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ABSTRACT

This paper investigates the relationship between the size of interest groups in terms of voter representation and the interest group's campaign contributions to politicians. We uncover a robust hump-shaped relationship between the voting share of an interest group and its contributions to a legislator. This pattern is rationalized in a simultaneous bilateral bargaining model where the larger size of an interest group affects the amount of surplus to be split with the politician (thereby increasing contributions), but is also correlated with the strength of direct voter support the group can offer instead of monetary funds (thereby decreasing contributions). The model yields simple structural equations that we estimate at the district level employing data on individual and PAC donations and local employment by sector. This procedure yields estimates of electoral uncertainty and politicians effectiveness as perceived by the interest groups. Our approach also implicitly delivers a novel method for estimating the impact of campaign spending on election outcomes: we find that an additional vote costs a politician between 100 and 400 dollars depending on the district.

Matilde Bombardini
Department of Economics
University of British Columbia
997 - 1873 East Mall
Vancouver, BC V6T 1Z1
Canada
matildeb@interchange.ubc.ca

Francesco Trebbi
Graduate School of Business
University of Chicago
5807 South Woodlawn Avenue
Chicago, IL 60637
and NBER
ftrebbi@chicagogsb.edu

1 Introduction

The role played by special interest groups in shaping policy-making is hard to ignore. One simple reason is the considerable size of the amounts the special interest groups (SIGs) inject into the political system. During the 1999-2000 election cycle the first 50 donor industries disbursed to incumbents of the 106th Congress a cumulated $\$368,438,170$, about the size of the GDP of a (not so) small developing economy. In the 2005-2006 election cycle the first 50 donor industries disbursed the 109th Congress $\$444,505,353$. Much research effort has gone towards understanding the way in which special interest groups (SIGs) affect the political process and policy formulation, if and how SIGs buy influence. In particular, within this literature one specific path has been to investigate the importance of campaign contributions by SIGs to politicians who value such donations as inputs that increase their probability of electoral success.

One aspect that has received little attention along this path of research is that, since the probability of being (re-)elected ultimately depends on the number of votes a politician can attract, the legislator should take into account both the electoral strength of an interest group (i.e. the share of voting population it represents) and its contributing possibilities when deciding whether to support or not legislation in favor of such group.[1] On the one hand, SIGs that represent a large number of voters in a district also benefit more from a given policy and therefore might contribute more. On the other hand, such interest groups might be required to make fewer contributions if they can pledge voter support.[2] The ability of employers to affect the electoral orientation of their

[1] The power of firms in terms of voter representation has been at the center of discussion following a recent move by Wal-Mart: "*In August, Wal-Mart distributed a letter to its employees in Iowa and three other states, highlighting what it said were inaccuracies in criticism by Governor Tom Vilsack, as well as Senators Evan Bayh of Indiana and Joseph Biden of Delaware and New Mexico's Governor Bill Richardson. The letter encouraged employees to talk to 'friends, neighbours and family about the good that Wal-Mart does'. It also promised that the company would 'keep you informed about what these political candidates are saying about your company while on the campaign trail'. Wal-Mart has also highlighted the significant number of its employees in both swing states. In Ohio its 50,000 workers represent roughly 1 per cent of voters in the 2004 presidential election, enough to be a factor in the current Senate battle between Sherrod Brown - a Wal-Mart critic - and Mike DeWine, the Republican incumbent. Wal-Mart's political action committee is also one of the largest corporate donors to Mr DeWine's campaign.*" (Financial Times - September 30, 2006)

[2] The idea that politicians may accept lower contributions by firms that represent a large number of voters is clearly expressed in the following interview to Representative Guy Vander Jagt (R-Michigan): "*I have one Fortune 500 company in my district that was so fuddy-duddy that they would never ever, ever do anything to help me. If their plane was going back to Michigan, they wouldn't let me ride on it. And that was before we got all these rules in. Nobody would do it now [accept a ride on a corporate jet], but back then, everyone would do it. When the Washington Senators were still here, instead of [this company] getting me tickets, I'd scramble around and get them tickets. In other words, I could not have been treated more shabbily in terms of anything they might do for me. And yet I always*

employees is illustrated by initiatives like the NAM (National Association of Manufacturers) Prosperity Project, which provides employers with the tools to inform workers of how their legislators are voting on issues of concern to their sector. [3]

This turns out to be a quantitatively important mechanism at play in the data. The main contribution of the paper is to show that the number of voters represented by interest groups is an important variable in explaining the pattern of campaign contributions. The data indicate that an inverted-U shape describes the relationship between the share of voters represented by an interest group and the contributions to a legislator.

