Benjamin Barber IV*, Jan Pierskalla and Simon Weschle

Lobbying and the collective action problem: comparative evidence from enterprise surveys

Abstract: Industry lobbying is traditionally thought of as a non-excludable good subject to collective action problems that are most easily solved by concentrated industries. However, there is very little empirical support for this hypothesis. In this paper, we address a major shortcoming of existing work on the topic: Its near-exclusive reliance on data from the US. Using comparative firm-level survey data from up to 74 countries, we construct an industry-level indicator of concentration and test its effect on firms' lobbying activity. Using multilevel Extreme Bounds Analysis and Bayesian Variable Selection techniques to account for model uncertainty, we find no evidence that industry concentration is a predictor of lobbying activity. We discuss the implications of these non-findings for the literature and outline possible avenues for further research.

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1 Introduction

It is hard to overstate the impact of Mancur Olson's "The Logic of Collective Action"[1] on the study of interest group formation and lobbying, where its theoretical ideas have become nothing short of conventional wisdom.[2] If benefits to collective lobbying are a non-excludable good, then for many companies, the individual costs of lobbying are higher than the marginal benefits, resulting in the under-provision of the good. One implication of Olson's theory is

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1 Olson (1965).
2 Baumgartner and Leech (1998); Hart (2004).

that a concentrated industry, that is an industry consisting of a few large firms, is more conducive to solving the collective action problem. In these industries, the marginal benefits to industry-wide policy can be large enough for big companies to invest resources in lobbying and to accept free-riding by smaller competitors. In dispersed industries with a large number of small firms, the costs of contributing eclipse the marginal benefits, resulting in the under-provision of collective lobbying efforts. The argument is theoretically appealing and widely accepted in political science. However, many studies have investigated the relation between industry concentration and lobbying efforts, and only a few find some support. The majority of studies report null effects.[3]

One major shortcoming of existing studies of the effect of industry concentration on lobbying activity is that they almost exclusively rely on data from the US. It is therefore not clear whether the lack of empirical support is a general phenomenon, or whether it is specific to the political and economic environment in the US. In this paper, we address this shortcoming by testing the concentration hypothesis using the *World Bank Enterprise Surveys*, which provide us with micro-level data from up to 74 countries, including many low and middle income economies. We investigate the effect of industry-level sales concentration on firms' propensity to lobby the government or join a business association – two conceptually related measures frequently used in the literature that capture lobbying activities.

A second, more general difficulty in evaluating Olson's argument lies with the empirical research strategy. Parallel to Olson's arguments about collective lobbying, new research argues that private benefits of individual lobbying efforts are necessary to understand the political activities of firms. This research has identified several firm-level, rather than industry-level, variables as critical determinants of firms' political engagement.[4] In light of this new evidence, it is important to comprehensively test the effect of industry concentration on lobbying activity, controlling for relevant firm-level variables. However, theory about what the relevant control variables are is limited, especially in a comparative context. We therefore do not have a strong theoretical prior about the "true" specification of the model. This invites problems of model search and "fishing."[5]

3 Rodrik (1995); Gray and Lowery (1997); Mao and Zaleski (2001); Hart (2003, 2004); Hansen, Mitchell, and Drope (2005).

4 See e.g., Fisman (2001); Hansen, Mitchell, and Drope (2005); Khwaja and Mian (2005); Faccio (2006); Richter, Samphantharak, and Timmons (2009).

5 Humphreys, de la Sierra, and van der Windt (2013).

To ensure that our findings are not driven by a specific combination of control variables, we take model uncertainty seriously and employ Extreme Bounds Analysis.[6] This allows us to exhaustively test the industry concentration hypothesis in the face of uncertainty about what control variables matter for firms' political behavior in a comparative context. Across a large number of model specifications, we consistently find no evidence for an effect of industry concentration on lobbying or membership in a business association. This holds for pooled hierarchical models with random country intercepts as well as models with country fixed effects. We further substantiate the null findings using Bayesian Variable Selection techniques.[7]

Our paper makes several contributions to the existing literature. We provide the first empirical test of Olson's argument about the link between industry concentration and firm lobbying in a broad, cross-national sample that includes many low and middle income countries. This adds a much needed widening of the empirical context to the literature on business lobbying, in particular with respect to the Olsonian industry concentration hypothesis.[8] Second, our empirical approach safeguards against false positive (or false negative) findings. Last, our comprehensive and comparative investigation of the collective action hypothesis solidifies the conclusion reached by many studies using US data that simple collective action arguments give little purchase in explaining the political activity of firms. In turn, this signifies a real need for new theoretical work on the political activities of firms that either extends the basic logic of Olson's argument or provides a stronger theory of lobbying for particularistic benefits.

The paper proceeds as follows. In the next section, we briefly revisit Olson's argument with respect to collective lobbying efforts, spell out its main hypothesis, and review the literature that has sought to test it empirically. Section 3 introduces our data and the derivation of our measure of industry concentration. In Section 4, we first present a number of select model specifications. Afterward, we outline the basics of the Extreme Bounds Analysis and present the results, as well as a number robustness checks such as additional model specifications and Bayesian Variable Selection techniques. We conclude with a discussion of theoretical implications of this finding and outline future research avenues.

6 Leamer (1985); Levine and Renelt (1992); Sala-i Martin (1997).

7 Hoeting et al. (1999); Montgomery and Nyhan (2010).

8 There are a number of other contributions on lobbying that use the comparative data provided by the Enterprise Surveys, but they focus on firm-level characteristics, e.g., Kenyon and Naoi (2010); Jensen, Li, and Rahman (2010); Weymouth (2012).

