Journal of International Economics 87 (2012) 18–26

Contents lists available at SciVerse ScienceDirect

Journal of International Economics

journal homepage: www.elsevier.com/locate/jie

Competition and political organization: Together or alone in lobbying for trade policy?☆

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ARTICLE INFO

Article history:
Received 7 July 2009
Received in revised form 28 November 2011
Accepted 29 November 2011
Available online 7 December 2011

JEL classification:
F13
L13
D7
H0

Keywords:
Lobby formation
Collective action
Product market competition

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 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.

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.[1] 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. 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 comprehensive 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 on lobby formation across a wide spectrum of U.S. industries. The data show that almost 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 sector characteristics seem to favor political organization. We find that sectors with higher levels of product market competition and low levels of concentration tend to lobby jointly, that is, through sector-wide trade associations. This is in contrast with 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 targets the case of trade policy, we believe its insight can be applied more broadly to understand the determinants of collective versus individual lobbying.

☆ We benefitted greatly from conversations with Patrick Francois and Okan Yilankaya. We would like to thank Gorkem Celik, Steve Coate, Keith Head, Jim Snyder, Thomas Stratmann, and seminar participants at the University of British Columbia, Harris School of Public Policy at the University of Chicago, Canadian Institute For Advanced Research, Kellogg School of Management MEDS, Rotman School of Management at the University of Toronto, Pennsylvania State University, PEUK 2008, Stanford University, SED 2008, PIER 2008, SOEGW 2008, Econometrics Society Summer Meetings 2008 and Carleton University for helpful comments. Seyed Ali Madanizadeh provided excellent research assistance. Financial support from CIFAR and the Initiative on Global Markets at Chicago Booth is gratefully acknowledged.

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[1] For a discussion of the empirical literature see Bertrand et al. (2011), and for a theoretical overview Grossman and Helpman (2001).

0022-1996/$ – see front matter © 2011 Elsevier B.V. All rights reserved.
doi:10.1016/j.jinteco.2011.11.011

Our point of departure is the literature on special interest politics which, in particular with respect 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), which aim at endogenizing political organization. In the same spirit, Bombardini (2008) proposes a microfoundation of firms' decision to participate in political activity.[2]

Almost any attempt to analyze the interaction among firms within sectors has to deal with the collective action problem, described by Olson (1965), of lobbying for an object, e.g. trade policy, that benefits all firms in the sector. This is a classic problem of private provision of a public good (see Bergstrom et al., 1986).[3]

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), which 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 sector targeting 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 Silverman (2006), lobbying disclosure data have not been frequently employed in the literature[4] 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 identify industry characteristics that are related to the mode of lobbying. The empirical analysis shows that more competitive sectors lobby to a greater extent 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 empirical results. 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 one on the specific good that they produce.[5] When they lobby jointly through a trade association, producers perceive their lobbying efforts to benefit other firms. Hence, the model features sub-optimal lobbying in the trade association as in Olson (1965). This mechanism alone would induce firms to lobby for their product-specific tariff. Nevertheless, the 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 higher prices and in profits only if consumers cannot substitute away from the good. If the product is very substitutable with other domestic varieties, then the firm prefers all tariffs to be raised at the same time, an outcome accomplished with lobbying by the trade association. Thus, the model explains why high substitutability delivers a higher share of joint lobbying in a given industry.

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 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. Because a higher number of firms cause 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 our empirical results and is related to the theoretical result we present, although our main focus is on the degree of product substitutability. The empirical literature[6] emphasizes the ambiguity of results connecting firm concentration to political influence, absent direct measures of political organization.[7]

Employing our intuitive measure of political organization, in the working paper Bombardini and Trebbi (2009) 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, although we leave open the question of why the mode of lobbying may affect the degree of protection granted to the industry.

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 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.

[2] The paper shows that the distribution of firms in a 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.

[3] See Gawande (1997) for the specific case of tariff protection.

[4] More recently an increasing number of papers have made use of this data set. A non-exhaustive list includes Bertrand et al. (2011), Facchini et al. (forthcoming) and Ludema et al. (2010).

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

[6] See Hansen et al. (2005) and Potters and Sloof (1996) for a review.