As a departure point, the paper exploits the variation in economic structure across US states and congressional districts to investigate the relationship between the electoral strength of a given interest group and the political contributions to a given politician. For each US House Representative and each Senator, we match PAC and individual contributions by each economic interest group (e.g. tobacco, insurance, steel producers, textiles) to the number of employees in the corresponding sector.[4] We find that, within each Congressional District and each State, an inverted-U describes the relationship between campaign contributions and the number of employees in the sector represented by the corresponding interest group. At low employment levels (i.e. fewer voters), interest group contributions to the politician increase with the number of employees in a sector. At higher employment levels the interest group contributions decrease with the number of employees. Indeed, the data show that the largest employers are practically never the largest contributors. This pattern

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knocked myself out for them because they were the biggest employer in that county. Their health was essential to the health of my constituents, the people who worked there." - Speaking Freely by Martin Schram for the Center for Responsive Politics (1995, First Edition)

The following quote by Senator Dennis DeConcini (D-Arizona) clarifies further the concept: *"If I get a contribution from, say, Allied-Signal, a big defense contractor, and they've raised money for me. And then they come in and say, 'Senator, we need legislation that would extend some rule of contracting that's good for us.' They lay out the case. My staff goes over it. I'm trying to help them. Why am I trying to help them? The cynic can say: 'Well, it's because they gave you 5,000 bucks. And if you ran again, they'll give you another 5,000 bucks.' Or is it because they have 15,000 jobs in Arizona and this will help keep those jobs in Arizona? Now to me, the far greater motivation is those jobs, because those are the people that are going to vote for me. But I can't ignore the fact that they have given me money... Now the ideal situation is if I was motivated only by the jobs and the merits and there was no money here - that's the way it ought to be - or if the money was so minimal that nobody would think it was a factor. If I could only spend a half a million dollars in a Senate campaign and they could only give me $1,000, it would not be a factor."*

[3] See the project web site at http://www.bipac.net/page.asp?content=nam&g=nam&parent=p2demo.

In 2004 NAM reports "*By Election Day, the program reached more than 19 million employees, delivered more than 40 million messages and helped 1.7 million employees with voter registration and early ballot information.*"

[4] It seems reasonable to proxy the number of voters an interest group represents with the number of employees in the sector.

is robust to a battery of specifications and controls and, to the best of our knowledge, has not been explored before in the literature on political contributions. Furthermore, we believe this framework highlights a channel of influence at work in a wider sample than the one we consider here. For instance, several surveys of legislators indicate AARP as the most influential special interest group in Washington. AARP gives \$0 of political contributions by statute. These two facts cannot be reconciled by standard models of lobbying, but they are rationalized in the framework we present, given the large fraction of voters represented by the elderly.

From a theoretical standpoint, we interpret the evidence by modeling the interaction between heterogenous interest groups in a district and a politician in a simultaneous bilateral bargaining framework, which illustrates the effects of interest group size on the amount of campaign contributions. Each interest group bargains with its representative over the latter's support for a policy favorable to the SIG and over the amount of contributions and voter support by the interest group. The politician is interested in ensuring support because it faces electoral uncertainty and aims at increasing the probability of winning by trading legislation support for (i) a guaranteed number of votes by individuals members of the SIG's and (ii) contributions that are then employed to affect the decision of *impressionable* voters through advertising. The size of the interest group affects the bargaining because: (i) a larger interest group benefits more from a given favorable policy and must therefore give larger contributions, (ii) a larger interest group can ensure the legislator a wide support in the sense of persuading the voters it represents to vote in favor of the politician and therefore it might not be required to contribute as much, if it sufficiently increases the probability of winning of the politician by just committing the support of its members.

The model delivers a structural relationship between votes and contributions, which we estimate, thus obtaining a measure of the rate at which politicians transform contributions into votes, of the degree of electoral uncertainty, and of the implicit ability of politicians to support legislation in favor of interest groups. We employ our results to make four points.

First, according to our parameter estimates, each politician expects to be spending between \$100 and \$400 in order to assure an additional vote through advertising and other forms of campaigning. Levitt (1994) finds that campaign spending has a small impact on electoral outcomes[5], or equivalently, that to obtain on average one more vote politicians need to spend a large amount of money. Interpreting Levitt's estimates in this direction yields a cost of \$130 – \$390 per vote. Our estimates, though the result of a different empirical approach, are of the same magnitude.

[5] The impact is also not significantly positive, but here we simply make use of his point estimates to illustrate the comparison.

Second, we relate our estimates of the cost of a vote to the density of population finding that more urbanized districts have a higher cost of votes. This result is consistent with findings in Stratmann (2004), who reports that some districts have a higher cost of media advertising. If we think that cities like New York have both high density and high cost of media advertising then the positive correlation we obtain can be rationalized.

Third, the estimates of ex ante electoral uncertainty are compared to measures of lopsidedness using ex-post vote margins. We find that in districts where electoral races are closer (ex-post victory margin is thin) our estimates indicate higher ex-ante uncertainty. Analogously, for races that are considered more lopsided our estimates indicate lower ex-ante variance.