2 Lobbying and the collective action problem

Who lobbies the government? This question is central to Mancur Olson's classic "The Logic of Collective Action," which arguably provides the most well-known theory of lobbying. The central idea is that the benefits of collective lobbying are a non-excludable good for firms in the same industry. For most businesses, the costs of lobbying the government outweigh the marginal benefits from favorable policies or regulations that may result from these efforts. This leads in the extreme to the total absence of lobbying efforts. Olson suggests that concentrated industries, that is those that have a few large firms, are more likely to overcome this problem. The individual benefits for large companies from lobbying can be sizeable enough so they provide the effort and accept free-riding by smaller firms.[9] While there exist a few contributions that refine this logic,[10] the standard Olsonian expectation that permeates much of the literature is:

> *Hypothesis: Firms are more likely to lobby if they are part of an economically concentrated industry.*

Even though Olson's theory is considered *the* theory of lobbying and is often accepted as conventional wisdom, it has received surprisingly little empirical support. Hansen, Mitchell, and Drope (2005) review 15 studies that test the market concentration hypothesis in the US context. They report that only four provide at least mixed results in its favor, while none of them find unambiguous support. In their own analysis, using a variety of concentration measures, they also find a consistent null effect. In response, scholars have questioned both the empirical contributions testing the concentration hypothesis, as well as the relevancy of Olson's theory for lobbying itself.

The first reaction is best exemplified by Rodrik (1995), who expresses disappointment "that the empirical literature is not more clearcut on the political advantages of high concentration, in view of the strong presumption that free-rider effects should be important in lobbying."[11] He faults weak empirical

9 See also Pittman (1977); Andres (1985).

10 Zardkoohi (1985) argues that while firms in concentrated industries are more likely to overcome the collective action problem, they are also able to extract monopoly rents without the help of the government. Munger (1988) proposes that these firms also should be more likely to lobby directly rather than through an industry association or a PAC. These theories suggest that industry concentration and lobbying effort are related in a non-linear way, with lobbying being most likely at an intermediate level. Busch and Reinhardt (1999, 2000) argue that a concentrated market structure is not the only mechanism to overcome the collective action problem. They theorize that the geographic structure of an industry plays an important role as well.

11 Rodrik (1995), p. 1483.

estimation strategies with little connection to theoretical work. Other authors identify a "streetlamp problem"[12] and point out that most studies of interest groups and lobbying have been done in American politics.[13] In particular, the collective action hypothesis has mostly been tested using PAC contribution data. Empirical work looking at other indicators of lobbying activity in the US is rare.[14] Large-N quantitative work on lobbying activity in countries other than the US is sparse, and comparative work is almost entirely absent.[15]

The second reaction is the development of a literature that runs parallel to the one focusing on the collective logic of industry lobbying. It argues that political activity by firms produces private goods, making it rational for many firms to engage in it independently of how their industry is structured.[16] For example, Richter, Samphantharak, and Timmons (2009) find that a 1% increase in lobbying expenditures by US firms leads to a 0.5 to 1.6% point reduction in the effective tax rate, benefiting the individual firm instead of the whole industry. Similarly, a number of studies document the economic benefits for firms through high-level political connections.[17] Congruently, the focus of lobbying studies in the past 15 years has shifted away from industry-level variables towards characteristics of firms as the determinants for their political activity. These contributions consistently find that factors such as firm size, revenue, sales to the government, and susceptibility to regulation predict whether firms lobby or increase their self-perceived political influence.[18]

We hope to add another layer of empirical evidence to the question of the validity of Olson's argument for lobbying that builds on the two reactions outlined above. Most importantly, we undertake a test of Olson's argument that vastly extends the empirical context and utilizes data from a broad sample of low, middle, and high income countries. This allows us to explore whether there exists a link between industry concentration and firm lobbying in much more breadth than is the case in the existing literature. Moreover, our analysis

12 Hart (2004).

13 See Gray and Lowery (1996, 1997); Baumgartner and Leech (1998); Baumgartner et al. (2009).

14 For exceptions see Hansen and Mitchell (2000); Milyo, Primo, and Groseclose (2000); Lowery et al. (2004); Hansen, Mitchell, and Drope (2005); Bernhagen and Mitchell (2009); Hall and Reynolds (2012).

15 Coen, Grant, and Wilson (2010); Hojnacki et al. (2012).

16 See Hansen, Mitchell, and Drope (2005); Gordon and Hafer (2007). Another strand of the literature argues that private goods provided by the business association help to solve the collective action problem, see e.g., Schmitter and Streeck (1999); Schneider (2004).

17 Fisman (2001); Khwaja and Mian (2005); Faccio (2006).

18 Mitchell, Hansen, and Jepsen (1997); Hart (2001); Hansen, Mitchell, and Drope (2005); Desbordes and Vauday (2007); Macher, Mayo, and Schiffer (2011); Weymouth (2012).

considers the relevance of firm-level characteristics as determinants of lobbying efforts to ascertain the independent effects of industry concentration. Including both industry and firm-level variables in our analysis allows us to better situate our findings (or non-findings) in the larger theoretical context.

3 Data

Most studies looking at the effect of industry concentration on lobbying activity rely on samples of relatively homogeneous firms from the US. It is therefore not clear whether the lack of support for the Olsonian industry concentration hypothesis reflects a general empirical reality, or whether it is specific to one country. In this section, we introduce the micro-level dataset that allows us to examine the determinants of lobbying activity in countries around the world.