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

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.[8]

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 the government.[9] The LDA imposes disclosure requirements for lobbyists, which have to file registration and regular six-month reports indicating the amounts received by companies as compensation for their services, the issues (among them international trade) and the government agencies lobbied.[10]

Although the literature on trade policy and special interests has paid substantial attention to political contributions data, lobbying expenditures have been mostly neglected, due to 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 information is not 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 during 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 (SOPR): 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.). The data are available from 1998 to 2008, 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 manually match individual firms and trade associations to sectors identifiers (4-digit level Standard Industrial Classification, SIC, or 3-digit SIC) using a 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.[11] 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. 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. Interestingly, the vast majority of U.S. sectors engages in some form of lobbying at some point in time. More than 84% 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 collect sector 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 sectoral level (averaged over the 1986–96 period). We obtain elasticities of substitution, $Elast_i$, from Broda and Weinstein (2006), which we use in their original format and we also discretize in three tercile-specific dummies (low, medium and high elasticity of substitution) in order to partially control for measurement error in the estimates. $Conc_i$, 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. The data on the number of tariff lines per harmonized system code at the 8 and 10 digits 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 large fraction of sectors displays high levels of individual lobbying. Indeed, the density of $IndFrac_i$ is bimodal. The share of sectors with a fraction above 90% of total lobbying done at the trade association level roughly varies between 15 and 20% 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 (7) in Table 2). The share of sectors with a fraction above 90% of lobbying done at the individual level roughly varies between 40 and 55%. 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 the total amount of lobbying expenditure for international trade that during the period 1999–2001 averaged to $630,000 per sector, almost twice as large 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 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, where i denotes a 4-digit Standard Industrial Classification sector: $IndFrac_i$ is the share of total

[8] A meaningful discussion of the costs and benefits of the mode of lobbying requires the existence of rents from protection. Therefore we assume no free entry, since it would eliminate such rents and all incentives to lobby.

[9] The LDA defines 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% or more of his or her services on behalf of that client during any three month period."

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

[11] 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.

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 substitution (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 et al. (2002). Non-tariff measures (weighted and unweighted) are constructed from TRAINS-WITS, see text for details. Firm size in US$ millions is total shipments divided by number of establishments from the 1997 Economic Census. Lobbying amounts 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.

lobbying expenditure done by individual firms in sector i; $Elast_i$ is the elasticity of substitution or a 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 the largest 4 firms). The specification that we estimate is:

$$IndFrac_i = \rho_0 + \rho_1 Elast_i + \rho_2 Conc_i + X_i'\beta + \nu_i \quad (1)$$

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 Eq. (1) using a Tobit two-sided censoring in all specifications. All standard errors are heteroskedasticity robust.

In Table 2 we report estimates of the reduced-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 the 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.

Table 2
Share of lobbying by individual firms and competition.

Marginal effect on latent	Dependent variable: fraction of total lobbied by individual firms								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Medium sigma	−0.275						−0.343		
	[0.098]***						[0.098]***		
High sigma	−0.182						−0.245		
	[0.093]*						[0.099]**		
Log sigma		−0.086						−0.110	
		[0.043]**						[0.056]*	
Sigma			−0.006						−0.01
			[0.002]***						[0.005]**
Fraction of value of shipmts. by top 4				0.007			0.003	0.004	0.004
				[0.002]***			[0.002]	[0.002]*	[0.002]*
K/L					0.002		0.002	0.001	0.001
					[0.000]***		[0.000]***	[0.0004]***	[0.000]***
Average firm size						0.522	0.231	0.216	0.204
						[0.465]	[0.229]	[0.209]	[0.197]
Marginal effect									
Medium sigma	−0.0571						−0.0745		
	[0.0207]***						[0.0237]***		
High sigma	−0.0359						−0.0530		
	[0.0186]*						[0.0217]**		
Log sigma		−0.0167						−0.0228	
		[0.008]**						[.011]*	
Sigma			−0.0012						−0.0022
			[0.00039]***						[0.0011]**
Fraction of value of shipmts. by top 4				0.0014			0.0007	0.0008	0.0008
				[0.0004]***			[0.0005]	[0.0005]*	[0.0005]*
K/L					0.00030		0.0003	0.0003	0.0003
					[0.00008]***		[0.0001]***	[0.0001]***	[0.0001]***
Average firm size						0.1006	0.0496	0.0447	0.0423
						[0.0905]	[0.0492]	[0.043]	[0.0407]
Left-censored	1	1	1	1	2	2	1	1	1
Right-censored	131	192	131	142	144	142	123	123	123
Observations	324	324	324	346	339	346	286	286	286

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
Share of lobbying by individual firms and competition. Robustness.