Fourth, by considering the electoral support offered by an interest group along with its contributions, we are able to recalculate the return to political 'investment', broadly defined and we assess its magnitude. Ansolabehere, de Figueiredo and Snyder (2003) provide a comprehensive review of the discussion surrounding the question of whether returns to political contributions are too high (implying that contributions should be several orders of magnitude higher) or too low (implying that we should observe very little contributions). The very nature of this question presupposes that contributions are similar to an investment decision and that interest groups are buying favors at some implicit price. The conclusion that Ansolabehere et al. reach is that if contributions were truly an investment decision then we should observe higher levels of monetary support, as their returns appear considerably higher than other types of investment. Therefore, they claim, contributions must rather be a form of consumption. We argue that in order to calculate the return to contributions one needs to take into account that interest groups give votes (which can be translated into money) and money.[6] The method we propose delivers considerably lower (and more reasonable) returns.

Relation to previous literature

The literature on campaign financing is vast.[7] The models that have been proposed in the literature attribute to political contributions different motivations and consequences. We will focus on those papers that are more relevant to this study here, with the full knowledge that this review is far from complete.

Various theoretical models have identified reasons why contributions are given and how they are used. According to these models contributions are given in order to (i) affect the policy choice

[6] So an extra dollar would earn return on a larger denominator and not the return found by simply dividing the value of political favors by the amount of dollar contributions.

[7] A recent and detailed survey is provided by Stratmann (2005).

of an incumbent government (Grossman and Helpman, 1994[8]), (ii) to influence the platform of political candidates (Grossman and Helpman, 1996[9]), (iii) to increase the likelihood of election of a candidate with a given (i.e. non-flexible) favorable position (Grossman and Helpman, 1996; Morton and Myerson, 1992) or (iv) to buy access (Austen-Smith, 1995). Politicians find those contributions useful because campaign spending can be used to inform voters of a candidate position (Austen-Smith, 1987) or to convince them of the candidate's quality (Coate, 2004).

Empirical studies of mechanisms (i) and (ii) have found some effect of contributions on voting behavior on specific pieces of legislation[10] although others have not.[11] In this paper, we assume contributions are valued by politicians and therefore affect legislators' votes on certain bills. Effect (iii) is hard to distinguish empirically from effect (ii), but many studies have nevertheless tried to assess the impact of a given candidate spatial position on the contributions raised (Poole and Romer, 1985; Poole, Romer and Rosenthal, 1987; McCarty and Poole,1998). Ansolabehere, Snyder, and Tripathi (2002) and references therein discuss effect (iv)[12].

Whether the politicians' perception that contributions can indeed affect voters decisions is justified has been the subject of very close empirical scrutiny. This literature has pursued the goal of quantifying the impact of campaign spending on the share of votes obtained in the election (Jacobson, 1978; Green and Krasno, 1988, Palda and Palda, 1998). The difficult task faced by this literature has been to control for other variables that affect electoral outcomes and that might therefore bias the estimate of the impact of spending. A few studies have addressed this issue using different techniques and obtaining different results (Levitt, 1994; Milligan and Rekkas, 2006, Erikson and Palfrey, 1998). This paper is not going to address the issue directly, but it offers an implicit way of estimating the monetary value of a vote, which is just another way of expressing how much money is needed to 'influence' an additional voter. Our methodology, using within-district data, is not subject to bias coming from unobserved candidate characteristics because such

[8] Grossman and Helpman (1994) study the impact of political contribution on trade policy determination, but the electoral process is not modeled and contributions are assumed to increase the utility of politicians.

[9] In Grossman and Helpman (1996) political candidates have a given position on some issues, but their platform on other topics can be affected by contributions (valued as a tool to gather votes). Interest groups have two goals in giving contributions: influencing the platform of candidates and affecting the probability of winning of those candidates that are ex-ante aligned with them. In this paper, policy is taken to be exogenously given for the individual candidate, who has the choice of supporting it or not. This is a realistic assumption when we analyze the case of an individual politician during a given legislature.

[10] Baldwin and Magee (1998), Stratmann (2002)

[11] Ansolabehere et al. (2003) report a number of studies that have found mixed results in support of this hypothesis.

[12] The authors also have a relevant discussion of the relationship between size of the SIG's membership and access to politicians for AARP, Business Round Table, and other groups.

characteristics are constant at the district level. Admittedly we cannot perform the same exercise as the previous studies, but we can obtain an estimate for the implicit cost of a vote that is free of individual candidate bias.

Another strand of research has focused on identifying the strategy of interest groups in terms of choice of timing and recipients of contributions. Several papers have found committee assignments and constituency characteristics to be important determinants of interest group donations, both theoretically and empirically (Grier and Munger, 1991; Denzau and Munger, 1986; Stratmann, 1991). Generally, the view in these studies is that interest groups at the national level decide where to allocate a given amount of money according, for instance, to whether the legislator's constituents' interests are or not aligned with the interest group. The view that we take in this paper is to consider an individual politician and abstract from the national interest group allocation problem.