3.1 World Bank Enterprise Surveys

To test Olson's hypothesis we use a uniquely compiled version of the *World Bank Enterprise Surveys*. The Enterprise Surveys have been conducted since 2002 in over 125 countries. The World Bank employs an independent firm to survey upper management representatives from enterprises in the non-agricultural private economy. These interviews are conducted face-to-face on a wide range of topics, for example the business climate, innovation, or lobbying and corruption. The surveys also collect detailed information on firm characteristics such as sales, finances, and work force. Firms are chosen through stratified sampling that ensures representativeness in terms of geographic location, industry, and firm size.[19] The surveys have been used relatively sparingly in political science so far, but have become more popular in recent years.[20] We compile all relevant questions across all different versions of the surveys to produce a sample of 29,000 to 48,000 firms in 52 to 74 countries. While the sample includes a number of OECD countries (e.g., Germany, Spain, Ireland), the focus is on middle income countries (e.g., Brazil, South Africa, Poland, Hungary) and developing economies (e.g., Bangladesh, Honduras, Ethiopia, Uzbekistan). Table 1 lists the countries along with descriptive statistics of the two dependent variables and the core independ-

19 More details on the Enterprise Surveys construction found here: www.enterprisesurveys.org/methodology.

20 See e.g., Jensen, Li, and Rahman (2010); Kenyon and Naoi (2010); Weymouth (2012).

Table 1 Descriptive statistics of the dependent variables and main independent variable per country.

Country	% Lobbying	% Business Assoc.	Mean Herfindahl
Albania	0.39	0.87	0.21
Algeria		0.50	0.15
Armenia	0.17	0.31	0.36
Azerbaijan	0.10	0.19	0.24
Bangladesh		0.91	0.07
Belarus	0.17	0.18	0.16
Benin	0.04	0.57	0.29
Bosnia and Herzegovina	0.23	0.52	0.14
Brazil		0.74	0.12
Bulgaria	0.21	0.47	0.10
Cambodia	0.17	0.42	0.22
Chile		0.52	0.69
China	0.05	0.57	0.12
Costa Rica		0.43	0.31
Croatia	0.28	0.80	0.10
Czech Republic	0.12	0.25	0.25
Dominican Republic		0.58	0.29
Ecuador	0.19	0.97	0.11
El Salvador		0.59	0.09
Estonia	0.17	0.48	0.23
Ethiopia		0.63	0.13
Georgia	0.24	0.26	0.33
Germany	0.03	0.84	0.09
Greece	0.08	0.86	0.19
Guatemala		0.55	0.09
Guyana		0.31	0.15
Honduras		0.72	0.13
Hungary	0.14	0.55	0.32
India		0.78	0.19
Indonesia		0.55	0.29
Ireland	0.16	0.64	0.30
Kazakhstan	0.12	0.22	0.16
Kenya	0.35	0.78	0.40
Kyrgyzstan	0.26	0.29	0.26
Laos		0.41	0.11
Latvia	0.23	0.27	0.20
Lebanon		0.90	0.40
Lesotho		0.74	0.51
Lithuania	0.21	0.36	0.17
Macedonia	0.34	0.37	0.21
Madagascar		0.53	0.24

(**Table 1** Continued)

Country	% Lobbying	% Business Assoc.	Mean Herfindahl
Malawi		0.63	0.22
Malaysia		0.50	0.17
Mali	0.04	0.68	0.25
Mauritius	0.06	0.60	0.25
Moldova	0.17	0.31	0.20
Mongolia		0.46	0.23
Montenegro	0.13	0.40	0.36
Morocco		0.64	0.45
Nicaragua		0.43	0.16
Pakistan	0.25	0.66	0.11
Peru	0.14	0.47	0.10
Philippines	0.09	0.51	0.13
Poland	0.11	0.33	0.10
Portugal	0.10	0.45	0.21
Romania	0.12	0.54	0.13
Russia	0.12	0.22	0.14
Senegal	0.08	0.55	0.19
Serbia	0.10	0.58	0.37
Slovakia	0.22	0.36	0.20
Slovenia	0.33	0.93	0.20
South Africa	0.19	0.60	0.17
South Korea	0.16	0.60	0.20
Spain	0.06	0.73	0.18
Sri Lanka	0.21	0.72	0.12
Tajikistan	0.14	0.15	0.26
Tanzania	0.13	0.65	0.22
Thailand		0.63	0.04
Turkey	0.09	0.88	0.11
Uganda	0.16	1.00	0.15
Ukraine	0.21	0.24	0.15
Uzbekistan	0.09	0.42	0.21
Vietnam	0.10	0.18	0.11
Yugoslavia	0.31	0.55	0.22
Zambia	0.44	0.70	0.10

ent variable (see below). Previous studies have focused on single-country data mostly from advanced industrial economies, in particular the US. With one of the most comprehensive comparable datasets on lobbying at our disposal, we can test Olson's concentration hypothesis in a wide range of different contexts. The wider context of the developing world also adds important empirical insights to the small amount of literature comparing lobbying behavior across countries.

3.2 Dependent variables

Firms can lobby the government individually, and/or they can join together with other companies in the same industry into a business association and lobby collectively. To the extent that the policy benefits that the companies are seeking are non-excludable, there is a theoretical incentive to free-ride in both situations. The optimal outcome for a firm is to reap benefits from a successful lobbying effort, but let other companies incur the expenses of lobbying the government privately or through an association. To capture both of these possibilities, we use two different questions from the *Enterprise Surveys* as our dependent variables. The first question focuses on private lobbying efforts: *"Has your firm lobbied the government in the last 2 years?"* The possible answers are yes or no. The second question focuses on collective efforts: *"Is this establishment a member of a business association or chamber of commerce?"* The possible answers are again yes or no. While the second question does not ask explicitly about lobbying, it covers an important way in which firms lobby collectively: by contributing membership fees and/or personnel to an industry business association, which in turn can lobby the government on behalf of its members. Note that the wording of the questions and subsequent interpretation by respondents do not allow us to infer the specific character of the lobbying activity. If a firm indicates that it did lobby the government, it is not clear whether it did so to advocate for excludable or non-excludable benefits. Similarly, a firm may be member of a business association because of its collective lobbying, or because of other benefits the association provides. However, if we were to find that industry concentration is a relevant predictor of lobbying, one could reasonably surmise that there are non-excludable aspects to the benefits being sought. Table 1 gives the proportion of firms that lobby the government and the proportion which are members of a business association in each country.[21]