	Dependent variable: fraction of total lobbied by individual firms								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Medium sigma	−0.409						−0.413		
	[0.102]***						[0.101]***		
High sigma	−0.303						−0.328		
	[0.103]***						[0.102]***		
Log sigma		−0.114						−0.127	
		[0.056]**						[0.055]**	
Sigma			−0.01						−0.01
			[0.005]**						[0.005]**
Fraction of value of shipmts. by top 4				0.006			0.005	0.005	0.005
				[0.003]**			[0.003]*	[0.0025]**	[0.003]**
K/L					0.001		0.001	0.001	0.001
					[0.001]**		[0.001]	[0.001]	[0.001]
Average firm size						0.046	0.423	0.235	0.194
						[0.453]	[0.694]	[0.564]	[0.529]
Geo concentration	−0.212	−0.257	−0.275	0.038	−0.092	−0.117	−0.073	−0.104	−0.119
	[0.361]	[0.363]	[0.367]	[0.372]	[0.373]	[0.372]	[0.361]	[0.361]	[0.367]
Pol Conc Herf	−0.475	−0.378	−0.433	−1.866	−1.257	−0.612	−2.192	−2.121	−2.12
	[0.994]	[1.004]	[1.022]	[1.146]	[1.077]	[1.101]	[0.987]**	[1.047]**	[1.099]*
log Tot. sales	0.057	0.063	0.059	0.036	0.032	0.049	0.023	0.031	0.029
	[0.034]*	[0.035]*	[0.035]*	[0.036]	[0.036]	[0.039]	[0.036]	[0.037]	[0.037]
No. HS8 tariff lines	0.000	−0.001	−0.001	−0.001	−0.001	−0.001	−0.001	−0.0007	−0.001
	[0.000]	[0.0002]*	[0.000]*	[0.000]**	[0.000]***	[0.000]*	[0.000]*	[0.0002]**	[0.000]**
SIC 1 dummy (2000)	0.499	0.465	0.447	0.466	0.406	0.455	0.47	0.435	0.421
	[0.083]***	[0.083]***	[0.083]***	[0.081]***	[0.086]***	[0.083]***	[0.084]***	[0.084]***	[0.084]***
Observations	246	246	246	249	249	249	246	246	246

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 low 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 Bernard et al. (2006).

We begin by imposing $\rho_2 = 0$ and $\beta = 0$ in order to study the simple correlation between 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 dummy variables for medium and high elasticity of substitution in the sector (leaving low elasticity as baseline group). From a quantitative standpoint the effects are sizable. Referring to the marginal effects on the latent variable (upper panel of Table 2) column (1) shows that moving from high/medium to low elasticity produces an increase in the fraction of lobbying done at the firm level of 18.2 to 27.5 percentage points.[12] In column (2) we re-estimate (1) keeping the restriction $\rho_2 = 0$ and $\beta = 0$, but using a continuous logarithmic transformation of the elasticity of substitution, and we obtain similar results. Column (3) employs the elasticity of substitution in levels, also confirming the previous results.

We find evidence of a positive correlation between standard product market concentration measures ($Conc_i$) and the share of total lobbying expenditure done by individual firms in an industry. We employ the fraction of total shipments covered by the top four firms, the capital/labor ratio (as a potential proxy for entry barriers in the sector) and average firm size in the industry. Columns (4)–(6) 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 in the last three columns of Table 2. Higher elasticity of substitution, lower concentration and lower capital intensity at the sector level strongly predict higher lobbying through trade associations, as opposed to individual lobbying. F-tests, not reported, reject the null of no explanatory power for our set of measures of competition.

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.[13] 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 exogeneity of the technological and structural sectoral characteristics proxying 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 a substantial drop 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 a small spectrum of controls such ours.[14] In contrast, we find larger effects, suggesting that omission of variables does not appear to be a first order concern for our reduced-form estimates.