There is also relevant political science research on the role of groups as vote providers and turnout, which include both theoretical and empirical contributions. For the former, see Morton (1987, 1991), Schram (1990), Uhlaner (1989). For the latter, see Filer, Kenny, and Morton (1993) and Nalebuff and Shachar (1999).

The study that comes closest to what we do in this paper is Stratmann (1992). Stratmann looks at the relationship between farm PAC contributions in a given district and the fraction of farm population in that congressional district[13]. He finds that farm PAC contributions are low for those legislators whose district has a low fraction of rural population (approximately below the median for the country) suggesting that, according to Stratmann, those politicians are 'too costly' to bring to the farm cause because they do not have support for those policies from their constituency[14]. Stratmann also finds that, conditional on the fraction being (approximately) above the median, contributions first decrease in farm population (because politicians with larger farm constituencies care more about farming and need to be compensated less for supporting farming-favorable policies), but then increase. Stratmann explains that the latter effect is suggestive of the fact that politicians with large farming constituencies are the ones with the highest productivity in pushing legislation that is pro-farming and therefore PACs that try to maximize their return should invest more heavily in them. Although this paper primarily focuses on the interaction between a politician and interest

[13] Rural fraction is used as a proxy for the fraction of population with some interest in policies favorable to farming. This measure is also taken to proxy the position of the specific legislator about issues concerning farming, independently of campaign contributions.

[14] An interest group interested in guaranteeing that the majority of legislators will support a given policy, will try to influence the 'least costly' half of the legislature.

groups in his electoral district, in Section 3 we discuss the relationship between our results and Stratmann's regressions.

The rest of the paper proceeds as follows. Section 2 introduces the data and presents the reduced-form evidence. Section 3 presents a model of bargaining between the legislator and interest groups and derives a structural relationship between votes and money. Section 4 presents the estimation procedure and the structural estimation results. Section 5 concludes.

2 Presentation of the data and reduced-form estimation

This section presents the data on the number of voters pertaining to each special interest group and the amount of political contributions to each legislator by each interest group. The data come from two sources. Data on local employment by sector are contained in the Country Business Patterns database, an annual series[15] published by the U.S. Census Bureau, which provides U.S. county-level employment[16] by 6-digit NAICS.[17] The county-level data is aggregated to the congressional district level and the state level using the MABLE-Geocorr software.[18]

Campaign contributions data from the Federal Election Commission (FEC) files are collected and aggregated by the Center for Responsive Politics (CRP). The CRP classifies Political Action Committee (PAC) contributions and individual contributions according to the industry to which the PAC or the individual donor is associated[19][20]. We use the subset of groups identified by the CRP

[15] The series excludes data on self-employed individuals, employees of private households, railroad employees, agricultural production employees, and most government employees.

[16] The Business Register database contains information about every known establishment in the United States. The information on employment is summarized in CBP by establishment size bracket.

[17] In this paper we employ the 1989-90 and 1999-2000 issues.

[18] Supported by the Missouri Census Data Center. Whenever counties are split between two congressional districts, we utilize the following methodology to allocate employment to the two districts. Consider county i, part of which lies in congressional district d and part in d'. Define as $POP_{id}$and $POP_{id'}$ the population of county i in districts d and d' respectively. The county-level employment in sector s, v_{si} is attributed to the two districts in the following amounts: $v_{si}\frac{POP_{id}}{POP_{id}+POP_{id'}}$ and $v_{si}\frac{POP_{id'}}{POP_{id}+POP_{id'}}$.

[19] FEC regulation requires the disclosure of the donor's employer.

[20] Noticeably, the approach followed by the CRP may induce a form of measurement error in the data if voters' contributions are unrelated to the economic SIGs inferred from employment data (for instance, because donors are driven exclusively by ideological concerns). This would clearly induce attenutation bias in the data, moving against the mechanism we present. As we report in what follows, attenuation bias does not seem to be a first-order issue, given the quantitative strenght and precision of our estimates.

Finally, the absence of generalized information concerning affiliation to non-economic interest groups prevents us from extending the analysis beyond economic SIGs. The effects we describe however directly generalize to any instance in which groups have non-zero electoral mass.

for which we have employment data and match the CRP interest groups to 6-digit NAICS sectors[21] using the definitions reported by the U.S. Census Bureau. The 86 SIG's and the corresponding NAICS industries are listed in Table 1. For each SIG we have contributions to each member of the Senate and the House of Representatives for the 101st (election cycle 1989-90) and 106th Congress (election cycle 1999-2000). Data collected by the CRP have been extensively employed in the politico-economic literature[22].