3.3 Main independent variable

The main independent variable is industry concentration, which is most commonly measured by the concentration of sales. Using data on the firms' reported total sales, we compute the Herfindahl index for each industry in a country. This index is a standard measure of industry concentration and widely used in studies

21 A worry with these questions is non-random missingness due to their potentially sensitive nature. As we show in the Supplementary Material, response rates for both questions are very high in almost all countries.

of lobbying. Denote the total sales of firm i in industry j by s_{ij}. The Herfindahl index for this industry consisting of n firms is

$$H_j^S = \sum_{i=1}^{n} \left(\frac{s_{ij}}{\sum_{i=1}^{n} s_{ij}} \right)^2$$

An industry in which there is only one company is perfectly concentrated and has an index score of one. When there are a large number of firms with equal market share, an industry is dispersed. In this case, the Herfindahl index goes towards zero. The index is computed for each industry in each country separately.[22] It is important to note that the Herfindahl index we compute is based on a sample of companies. As a consequence, we overestimate each firm's market share, since we do not have information on the sales of companies that are not sampled. Thus our Herfindahl index systematically overstates market concentration. Since our data is representative at the country-industry level and information which industry is relatively more concentrated is preserved, this is not a problem for inference. If industry x is more concentrated than industry y, then a representative sample of x will also be more concentrated than a representative sample of y. To check that the concentration measures we derive from our sample are congruent with the results of previous studies on firm concentration,[23] we implement a validation exercise, which is reported in the Supplementary Material.

3.4 Control variables

We identify a set of potential control variables by drawing on recent work on the connection between firm characteristics and lobbying.[24] To capture how economically powerful a firm is, we divide its sales by the total sales of all sampled firms in the country.[25] We also divide a firms' sales by the total sales of all firms in the industry, giving an indicator of how powerful the company is within its industry.[26] The size of the firm is captured by the logged number of employ-

22 The industry designations are based on the 2-digit level of the International Standard Industrial Classification (ISIC), Version Rev3.1: Food (non-agricultural firms), Garments, Leather, Textiles, Metals and Machinery, Electronics, Chemicals, Wood, Plastic, Automobile, Miscellaneous Manufacturing, Retail, Hospitality, Miscellaneous Services, Other.

23 For example Mitton (2008).

24 Desbordes and Vauday (2007); Macher, Mayo, and Schiffer (2011); Weymouth (2012).

25 We take the log of this variable.

26 Again, we take the log of this variable.

ees.[27] Additional potential controls at the firm-level are the number of years the firm has been operational, a dummy variable indicating whether the firm is in the manufacturing sector, and a binary variable that takes the value of one if the firm exports any of its products. We also include the percentage of the firm owned by the government, whether the firm is owned by a foreign company, and the size of the city that the firm is located in.

In addition to these measures that are widely employed in the literature, we add two controls that are less commonly used, but should be theoretically important. First, the mobility or fixedness of capital is intimately related to political power. Fixed assets are easily taxed and subject to potential expropriation by the government. Mobile capital has outside options and can potentially avoid the purview of the state. This tension features prominently in various thematic areas in comparative political economy.[28] The most important implication is that owners of immobile capital and companies with large fixed assets are more vulnerable to the will of the political leadership. We therefore include a proxy measure of the firms' fixed assets as a potential control. We define firm-level fixed assets as the net book value of machines and land owned, divided by total sales. Firms owning valuable machinery and land are unlikely to be able to quickly liquidate assets and move their operations across localities or countries, at least in the short to medium run. Second, we include a measure of the trajectory of the economic health of firms. Research has shown that companies suffering financial difficulties are more likely to turn to the government as a secure source of income.[29] For our measure, we rely on reported sales information from the current year and from 3 years before. If the firm reports higher total sales 3 years ago than in the current year, it is coded as having economic difficulties.[30] In some of our models we also consider a number of standard controls at the country level, which are taken from the *Quality of Government* database.[31] These variables are logged GDP per capita, logged population size, the country's Polity 2 score, and its trade openness (exports plus imports as a percentage of GDP). Summary statistics for all variables are available in the Supplementary Material.

27 All these variables were logged because of their skewed distributions. When necessary, we add one before taking the log.

28 See e.g., Levi (1989); Boix (2003); Basinger and Hallerberg (2004); Acemoglu and Robinson (2006).

29 Damania (2002); Baldwin and Robert-Nicoud (2007).

30 If sales information is unavailable from 3 years prior, we use sales information from 2 years prior.

31 Teorell et al. (2011).

4 Industry concentration and the political activity of firms in comparative perspective

To test the relationship between the level of concentration in a firm's industry and collective lobbying efforts, we need a statistical approach that bridges multiple levels of analysis. Using purely industry-level data is possible, but would bar us from testing the effect of the industry's concentration on the *individual* firm's decision to contribute to collective lobbying efforts. Moreover, a purely industry-level dataset would not allow us to control for firm-level characteristics shown to be important predictors of political involvement. Conversely, a data structure with only firm-level variables cannot capture the effects of the competitive environment each firm finds itself in. Hence, we draw on hierarchical/multi-level models, an increasingly common statistical modeling approach that explicitly allows for the joint estimation of effects at varying levels of analysis.[32] This allows us to test the effect of industry concentration on individual firm behavior.[33]