Finally, Figs. 1 and 2 show that the negative relationship between the share of individual firm lobbying and the elasticity of substitution does not depend on outliers. In these graphs we report partial regression plots, i.e. we plot the residuals from regressing $IndFrac_i$ and the

[12] Column (1) in the lower panel of Table 2 reports marginal effects. Moving from high/medium to low elasticity produces an increase of 3.6 to 5.7 percentage points in the fraction of lobbying done by individual firms. The estimates are smaller in the lower panel as they are rescaled for the probability of IndFrac falling in the unit interval.

[13] 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.

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

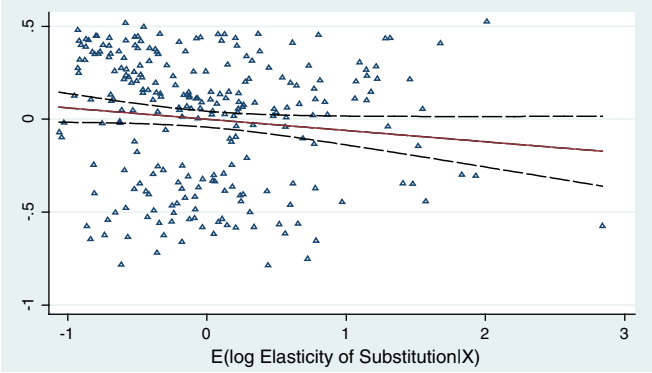

Fig. 1. Partial regression: share of individual lobbying and elasticity of substitution.

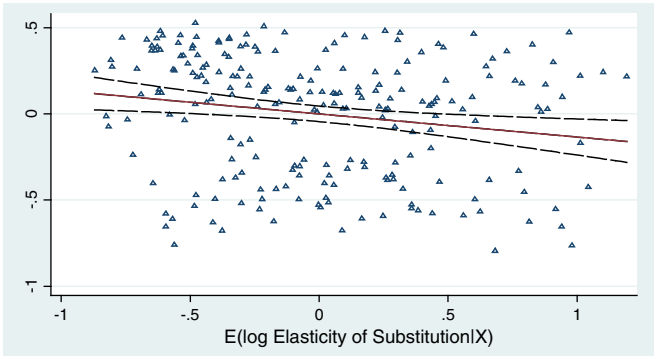

Fig. 2. Partial regression: share of individual lobbying and elasticity of substitution <90th percentile.

logarithm of $Elast_i$ on all the controls listed in Table 3.[15] Fig. 1 includes all observations, while Fig. 2 (and the corresponding regression) drops the sectors in the top decile of the elasticity distribution, to show that removing outliers does not affect the shape of the relationship.

The following section offers a theoretical model that can rationalize our finding that firms in more competitive industries are more likely to lobby through a joint trade association.

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:

$$U = \alpha(Q_1 + Q_2) - \frac{\beta}{2}\left(Q_1^2 + Q_2^2\right) - \beta\sqrt{\eta}Q_1Q_2 + q_0$$

where q_0 is consumption of a homogeneous good, chosen as numeraire, and Q_i is consumption of a variety of differentiated good, with $i=1, 2$.[16] While this paper analyzes the case of two differentiated varieties, the working paper Bombardini and Trebbi (2009) presents the analysis of the N-variety case. The parameters of the utility function α and β are positive and $0 \leq \eta < 1$. We assume throughout that the demand for all goods is positive. Given these preferences, the demand for variety 1 is:

$$Q_1 = \frac{1}{\beta(1-\eta)}(\alpha(1-\sqrt{\eta}) - p_1 + \sqrt{\eta}p_2). \quad (2)$$

where p_i is the price of variety i. For analytical convenience we choose the parameterization proposed by Singh and Vives (1984), where η characterizes the degree of differentiation among varieties. For $\eta=0$ varieties are independent and demand for Q_1 does not depend on p_2. For η approaching 1 varieties are perfect substitutes.[17] Demand for the homogeneous good is $q_0 = I - \sum_{i=1}^{2} p_i Q_i$, where I is income. Under these preferences, indirect utility V takes the form:

$$V = I + \frac{2\alpha^2(1-\sqrt{\eta}) - 2\alpha(1-\sqrt{\eta})(p_1+p_2) + p_1^2 + p_2^2 - 2\sqrt{\eta}p_1p_2}{2\beta(1-\eta)}. \quad (3)$$

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 is freely traded. The production of differentiated goods is undertaken by domestic and foreign firms. Each variety Q_i is produced by 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. Although perfect substitutability across a domestic and a foreign variety is an extreme assumption, what we aim to capture here is the fact that for every domestic firm there is a foreign variety of imports that the firm perceives as a direct competitor and has a particular interest in limiting.

