245	245	334	334

Notes: 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). Economic SIC 4 level Controls are from BEA and US Census Bureau.

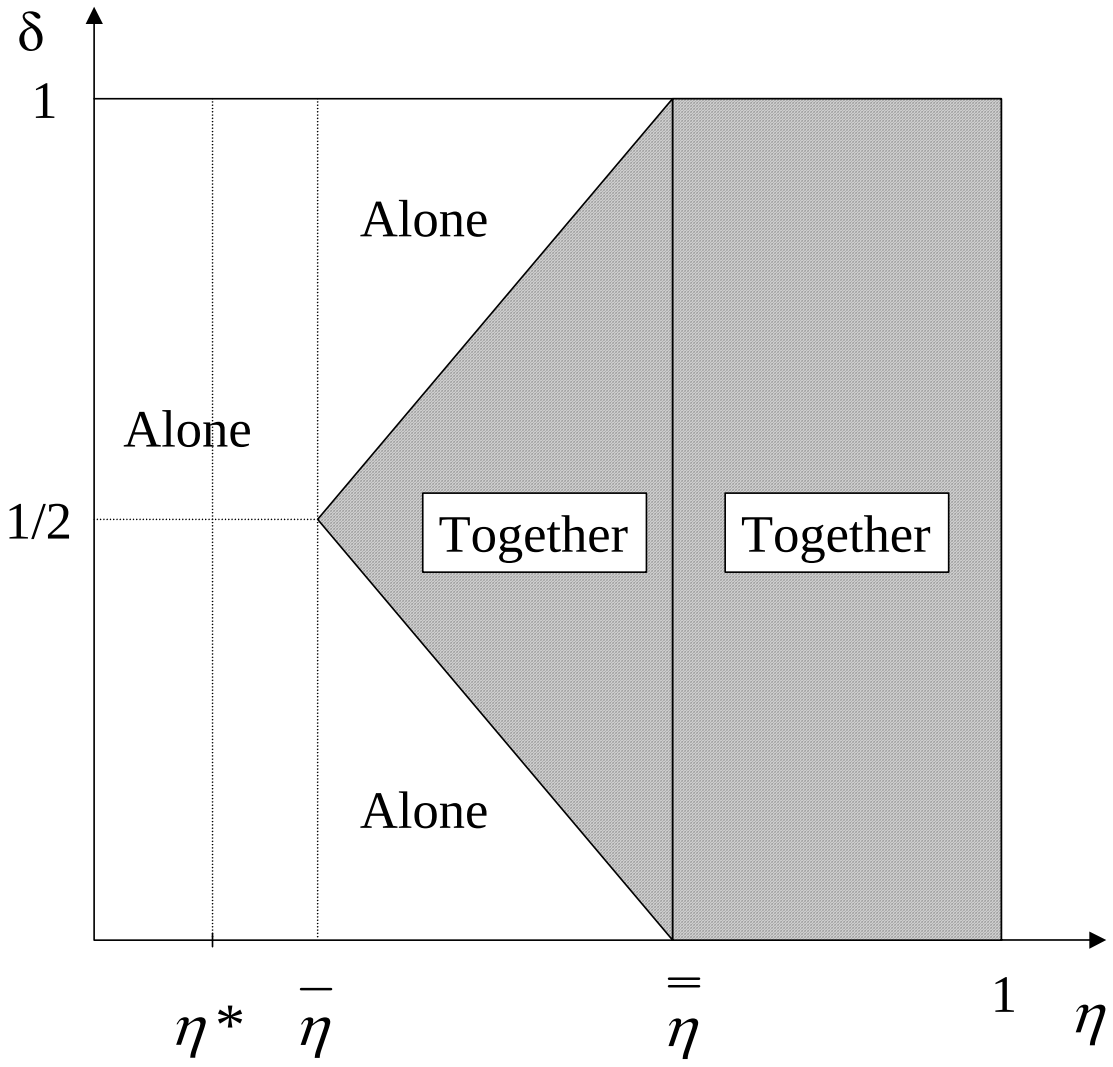
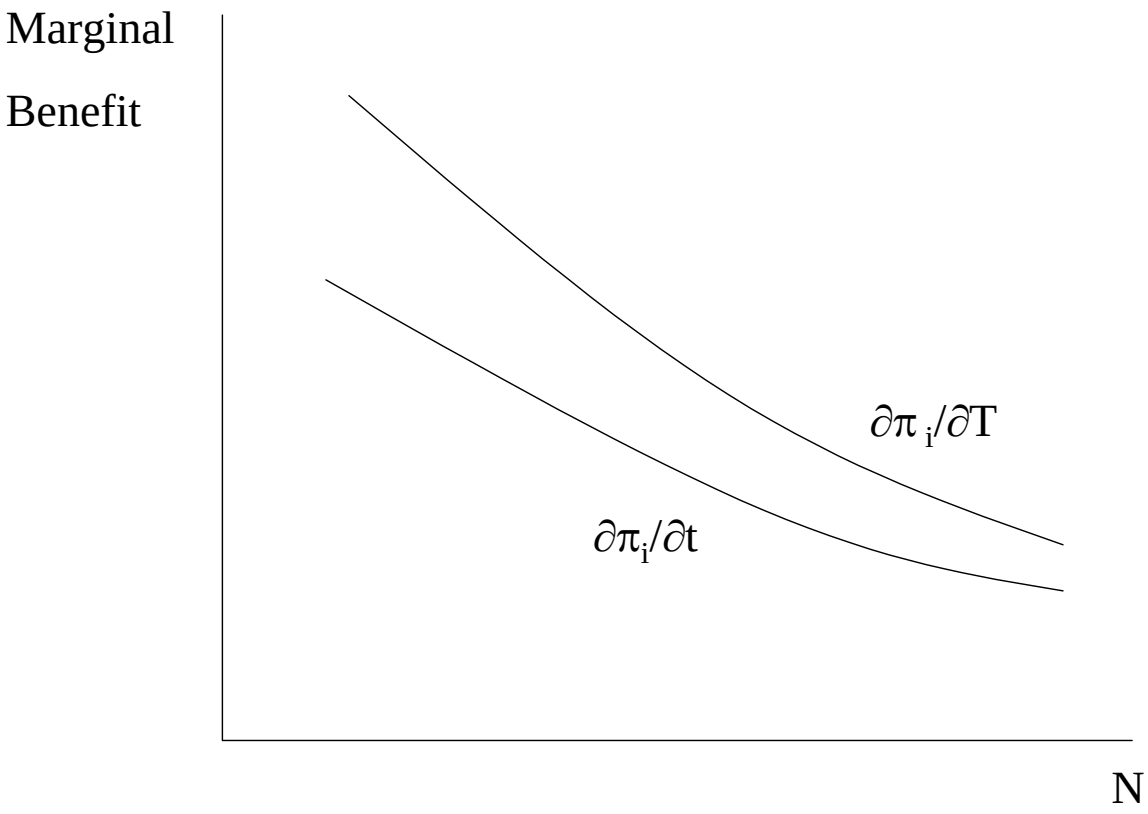
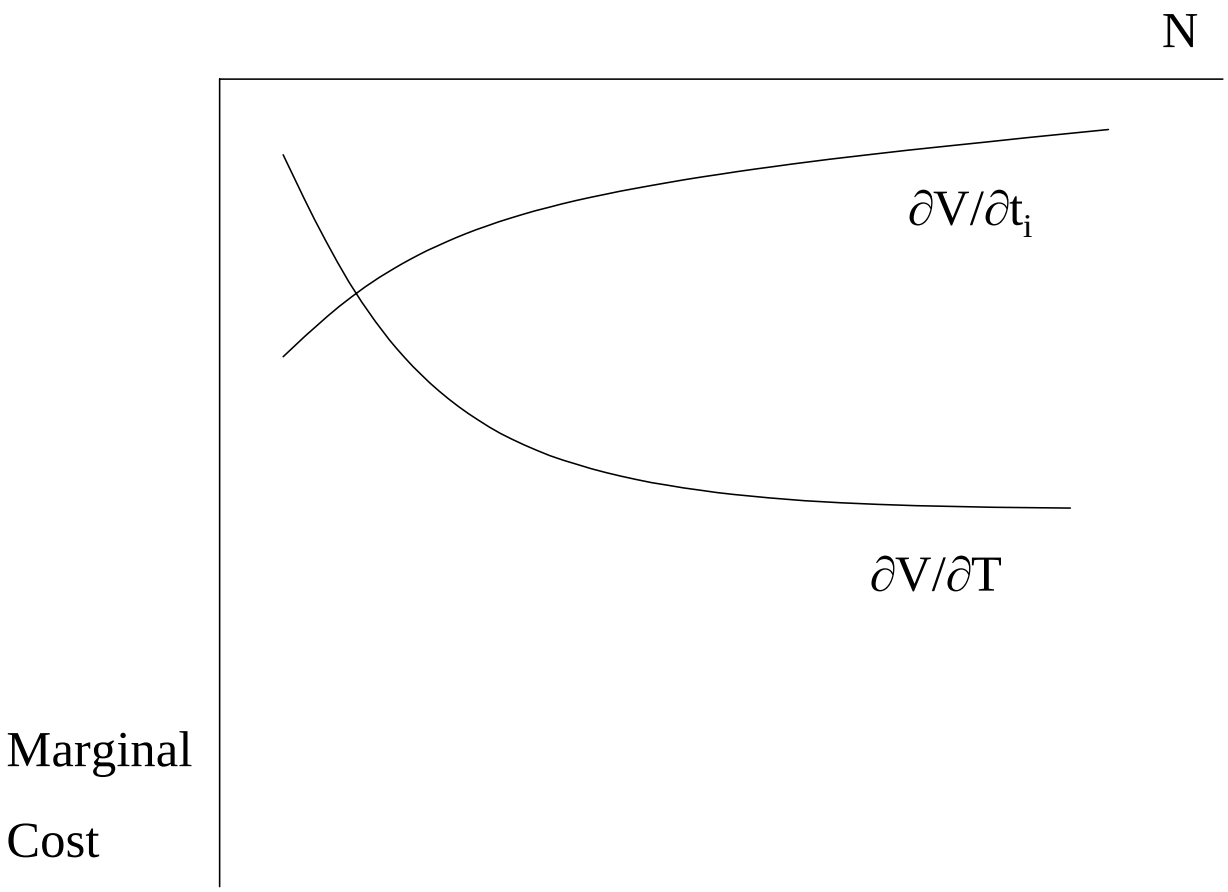


DIAGRAM 1



GRAPH 2



GRAPH 3