Since our dependent variable is binary, we model the probability of a success conditional on covariate information $P(Y=1|X)$ via a canonical link function, here the logit link, to the linear predictor η:

$$P(Y=1|X)=\mu=g(\eta)$$

We then model the probability of success based upon a number of covariates specified as:

$$\eta_{ijk}=\alpha_k+\beta\cdot c_{jk}+\mathbf{x}'_{ijk}\gamma \quad (1)$$

where η_{ijk} is the linear predictor for lobbying of firm i in industry j in country k. The concentration of sales within an industry, c_{jk}, affects the probability of lobbying via the parameter β. $\mathbf{x}_{ijk}$ captures additional country, industry and firm-level covariates that act as important controls. α_k is a country-specific random or fixed effect that models cross-country heterogeneity.[34]

32 Gelman and Hill (2008).

33 For completeness, the Supplementary Material also shows results for a model that aggregates all variables to the industry level. We do not find any evidence for a positive effect of industry concentration on lobbying at the industry level.

34 This approach is able to capture possible differences between countries in what constitutes lobbying, or what a business association or chamber of commerce is. If there are certain things that fall under the definition of lobbying in country X but not in country Y, this will be reflected by a lower propensity to answer "yes" to the lobbying question in country Y. The multilevel models estimate a different intercept for each country, either through random or through fixed effects. This means that differences between countries in the propensity to answer "yes" due to differences in what constitutes lobbying or a business association will be reflected in the model through different intercepts.

4.1 Results: select model specification

As a first step, Table 2 gives the effect of the industry concentration on lobbying activity and membership in a business association given a select set of control variables. We include standard firm characteristics (number of employees, sales,

Table 2 Results of hierarchical logistic regressions: effect of industry concentration on firms' lobbying activity and membership in a business association (t-statistics in parentheses).

	(1) Lobbying	(2) Lobbying	(3) Business Assoc	(4) Business Assoc
Industry concentration	0.171	0.188	−0.121	−0.109
	(1.083)	(1.195)	(−1.422)	(−1.274)
log(Number of employees + 1)	0.223***	0.206***	0.224***	0.223***
	(7.944)	(7.005)	(17.265)	(17.038)
Share national sales	3.891***	4.408***	6.562***	6.679***
	(6.086)	(6.495)	(17.898)	(18.016)
Age of firm	0.005***	0.005***	0.014***	0.014***
	(3.773)	(3.948)	(14.032)	(14.162)
Share industry sales	−0.477	−0.675	−0.834**	−0.831**
	(−1.150)	(−1.591)	(−3.114)	(−3.090)
Manufacturing sector	−0.343***	−0.323***	−0.044	−0.034
	(−5.575)	(−5.277)	(−1.113)	(−0.865)
Government ownership	0.002	0.002*	−0.004***	−0.004***
	(1.659)	(2.012)	(−6.728)	(−6.474)
City size	0.066***	0.064***	0.016	0.014
	(3.674)	(3.589)	(1.455)	(1.296)
log(GDP per capita)	−0.032		0.183	
	(−0.281)		(1.431)	
log(Population)	−0.229**		0.052	
	(−2.715)		(0.543)	
Economic openness	0.002		−0.009*	
	(0.569)		(−2.138)	
Polity 2	−0.019		0.044	
	(−0.841)		(1.652)	
Constant	−2.451*	−3.979***	−5.582***	−1.869***
	(−2.041)	(−12.870)	(−3.852)	(−6.785)
Country random effects	Yes	No	Yes	No
Country fixed effects	No	Yes	No	Yes
AIC	11180.021	11400.028	33222.666	33316.501
BIC	11288.003	11848.367	33339.347	33958.947
Deviance	11152.021	11284.028	33194.666	33162.501
Log-likelihood	−5576.010	−5642.014	−16597.333	−16581.251
n	16532	16814	30771	31053

*p<0.05, ** p<0.01, *** p<0.001.

age) as well as whether the firm is in the manufacturing sector and the percentage that is owned by the government. Finally, we control for the size of the city that the firm is located in. Models (1) and (3) are estimated with random country intercepts, so we include four country-level variables: GDP per capita, population, economic openness, and the Polity 2 score. Models (2) and (4) include country fixed effects to control for all observed and unobserved heterogeneity between countries.

The Olsonian hypothesis predicts that industry concentration should have a positive effect on both dependent variables. We do not find evidence for this in any of our models. The coefficients for the Herfindahl index are positive for the lobbying models, but the standard errors are large. When the dependent variable is whether the firm is member in a business association, the coefficients are actually negative, but again with large standard errors. Mirroring many studies that investigate the effect of industry concentration on political activity within the US, we find no association between the two in our cross-national sample.

The control variables behave largely as one would expect. Firms that have more employees, have a higher share of national sales, and are older are more likely to lobby the government and be member of a business association. A somewhat surprising finding is that if firms have higher sales compared to the other firms in their industry, they are less likely to be member of a collective organization, but there is no effect on lobbying. Firms in the manufacturing sector are less likely to lobby, and those who are partly owned by the government are less prone to join a business association. Finally, firms located in larger cities are more likely to lobby. The country-level variables in the random effects specifications generally do a poor job at predicting firm-level behavior. Firms in larger countries seem to lobby less, and business associations are less prevalent in open economies.

The results confirm the null findings in the literature on industrial concentration and collective lobbying. However, Table 2 only presents one of many plausible model specifications. Several other control variables could be reasonably included or excluded to test this hypothesis. Depending on the correlational structure of the independent variables, changing these variables could show industry concentration as a "significant" predictor of the political activity of firms. In the following section, we explain and implement an approach that allows us to assess the effect of industry concentration in the face of uncertainty about the "correct" set of controls.