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[18] $T + t_i$, which we discuss below. We assume Bertrand competition among producers of the differentiated goods. In the presence of positive tariffs, Bertrand competition among producers of identical goods guarantees that the domestic firm chooses a limit price:

$$p_i = \phi + T + t_i \quad (4)$$

as long as it is below the equilibrium price that would prevail in the absence of foreign competitors.[19] We assume throughout that we are operating at a level of tariffs such that limit pricing prevails.[20] Under the assumption that there exists a foreign 'rival' for each domestic producer, imports of differentiated goods are always zero in this model.[21]

[15] Taking logarithms of $Elast_i$ deals with the presence of some large outliers, which would render the graph lopsided.

[16] We follow Ottaviano et al. (2002)) and Melitz and Ottaviano (2008) in modelling product differentiation through a quadratic utility function. The choice is driven by analytical tractability.

[17] Elasticity of demand to own price, evaluated at symmetric prices p is $\varepsilon_1 = -\frac{p}{\alpha-p}\sigma$ where $\sigma = \frac{1}{1-\sqrt{\eta}}$. Elasticity to the competing variety price is $\varepsilon_2 = \frac{p}{\alpha-p}(\sigma-1)$. So η affects both elasticities, in a fashion analogous to the CES utility function case. With constant elasticity of substitution σ, demand for an individual variety exhibits constant elasticity of demand to own price equal to $-\sigma$ and a constant elasticity with respect to the aggregate price index of $\sigma-1$.

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

[19] In a model with only two domestic firms, Bertrand competition and differentiated products, the symmetric equilibrium price would be $p_i = \frac{(\alpha+\phi)(1-\sqrt{\eta})}{2-\sqrt{\eta}}$, $\forall i$.

[20] This requires imposing a high enough cost of lobbying (the parameter τ described below).

[21] The stark feature of no imports can be avoided with the realistic addition of foreign varieties that have no domestic producer. So for example we could consider a case where of the N varieties produced internationally only two have a local producer (and whose imports can be blocked by limit pricing in the presence of tariffs), while the other $N-2$ are imported, giving rise to positive imports at the industry level.

Substituting the limit price (4) into the quantity Eq. (2), we derive profits of domestic firm i as a function of tariffs:

$$\pi_i(t_1,t_2,T)=\frac{(T+t_i)\left[(\alpha-\phi-T)\left(1-\sqrt{\eta}\right)+t\sqrt{\eta}-\left(1+\sqrt{\eta}\right)t_i\right]}{\beta(1-\eta)}$$

where $t=t_1+t_2$. Having calculated profits, we can compute income I by adding up profits across firms and labor income, which is equal to one because both the population and the wage are equal to one:

$$I=1+\sum_{i=1}^{2}\pi_i. \tag{5}$$

Replacing Eqs. (5) and (4) in Eq. (3), we can express the indirect utility as a function of tariffs, $V(t_1, t_2, T)$.

Producers of differentiated goods not only interact in the product market, but also decide whether to organize politically to influence the level of tariffs, which affect their profits. They can choose to form a trade association and lobby the government jointly, or to lobby individually; we will analyze this choice later in this section. The government is a unitary agent that has the ability to set tariffs.[22] The government's objective function includes aggregate welfare as well as services provided by lobbyists, which are assumed to be proportional to the lobbying expenditures made by firms:

$$G=V(t_1,t_2,T)+\frac{1}{\tau}(L+l)\quad\text{with}\quad\tau>0 \tag{6}$$

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 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 politicians, 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.[23] 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; Austen-Smith, 1993). In this paper we take an approach in between these two strands of literature. On the one hand, we move away from the view that interest groups provide exclusively 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 interaction between lobbyists and the government as a game of information transmission, 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 inherently hard to test empirically. For the purpose of this paper we accept that lobbying services describe only part of the interaction between politicians and interest groups, but we limit ourselves to a reduced form that links the amount of lobbying activity to the utility of politicians. In expression (6) the parameter τ measures the trade-off between the amount of lobbying services and aggregate welfare. The working paper Bombardini and Trebbi (2009) allows such trade-off to depend on the source of lobbying services, in order to account for the possibility that trade associations might be more or less effective at lobbying the government than individual firms.