As additional controls, data concerning electoral districts and elections are obtained from the Office of Clerk of the House (for election results) and the Poole and Rosenthal's voteview data base[23] (for names, party affiliation, and characteristics of congressmen and senators). Finally, in order to remove the largest outliers we winsorize contributions and number of workers at the 99th percentile of the right-end tail of the pooled densities of each variable.

We now proceed to gauge the qualitative features of the data. Our starting point is to present evidence of a non-monotonic, inverted-U pattern between contribution and SIG's employment sizes. We present evidence of this empirical regularity in Table 2. The table is divided in three sections, corresponding to the House, the Senate, and the subgroup of Senators running for reelection at the two sampling dates of November 2000 and 1990[24] respectively. The dependent variables of interest are contributions by each SIG s in district d, which corresponds more directly to C_{sd}, and, in alternative, the fraction of all contributions received by a politician from each SIG. The independent variable, v_{sd}, is the fraction[25] of total population of total employment in district d represented by sector s. The four specifications that we estimate in Table 2 are:

$$\begin{aligned}
\text{(col. 1)} \quad C_{sd} &= \phi + \delta_1 v_{sd} + \mu_{sd} \\
\text{(col. 2)} \quad C_{sd} &= \phi + \delta_1 v_{sd} + \kappa_d + \psi_s + \mu_{sd} \\
\text{(col. 3)} \quad C_{sd} &= \phi + \delta_1 v_{sd} + \delta_2 v_{sd}^2 + \mu_{sd} \\
\text{(col. 4)} \quad C_{sd} &= \phi + \delta_1 v_{sd} + \delta_2 v_{sd}^2 + \kappa_d + \psi_s + \mu_{sd}.
\end{aligned}$$

The first two specifications presented account for a linear relationship between the number of voters represented by a given SIG and its contributions to a given legislator. A parametric (quadratic) polynomial is the simple but flexible approximation that we employ in columns (3) and (4). In

[21] For the 2000 data. For the 1990 data we match the CRP groups to 4-digit SIC (1987 version) industries.

[22] Among the others see Ansolabehere, de Figueiredo, Snyder (2003) and de Figueiredo and Silverman (2004).

[23] Initially from Poole and Rosenthal (1997).

[24] The House is renewed every two years, while the Senate is staggered in electoral classes of size 1/3 every two years. The term in office of representatives is therefore two years, relative to six years for Senators.

[25] We utilize shares of total population in order to account for possible differences in the size of the different polities. This is not particularly important for the House, but it is relevant for the Senate.

order to partial out unobserved sector-specific and politician-specific characteristics, we pool across districts all the observations for each branch of Congress and include both sector and legislator fixed effects. We include the fixed effects in columns (2) and (4).

The linear specifications indicate a positive correlation between contributions and size of the lobby, $\delta_1 > 0$, that is robust to the inclusion of fixed effects that is significant at standard confidence levels. Such relationship holds for the House and the Senate in 1990 and 2000, indicating a consistent pattern over time and across Congressional branches. As expected the relationship is stronger in the subgroup of Senators up for reelection in November 2000.

More interestingly Table 2 shows that the pooled regression indicates a hump-shaped relationship between votes and contributions: the parameters present a positive sign on the linear term and negative on the quadratic ($\delta_1 > 0$ and $\delta_2 < 0$) and are always statistically significant, whether we include the fixed effects or exclude them. In order to give quantitative intuition the table reports also the point of maximum and the number of observations above the point of maximum of the parabola implied by the estimated coefficients. For the House the peak is located between 1.4 and 3 percent of the overall district population. In a congressional district of size approximately $600,000$ it corresponds to a SIG employing between $8,400$ and $18,000$ workers. This number is particularly reasonable considering that the margin of victory in the 2000 House elections was on average about $80,000 - 90,000$ voters, implying a pivotal group size around $40,000 - 45,000$ voters. As we could have expected, the number of observations above the point of maximum is not very large. Within each district there are never too many relatively large voter groups (the distribution of industry sizes is well approximated by a Pareto distribution)[26]. Furthermore, understanding the behavior of the function over the rightmost portion of the size range is important. Large employers are particularly interesting since they cover a substantial portion of the electorate.

For the Senate the peak of the inverted-U is located between 1.1 and 3.97 percent of the State population. Senatorial races operate over substantially larger constituencies and the number of lobbies large enough to exercise electoral pressure could differ from that for the House. This notwithstanding, the data seem to support an hump-shaped relationship for Senatorial races as well, especially for those Senators that had completed their fund-raising and were running for reelection in 2000 and 1990 (part 3 of Table 2).