4.2 Multilevel Extreme Bounds Analysis

4.2.1 Approach

The previous section presented the standard methodological approach in the social sciences. We picked a reasonable set of plausible control variables and

presented a select few finalized models that display the association between the explanatory variable and the dependent variable. The difficulty lies in how we (or any other researcher) arrived at such "final" and "reasonable" models. If researchers commit to pre-analysis plans[35] or have strong theoretical models that guide model specification, it is clear which control variables and model specifications have to be analyzed and presented. In the absence of either of these, empirical researchers often fall back on an iterative process of a back and forth between theoretical deliberations and the estimation of new model specifications. This is problematic, because it leads to overconfidence in the estimated effects and therefore unreliable inference.[36] This is true even if researchers do not selectively include or exclude variables to inflate the statistical and substantive significance of their main variables of interest.

Theory about the determinants of the political behavior of firms in a comparative context is limited. We therefore do not have a strong theoretical prior about the "true" specification of the model. Instead, we would like to assess the relevance of industry concentration on collective lobbying efforts while taking uncertainty in the model specification into consideration. To do so in a principled manner, we rely on Extreme Bounds Analysis (EBA), a global sensitivity analysis that estimates the coefficients of interest for a large number of model specifications.[37] The technique is used relatively frequently in economics,[38] but is rare in political science. Recent exceptions are Gassebner, Lamla, and Vreeland (2013), who use it to investigate factors that determine democratization, and Kennedy and Tiede (2013) who evaluate the effect of oil on the quality of institutions.

To conduct an EBA, the set of controls is divided into a set of variables that are always included, and a set of "optional" controls. Then, a separate model is estimated for each possible combination of controls. The impact of the variable of interest is assessed looking at a (weighted) average of these models, rather than just a single "final" specification. We use two approaches. First, we estimate hierarchical logit models with random country intercepts. The random intercepts approach allows us to account for unit-level heterogeneity, but still pool information across countries.[39] Second, we also estimate models with country fixed effects.

35 Humphreys, de la Sierra, and van der Windt (2013).

36 Cameron and Trivedi (2005); Gerber and Malhotra (2008); Kabaila (2009); Humphreys, de la Sierra, and van der Windt (2013).

37 Leamer (1985); Levine and Renelt (1992); Sala-i Martin (1997).

38 See e.g., Sturm and de Haan (2005); Sturm, Berger, and de Haan (2005); Moosa and Cardak (2006).

39 Gelman and Hill (2008).

In Section 3.4, we have identified a number of potential control variables. We include the number of employees, the firm's percentage of national sales, and the age of the firm in all of our specifications. These variables have consistently been shown to matter in empirical analyses of firm-level political behavior.[40] At the firm-level, the set of "optional" control variables are the share of industry sales, the manufacturing dummy, government ownership, exporter status, foreign owned status, size of the city the firm is located in, size of its fixed assets, and sales decline. At the country-level, they are logged GDP per capita, logged population size, the Polity 2 score, and trade openness. For computational reasons, most applications of EBA arbitrarily set a number for how many "optional" control variables are included in each regression (most commonly four.) Because our set of possible covariates is relatively limited, we are not forced to make such a choice and instead opt to include all possible combinations in the EBA. For the random effects models, there are 12 "optional" controls, which gives us $\sum_{i=0}^{12} \frac{12!}{i!\,(12-i)!} = 4096$ model specifications. For the models with country fixed effects, only the 8 firm-level covariates can be included, leading to $\sum_{i=0}^{8} \frac{8!}{i!\,(8-i)!} = 256$ specifications.

There are two approaches to evaluating results from an Extreme Bounds Analysis. Levine and Renelt (1992) suggest to look at the smallest and largest coefficient of the variable of interest across all specifications. A finding is considered robust if both coefficients have the same sign and their 95% confidence intervals do not include zero. But, as Sala-i Martin (1997) argues, some results are more likely than others. He instead suggests looking at the average coefficient and standard errors, possibly weighted by model fit. In addition, Sala-i-Martin develops the cdf(0) statistic, which gives the percentage of coefficients that fall on a particular side of zero (using the average coefficient and average standard errors.) A finding is considered robust if the cdf(0) is >0.9.

4.2.2 Results

Our EBA analysis finds no evidence that industry concentration determines political behavior. Figure 1 plots the point estimates and 95% confidence intervals of the concentration variable when the dependent variable asks whether the firm has lobbied the government in the past 2 years. Panel A shows the results for all

40 Desbordes and Vauday (2007); Desai and Olofsgard (2008); Macher, Mayo, and Schiffer (2011); Weymouth (2012).

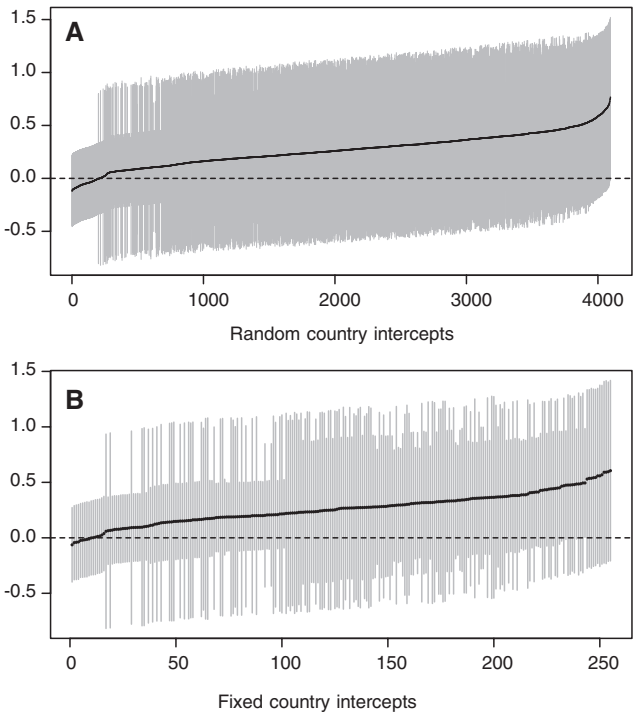

Figure 1 Coefficients for the effect of industry concentration, dependent variable: "Has your firm lobbied the government in the last 2 years?"