3.2. Structure of the lobbying game

In this section we analyze the endogenous choice of lobbying mode, i.e. whether firms decide to lobby individually or through a trade association. If firms lobby individually then they target their effort on placing a tariff on their own product (t_i), while a trade association pursues a wider strategy of asking for protection for the entire industry (T). The timing of the game is the following[24]:

Stage 1: Firm 1 chooses whether to propose to firm 2 to form a trade association. Firm 2 accepts or rejects the offer.[25]

Stage 2:

i) *Lobbying together:* if firm 2 accepts the offer at stage 1, then each firm i simultaneously sets L_i (contributions to trade association lobbying expenditures); the trade association makes a take-it-or-leave-it offer (T, L) to the government, with $L=\sum_{i=1}^{2}L_i$; the government accepts or rejects the offer.

ii) *Lobbying alone:* if the trade association is not formed, then each firm i simultaneously makes a take-it-or-leave-it offer (t_i, l_i) to the government. The government accepts or rejects the offers.

Stage 3: Production and consumption take place.

As for stage 3, we have already described the interaction among firms in the product market and have determined the variables that are relevant for the previous stages of the game, i.e. profits $\pi_i(t_1, t_2, T)$ and aggregate welfare $V(t_1, t_2, T)$.

3.3. Lobbying alone

At stage 2, in the absence of a trade association, firms consider whether to lobby to obtain a tariff on their own product. This means we are limiting the strategy space for each individual firm i to (t_i, l_i). Throughout we impose $t_i\geq 0$ and $l_i\geq 0$. We describe the problem from the perspective of firm 1. By symmetry all considerations made apply to firm 2. Firm 1's problem is to maximize profits net of lobbying expenditures subject to the constraint of keeping the government indifferent between accepting and rejecting the offer (t_1, l_1), given firm 2's offer (t_2, l_2). The shape of the constraint faced by firm 1 depends on whether the alternative for the government is to accept no offers or to accept only firm 2's offer, a decision which is a function of (t_2, l_2).

Therefore, firm 1's problem can be written as:

$$\begin{aligned}&\max_{t_1,l_1}\pi_1(t_1,t_2,0)-l_1\\ &s.t.\ l_1+l_2+\tau V(t_1,t_2,0)\geq max\{\tau V(0,0,0),l_2+\tau V(0,t_2,0)\}.\end{aligned} \tag{7}$$

Consider the case in which the best alternative for the government is to reject both offers, i.e. $\tau V(0, 0, 0)>l_2+\tau V(0, t_2, 0)$. In this case constraint (7) simplifies to:

$$l_1+l_2+\tau V(t_1,t_2,0)\geq\tau V(0,0,0). \tag{8}$$

In Appendix A we show that accepting only one offer is always an inferior alternative so that Eq. (8) is indeed the relevant constraint. In equilibrium Eq. (8) holds with equality, so we can derive l_1 from the

[22] Richer models of lobbying that incorporate a more realistic view of the government have been explored by Helpman and Persson (2001) and Hauk (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.

[23] 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).

[24] This is a simplified version of the game presented in the working paper version (Bombardini and Trebbi, 2009). In that paper we allow individual and joint lobbying to take place sequentially.

[25] Because of symmetry it is inconsequential whether we grant firm 1 or 2 the ability to propose to form a trade association.

constraint and substitute it in the objective function, obtaining the following maximization problem:

$$\max_{t_1} \pi_1(t_1, t_2, 0) + \tau[V(t_1, t_2, 0) - V(0,0,0)] + l_2. \quad (9)$$

Notice that this implies that the firm chooses the tariff t_i that maximizes the joint surplus of the government and the firm itself, given the proposed tariff and lobbying expenditures of the other firm. We take the first order conditions for both firms and solve for the Nash equilibrium tariff levels and lobbying expenditures.