We now proceed in further detail conditioning along the two main dimensions of the data (by district and by sector). Table 3(a) reports the results for the coefficients of interest after removing

[26] It is also mechanically impossible to have many relatively large sectors since their fractions of total employment have to add up to one.

the assumption of common behavior of the polynomial approximation across districts, while 3(b) reports within-sector results. Within each district we estimate the equation:

$$C_{sd} = \kappa_d + \delta_{d,1} v_{sd} + \delta_{d,2} v_{sd}^2 + \mu_{sd}, \tag{1}$$

and we consider the overall distributions of various test statistics (sign, 0.05 F-test, 0.05 and 0.10 t-tests). We find that $\delta_{d,1} > 0$ and $\delta_{d,2} < 0$ (i.e. the relationship between votes and contributions exhibit an inverted-U shape) in almost all the districts[27] and such pattern is significant at least at the 10 percent level generally in half the seats for all our samples[28].

A reasonable insight that we obtain from this table is that heterogeneity across congressional and senatorial races is quantitatively relevant. The fitted parabolas in column (1) change from district to district considerably. For instance, albeit the estimated mean peak of the parabola for the House in 2000 was 0.018, the standard deviation across district was almost as high (0.013). In the section devoted to structural estimation we devote considerable attention to what specific characteristics of the races may determine the pattern of contributions. The approach of Table 3(a) operates within politician by construction and does not allow accounting for unobserved SIG's characteristics that might be correlated with sector size and could be inducing certain levels of contributions. In column (2) we control for the value added of the sector in 2000, as computed by the Bureau of Economic Analysis, to obviate such design problem. The results of column (1) are broadly confirmed. We can reject at 5 percent the joint hypothesis of $\delta_{1d} = 0$ and $\delta_{2d} = 0$ for more than 2/3 of the districts. Column (3) of Table 3(a) repeats the analysis excluding from the sample four particular sectors[29] exhibiting often a large employment level and a low level of contributions and that might be suspected of driving the results (notice that from column 1 and 2 an average between 5.3 and 6.2 SIG's locate on the declining portion of the parabola). The results do not change substantially once we exclude those four observations. In fact, the results suggest that there is variation on which sectors belong to the declining portion of the parabola (their number varies between 3.7 and 5.2).

Table 3(b) reports the results for the coefficients of interest after removing the assumption of

[27] Congressional districts for the House and States for the Senate.

[28] We perform three types of tests on the subset of districts that present point estimates $\delta_{d,1} > 0$ and $\delta_{d,2} < 0$. First we test whether we can reject the null hypothesis that jointly $\delta_{d,1} = \delta_{d,2} = 0$ at the 5% confidence level. Second we test whether we can reject the null hypothesis that separately $\delta_{d,1} = 0$ and $\delta_{d,2} = 0$ at the 5% confidence level. Finally we repeat this second test at the 10% confidence level.

[29] The SIG excluded are Retail Sales, Hospitals and Nursing Homes, Food and Beverage, Restaurants and Drinking Establishments.

common behavior of the polynomial approximation across sectors. Within each sector we estimate:

$$C_{sd} = h_s + \delta_{s,1} v_{sd} + \delta_{s,2} v_{sd}^2 + \mu_{sd},$$

and report tests on the signs of $\delta_{s,1}$ and $\delta_{s,2}$ similarly to the case of district-level regressions. We find that for about two thirds of the sectors $\delta_{s,1} < 0$ and $\delta_{s,2} > 0$. In about half the sectors such pattern is significant at the 10 percent level[30] in the House, while the results for the Senate are less conclusive, mostly due to the fact that we are not distinguishing between Senate seats that are up for vote and those that are not.

An intuitive check for the nonmonotonicity documented in the previous tables is that by and large the largest employers should not be the largest contributors both within districts and within industries. It turns out they are not. Table 4 presents evidence of this finding. In the first panel of Table 4 we first report the number of districts in which the largest employer in that district is the top contributor and we find that this is the case for less than 2% of the districts[31]. The second line in the same panel reports the number of districts in which the top 5 percent (ventile) of sectors is the largest contributor. This condition is realized in less than 4% of districts. A monotonic increasing relationship between money and votes can hardly be reconciled with these figures. The second panel of Table 4 repeats the same calculation considering the distribution of contributions across districts for a given sector. We find that the largest employer in a sector is also the largest contributor in generally less than 7% of sectors. This fraction increases when considering the case of the top ventile of districts within each sector: the top 5 percent employment group is the top contributor in 18% to 37% of the cases. In the majority of instances sectors do not pay the largest contributions where their employment is the largest. We report the same type of evidence in Figure 1 where the employment size of the largest contributor is plotted against the employment size of the largest employer within a district (Figure 1a, for 106th and 101st House) and within a sector (Figure 1b). If contributions were increasing in employment size then all observations should lie along the 45° line, but we observe that the large majority of the observations lie strictly above such line. The graphs provide a snapshot of the size dispersion of the largest contributors as well.