model specifications using the random effects approach, Panel B shows them for the fixed effects models. There is no empirical support for the main hypothesis. The industry concentration coefficient is not statistically different from zero for almost all specifications. Figure 2 plots the same for the question asking if the firm is a member of a business association. Again, the confidence interval contains zero for the majority of estimations. In addition, the specifications that do provide a significant effect have the "wrong" sign, indicating that firms in more concentrated industries are *less* likely to be members of a business association.

The absence of empirical support for our main hypothesis is confirmed by both the Levine-Renelt and the Sala-i-Martin approach to EBA, displayed in Tables 3 and 4. For all four sets of EBA, the highest and the lowest coefficient have opposite signs. Table 4 looks at the distribution of all coefficients as suggested by Sala-i-Martin. The average coefficient for the first dependent variable is positive as predicted by the concentration hypothesis, but the average standard errors are rather large. The cdf(0) statistic indicates that about 80% of the coefficients are to the right of zero. This falls short of the threshold of 90% customarily used to

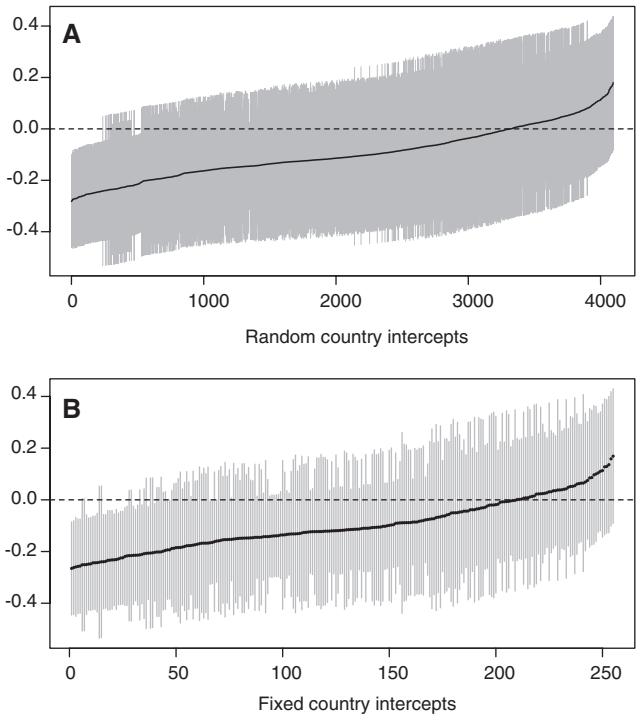

Figure 2 Coefficient for the effect of industry concentration, dependent variable: "Is this establishment a member of a business association or chamber of commerce?"

indicate a robust finding. There are few differences between the fixed effects and the random effects approach, or between the weighted and unweighted results.[41] The average coefficient for the second dependent variable is negative, but again

Table 3 Results of Levine-Renelt Extreme Bounds Analysis.

	β	SE	z-Score
DV Lobbying, RE, min	−0.119	0.172	−0.694
DV Lobbying, RE, max	0.766	0.385	1.989
DV Lobbying, FE, min	−0.063	0.171	−0.369
DV Lobbying, FE, max	0.605	0.415	1.459
DV Business Association, RE, min	−0.282	0.092	−3.071
DV Business Association, RE, max	0.179	0.132	1.355
DV Business Association, FE, min	−0.265	0.092	−2.887
DV Business Association, FE, max	0.169	0.133	1.270

41 Results were weighted according to their model fit as indicated by their pseudo-R^2.

Table 4 Results of Sala-i-Martin Extreme Bounds Analysis.

	β	SE	z-score	cdf(0)
DV Lobbying, RE, unweighted	0.266	0.314	0.843	0.802
DV Lobbying, RE, weighted	0.272	0.315	0.865	0.806
DV Lobbying, FE, unweighted	0.261	0.333	0.811	0.784
DV Lobbying, FE, weighted	0.275	0.351	0.816	0.783
DV Business Association, RE, unweighted	−0.096	0.127	−0.879	0.775
DV Business Association, RE, weighted	−0.095	0.129	−0.852	0.768
DV Business Association, FE, unweighted	−0.100	0.128	−0.890	0.781
DV Business Association, FE, weighted	−0.094	0.133	−0.798	0.759

the average standard error is relatively large and the cdf(0) statistics are smaller than the 0.9 threshold. Given the thousands of specifications and multiple ways to treat country heterogeneity, this suggests that the market concentration of an industry is a poor predictor of political action.

We estimate a number of additional specifications, the results of which we report in the Supplementary Material. Industry concentration is not a robust predictor of lobbying activity or business association membership if OECD countries are excluded from the sample. We also implement an EBA for each country separately using standard logit models. For most countries, there is no clear relationship between industry concentration and lobbying or membership in a business association. As expected, given the increased sampling variability, concentration has an effect in a few countries, but the sign switches across countries. We also estimate models where we interact the concentration measure with the share of the firms' sales of the industry to see if large firms in concentrated industries are more likely to lobby or join a business association. Again, there is no robust effect. Finally, we look at a model that aggregates all variables to the industry level. We do not find any evidence for a positive effect of industry concentration on lobbying at the industry level. The additional specifications robustly confirm our non-findings on the role of industry concentration in determining political action.