Proposition 1. *The equilibrium in Stage 2 under Lobbying Alone entails a unique level of individual tariffs:*

$$t_1^* = t_2^* = \Delta$$

where $\Delta = \frac{(\alpha-\phi)(1-\sqrt{\eta})}{2+\tau-\sqrt{\eta}(1+\tau)}$. *Lobbying expenditures are such that:*

$$l_1^* + l_2^* + \tau V(\Delta, \Delta, 0) = \tau V(0,0,0) \quad (10)$$

and $l_1^*, l_2^* \leq -\tau[V(\Delta, 0, 0) - V(0, 0, 0)]$.

The indeterminacy of lobbying expenditures is a common characteristics of this class of games (such as Grossman and Helpman, 1994) with transferable utility. As long as lobbying expenditures jointly satisfy the government's participation constraint and are individually small enough not to induce the government to accept only one offer, they can occur in equilibrium.[26] In order to analyze the decision of firms at stage 1 we need to make assumptions that restrict the level of equilibrium lobbying expenditures. The presence of identical firms justifies the assumption of symmetry in lobbying expenditures so that $l_1^* = l_2^* = -\frac{\tau}{2}[V(\Delta, \Delta, 0) - V(0,0,0)]$.

3.4. Lobbying together

If firm 2 accepts firm 1's offer to form a trade association, at stage 2 of the game firms decide how much to contribute to the lobbying expenditures of the trade association representing the sector. We adopt a very stylized view of the trade association. We see the trade association as a 'technology' that transforms lobbying expenditures into a common tariff T. The timing of the game and the strategy space for the firms will deliver free riding in the sense that the level of common tariff T achieved is the non-cooperative level. This is a desirable feature, because we view free riding as one of the fundamental aspects of the trade-off between individual and joint lobbying. On the one hand, when they contribute a dollar to lobbying expenditures of the trade association, firms perceive the return to be spread over all goods and therefore they tend to contribute less. On the other hand, in some sectors firms prefer all tariffs to be raised simultaneously. This trade-off gives rise to the choice of the mode of lobbying. 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-it-or-leave-it offer to the government (T, L) with $L = L_1 + L_2$. The government decides whether to accept the offer. The government will accept if the offer makes it at least as well off as the status quo (free trade):

$$L + \tau V(0,0,T) \geq \tau V(0,0,0) \quad (11)$$

The trade association will optimally lower its lobbying expenditure L until constraint (11) binds for a given T. 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 1's problem is to find the level of L_1 that maximizes profits net of lobbying expenditures, given the lobbying expenditures by firm 2:

$$\max_{L_1} \pi_1(0,0,T) - L_1 \quad (12)$$

$$s.t.\ L_1 + L_2 = \tau[V(0,0,0) - V(0,0,T)] \quad (13)$$

Deriving L_1 from constraint (13) and substituting in Eq. (12) leads to the following maximization problem for firm 1:

$$\max_{T} \pi_1(0,0,T) - \tau[V(0,0,0) - V(0,0,T)] + L_2$$

Proposition 2. *The equilibrium in Stage 2 under lobbying together entails a unique level of the common tariff:*

$$\bar{T} = \frac{\alpha - \phi}{2(1+\tau)}$$

and lobbying expenditures L_1^* *and* L_2^* *are such that* $L_1^* + L_2^* = \tau\left[V(0,0,0) - V\left(0,0,\bar{T}\right)\right]$.

Notice that this level of the common tariff is privately efficient from the point of view of firm i. 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 $\bar{T}$ is uniquely determined, along with the total amount of lobbying expenditure, the amount of individual lobbying expenditures cannot be pinned down, but we assume under symmetry an equal share across firms, so that $L_1^* = L_2^* = \frac{\tau}{2}\left[V(0,0,0) - V\left(0,0,\bar{T}\right)\right]$. [27]

4. Competition and the mode of lobbying

In this section we analyze the decision of firms at stage 1 to form a trade association or to lobby individually as a function of the degree of competition, measured by the degree of product substitutability η. The working paper version (Bombardini and Trebbi, 2009) presents the case with N firms and analyzes the decision as a function of industry concentration as well. Firm 1 will propose to form a trade association and firm 2 will accept only if the net gain from forming a trade association is bigger for either firm. The following proposition shows how η shapes the net gain from lobbying together versus lobbying alone.