As additional checks we report two important robustness extensions in Appendix Tables A1 and A2. Tables 2 and 3 do not allow for any role of electoral challengers. We consider this in Table A1. Large incumbency advantages are a robust feature of US Congressional elections and challengers usually garner relatively small amounts of resources for elections. Nonetheless, some

[30] We perform an F-test with a null hypothesis of $\delta_{s,1} = 0$ and $\delta_{s,2} = 0$ on the subset of sectors where we find coefficient point estimates that point to a hump.

[31] All the data used in table 4 and the graphs are not winsorized in order to properly compute frequencies.

special interests contribute to challengers, either exclusively or jointly with incumbents/favorites. Table A1 shows that considering the contributions to incumbents net of challengers' contributions does not change the frequency and robustness of the non-monotonicity that we report in the data in any significant way. As a second check we consider the case where SIGs may not deliver all their votes to only one candidate. To address this we split the SIG's votes proportionally to the splitting of the SIG's contributions across the two different candidates[32]. Table A2 shows the robustness of the results along this dimension. This specific way of controlling for SIG's vote-splitting does not change the frequency and robustness of the non-monotonicity.

By and large the reduced-form evidence tends to support the idea of a non-monotonic relationship between number of SIG's voters and SIG's contributions. This particular feature of the data is novel to the best of our knowledge and surprisingly robust. In the next section we present a model of the interaction between a legislator and several interest groups that rationalizes the results.

3 The model

This section presents a formal description of the game between politicians and SIGs. An initial caveat is in order. The model is rigged toward empirical estimation and as such it is simplified (radically) along several dimensions. Being critical of our own approach, we require cross-checking. First, whenever restrictive assumptions are made, we show how the empirical results are affected by relaxing them. Second, we check our structural estimates against information external to the model: parameter estimates should appear unreasonable if the model's assumptions are excessively restrictive.

3.1 Structure of the polity

Legislature and policy choice

Consider a jurisdiction where the population is divided into D equally sized electoral districts. The parliament is formed by D legislators, each representing an electoral district d, $d = 1, ..., D$. The task of the legislature is to pass or reject a set of policies. In order to simplify matters we disregard the agenda-setting stage and consider the decision of each legislator d to vote in favor or against each of the exogenously proposed policies. We do not model the interaction among the legislators and the determination of the national policy since we are interested in the district-level

[32] Given the absence of turnout and electoral data by SIGs, we are constrained by addressing the matter indirectly in Table A2.

interaction between the incumbent legislator and the set of local interest groups, in view of future electoral competition between the incumbent and a challenger.

Special interest groups

The economy is divided into S sectors producing goods or services. For the purpose of this model a sector s in electoral district d is a group of capital owners and workers, which share a common interest in policies that favor the sector.[33] In each electoral district d the economy is characterized by a different size distribution of sectors. The size of interest group s in electoral district d is represented by the number of workers/voters in the sector: v_{sd} (the set of all voters who have some stakes in policies that favor the sector). We indicate with the vector $y = (y_1, y_2, ..., y_S)$ the set of policies proposed by the agenda setter. Policy y_s might be an industry-specific subsidy or tariff, which increases the rent of interest group s. We assume that the benefit of the lobby depends only on the aggregate income of the interest group. Ignoring for now the role played by contributions, the income of the interest group depends on the benefit from policy y_s. We allow the benefit from y_s to depend on the size of the interest group and the ability of the politician. Interest group size matters because, for example, the benefit created by a subsidy given to an industry is increasing in the size of the industry. By allowing the benefit to depend on the specific politician, we want to capture the idea that more experienced legislators are more likely to be effective at supporting a piece of legislation and increase the size of the benefit to the interest group they agree to support. For simplicity let us assume that in the absence of policy y_s the rent of the interest group is zero.[34] The expected utility of interest group s, denoted by U_{sd} is therefore:

$$U_{sd} = \gamma_d + \rho_d v_{sd} + \varepsilon_{sd}$$

where ρ_d and γ_d are the legislator-specific parameters and ε_{sd} is a random component that might depend on the specific ability of a politician to support a particular sector.

We assume that agents with a stake in sector s act as a unified special interest group vis-á-vis the district legislator.[35] Since this paper focuses on the interaction between interest groups and

[33] Although we recognize that the interests of workers and capital owners might not always coincide, we here focus on policies for which they are sufficiently aligned.

[34] Members of the interest group might have other sources of income, which do not depend on the policy implemented. We disregard them here.

[35] We will be interchangeably use the expression (special) interest group and lobby, even though the word lobbyist would more strictly identify individuals that act on behalf of interest groups and do not necessarily decide on the amount of political contributions. Lobbyists are more likely to channel information to the legislators while interest groups decide independently to make campaign contributions (through their PAC's, for example, in the United States).

politicians, it seems plausible to abstract from coordination problems among individuals belonging to an interest group. Since Olson (1965) contribution, a large literature has tried to identify the characteristics that exacerbate the free-rider problem within groups that pursue a common objective. We assume that when the group decides to vote for a given politician no individual defects (defection is typically due to costly effort or any other private cost of voting).