4.3 Bayesian Variable Selection

The strength of EBA is its ability to test a key independent variable, here industry concentration, in the face of uncertainty about what control variables to include. Fundamental to EBA analysis is the assumption that the key independent vari-

Table 5 Results of Bayesian Variable Selection models: posterior inclusion probabilities.

Variable	Lobbying $P(\gamma=1)$	Business Association $P(\gamma=1)$
Industry concentration	0.006	0.189
log(Number of employees + 1)	0.997	1.000
Share national sales	0.206	0.211
Age of firm	0.213	1.000
Share industry sales	0.204	0.212
Manufacturing sector	0.006	0.212
Government ownership	0.558	1.000
Exporter status	0.254	1.000
Foreign firm	0.007	0.962
City size	0.006	0.213
Fixed assets	0.006	0.415
Declining sales	0.009	0.408
log(GDP per capita)	0.065	0.407
log(population)	0.221	0.407
Trade openness	0.065	0.804
Polity 2	0.006	0.035
Country RE	0.941	1.000

able is part of every model. An alternative to this approach is Bayesian Variable Selection (BVS), which assumes that the probability of *any* variable being included in the model is a quantity to be estimated, just like its effect size. BVS methods are useful because they can deal with a large set of potential covariates, and posterior estimates reflect added uncertainty due to model selection.[42] We implement a version of BVS for our data to test which variables ought to be included. A detailed description of the technical details of BVS and our specification can be found in the Supplementary Material.

BVS provides us with posterior inclusion probabilities for all variables considered in the model. The posterior inclusion probability $P(\gamma=1)$ is a good summary measure for the relevance of each covariate that reflects the uncertainty of model selection. In essence, $P(\gamma=1)$ reports the probability that this variable should be included in the model. Table 5 shows the posterior inclusion probabilities for both dependent variables. Variables with $P(\gamma=1)$ larger than 0.8 are highlighted in gray.

The first thing to notice is that the posterior inclusion probability of industry concentration is low in both cases. For business association membership, it

42 Hoeting et al. (1999); Clyde and George (2004); O'Hara and Sillanpää (2009); Montgomery and Nyhan (2010).

is <20%, and for direct lobbying of the government it is close to zero. This provides further evidence that industry concentration is not a relevant predictor of the political activities of firms. For lobbying activity as the dependent variable, the posterior inclusion probabilities for most variables are relatively low. The number of employees has the highest inclusion probability and should be part of the model almost with certainty. In addition, government ownership has an inclusion probability of over 0.5. For the determinants of business association membership, we find high posterior inclusion probabilities for the number of employees, the age of the firm, government ownership, exporter status, and foreign owned firms. Furthermore, the trade openness of the country plays an important role in determining association membership. For both models, the random country intercepts have a $P(\gamma=1)$ close to unity, indicating unexplored differences between countries. In summary, two different approaches to model selection and model uncertainty lead to the same conclusion: industry concentration does not have an effect on the propensity to lobby or join a business association.

5 Conclusion

Conventional wisdom suggests that the benefits of lobbying efforts are a public good and industries thus suffer from a collective action problem. A central implication of Mancur Olson's work is that concentrated industries are more likely to solve this dilemma. However, empirical research in the past decades has found little empirical support. One limitation of these studies is that they rely almost exclusively on data from the US. It is thus unclear if the non-finding holds in general, or if it is specific to the economic and institutional environment of one country. In this paper, we have assessed the validity of the concentration hypothesis using the most comprehensive cross-national firm-level dataset on lobbying to date. Using Extreme Bounds Analysis and Bayesian Variable Selection, we find that industry concentration has no influence on the propensity to lobby or of being member of a business association. We show that across a large number of models there is very little indication that the political behavior of firms is driven by standard Olsonian arguments.

Why does Olson's argument fare so poorly for our broad sample of firms? On the one hand, it could be that standard collective action theories fail to explain firm behavior because they have not sufficiently identified context conditions that enable or discourage political activity by firms. Industry concentration might only explain the *capacity* to lobby, but has nothing to say about the *motivation* to do so. Firms might only take advantage of their ability to overcome the collective

action problem when they are in particular need of government help, for example when they face economic decline, or when they are endowed with large fixed assets that prevent them from moving abroad easily and thus make them especially politically vulnerable.

On the other hand, the literature in the past decade has highlighted private gains from lobbying, and our analysis provides additional evidence that firm-level characteristics are paramount in explaining political activity. However, directly lobbying for private goods, and lobbying collectively with an industry for shared benefits are not mutually exclusive. Instead, which type to pursue is likely a strategic decision by firms, in turn influenced by the economic and institutional environment.[43] Taking the micro-logic of firm behavior seriously, we believe better insights into business behavior across countries will come from future theoretical work that combines insights from both the collective action and private benefits arguments.

Finally, our paper highlights the need for more comparative research on lobbying behavior and special interest politics. Much has been learned from studies focusing on the US, but a growing literature in comparative politics provides important new insights that cannot be gained without variance in economic development or political institutions. One major factor holding back comparative work has been the lack of suitable data. By using a comprehensive cross-country dataset on the political activity of firms, our results add to the critical view of simple collective action arguments of lobbying, and suggest that the Olsonian logic has to be reassessed to offer empirical leverage in other country contexts. This has implications for the wider political economy literature, which often uses lobbying arguments as primitives in their theories. Models of party competition, trade policy formation, taxation, and regime change often rely upon a simplistic version of Olson's theory to explain their outcomes of interest. Our empirical investigation highlights the need to have a better theoretical understanding of the conditions under which commercial interests engage in the political arena.

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