Proposition 3. *The equilibrium mode of lobbying depends on* η *: there exists a threshold* $\bar{\eta} = \left(\frac{\tau}{1+\tau}\right)^2$ *such that*

1. *if* $\eta < \bar{\eta}$ *then firms lobby alone and the individual tariff levels are* $t_1^* = t_2^* = \Delta$
2. *if* $\eta \geq \bar{\eta}$ *then firms lobby together and the common tariff level is* $T = \bar{T}$.

Proof. The benefit from lobbying alone is the difference between profits and lobbying expenditures evaluated at the equilibrium level of tariffs t_i^*. The benefit from lobbying together is analogously defined. The net benefit from lobbying alone, Λ, is calculated as the difference between the benefit of lobbying alone and the benefit from lobbying together and takes the following expression:

$$\Lambda = \frac{(\alpha-\phi)^2\left[\tau^2(2+\tau) + \eta(\tau-2)(1+\tau)^2 - 2\sqrt{\eta}\tau^2(1+\tau)\right]}{8\beta(1+\sqrt{\eta})(1+\tau)^2\left[\sqrt{\eta}-2+\tau(\sqrt{\eta}-1)\right]^2}$$

Although algebra intensive, it is straightforward to verify that, for any positive values of α, β and τ, and $0 \leq \eta < 1$, Λ is a continuous,

[26] Consider two contribution configurations: (l'_1, l'_2) and (l''_1, l''_2) such that Eq. (10) is satisfied. The government is indifferent between the two equilibria and, given the contribution of firm 1, firm 2 does not have an incentive to reduce its contribution because this would induce the government to reject both offers and revert to free trade. This multiplicity could be reduced by introducing non-constant marginal utility of income.

[27] Notice that although the equilibrium tariff does not depend on η, contributions do and so will the benefit from lobbying together discussed in the next section.

strictly decreasing function of η, is positive for $\eta=0$, negative for $\eta=1$ and equal to zero for $\eta=\bar{\eta}$ where $\bar{\eta}=\left(\frac{\tau}{\tau+1}\right)^2$. ■

The proposition has a clear intuition. It 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 induced by an increase in t_i, making lobbying for T a better alternative.

5. Concluding remarks

This paper presents a direct measure of the degree of political organization in U.S. industries for the purpose of lobbying the federal government for trade policy; the measure is constructed employing the universe of lobbying reports available at the Senate Office of Public Records. We document 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 the mode of lobbying that we observe in the data is consistent with a model incorporating market interaction among firms within an imperfectly competitive setting. Individual lobbying becomes less and less profitable in settings where individual price increases result in smaller profit increments. The main contribution of the paper is to show empirically and theoretically that competition forces do not necessarily imply political disintegration.

In the working paper Bombardini and Trebbi (2009) 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 non-tariff measures.

Appendix A

Analysis of constraint (7)

We have derived the equilibrium in Proposition 1 assuming that the best alternative for the government is to reject both offers. We can show that this is the only relevant case by solving the firm's problem under the opposite assumption, i.e.

$$\tau V(0,0,0) < l_2 + \tau V(0,t_2,0). \quad (A-1)$$

In this case constraint (7) takes the following form:

$$l_1 + \tau V(t_1,t_2,0) \geq \tau V(0,t_2,0) \quad (A-2)$$

It is easy to verify that the maximization problem yields the same first order conditions as in Eq. (9) and that the firms' reaction functions again uniquely cross at $t_1=t_2=\Delta$. Given the tariff Δ, each firm's lobbying expenditure must satisfy constraint (A-2) with equality, leading to

$$l_1 = l_2 = \tau[V(0,\Delta,0)-V(\Delta,\Delta,0)] = \tau\frac{\Delta^2(1-2\sqrt{\eta})}{2\beta(1-\eta)}.$$

In turn, $V(0,\Delta,0)-V(\Delta,\Delta,0)<V(0,0,0)-V(0,\Delta,0)=\frac{\Delta^2}{2\beta(1-\eta)}$ which implies $l_1=l_2<\tau[V(0,0,0)-V(0,\Delta,0)]$ and contradicts Eq. (A-2) at $t_2=\Delta$.[28]

[28] See Martimort and Stole (2003) for a similar proof.

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