In this paper we concentrate on the interaction between a legislator and its constituents, that is interest groups located in the electoral district. While we recognize that interest groups are able to organize at the national level, it is common to observe that national associations promoting special interests are divided into local chapters, which interact more closely with their respective legislator.[36] The importance of this local dimension of the interaction between interest groups and politicians is testified by the predominance of in-state versus out-of-state political contributions for the majority of politicians.[37] Although the model can be extended to the simultaneous interaction between legislators and lobbies at the national level, we choose not to pursue this avenue of research here as it would greatly complicate the empirical estimation of the game by making the SIG's payoffs functions of the payoffs and the bargaining outcomes in all districts.[38]

[36] It is also the case that many companies have their own PAC's. So another interpretation is that companies located in a district interact mainly with their legislator.

[37] For the electoral cycle 1995-96 the median of the percentage of in-state contributions as a fraction of the total is 80% while the mean is 74%.

[38] It is however interesting to address the question of how our results relate to previous research, particularly Stratmann (1992), focusing on a national lobby allocating resources across politicians. Stratmann considers a specific sector and explores the relationship between the number of employees in different districts and the amount of contributions given to each legislator. This is similar to our within-sector analysis, which we can perform on 86 (or 84 depending on the year) sectors (Stratmann only considers 1 sector, farming). Taking this standpoint, within-district results should be the byproduct of the relationship between SIG's and politicians at the national level. Five observations are in order when comparing Stratmann's results and ours. 1) As mentioned above, contributions are overwhelmingly a local phenomenon. Out-of-state contributions are a small minority. 2) When comparing within-district and within-sector results in Table 3, within-district results seem to present stronger evidence of a non-monotonic relationship than within-sector results. 3) Taking Stratmann's model seriously, one should not observe positive contributions for districts where a sector's employment size is smaller than the median (given majority voting in Congress). This would not strictly hold if there is uncertainty about politicians' behavior, so Stratmann does expect to observe some positive contributions even for observations below the median. However, the amount of contributions for observations below the median is too large for such interpretation: about 40 percent of total sector's contributions on average. 4) We find that the peak of contributions is generally well above the median (above the 3rd quartile) and not around the median. 5) Stratmann argues that for observations with employment levels above the median the relationship between votes and contributions should be first decreasing (politicians that have aligned interests have to be paid less) and then increasing (politicians with aligned interested are more productive and should be paid more). We do not find generalized evidence of a spike in contributions for the highest levels of employment in nonparametric analysis

Voters

Like Baron (1994) and Grossman and Helpman (1996) we consider two types of voters, the *informed* and the *uninformed*. Differently from these papers, the *informed* voters here are identified by their occupation and general economic interests. In this paper the set of informed voters also corresponds with the members of the interest groups, broadly defined as the set of individuals with some stake in the sector. Therefore the number of informed voters in a district corresponds to the sum of the individuals employed in each sector, v_{sd}, in that district. The informed voters' only concern is whether the proposed policy which benefits their sector, is supported by the elected politician (and subsequently passed by the legislature). Interest groups can influence the incumbent to vote in favor of their preferred policy not only by promising support of the *informed* voters in the sector, but by also making political contributions which in turn can be used by the candidate in the election campaign to affect the decision of uninformed voters.

Uninformed voters are not influenced by the position of the candidates on the specific policy vector y, but some of them can be affected by the amount of advertising and other campaign expenditures undertaken by the candidates and directed to them. We define the set of uninformed voters that responds to advertising as *impressionable uninformed voters* while the remaining uninformed voters are defined as *non-impressionable uninformed voters*. For simplicity we assume that for each dollar spent on campaigning, the incumbent obtains the vote of α_d impressionable uninformed voters with certainty (alternatively, the 'cost' of an additional vote is $\frac{1}{\alpha_d}$). Conversely we assume that there is uncertainty over the behavior of non-impressionable uninformed voters: the incumbent (and members of special interest groups) does not know how many of those uninformed voters will turn up on election day and how many will vote for him or his challenger. The nature of the uncertainty is described in the next subsection.

The incumbent legislator

The incumbent legislator in district d is concerned with winning the election (or re-election) so her expected utility U_d^I depends on the return from being elected E_d, the probability of winning the election, $\Pr\left(W_d^I\right)$ and some exogenous factor ξ_d:

$$U_d^I = E_d \Pr\left(W_d^I\right) + \xi_d$$

Let us indicate by v_I the number of *NIU* (non-impressionable uninformed) individuals who vote for the incumbent, while v_A is the number of *NIU* individuals who vote for the adversary (the challenger). Knowledge of the incumbent legislator is limited to the ex-ante distribution

(not reported). These results suggest that, while Stratmann's explanation for the farming sector contributions is still valid, we need to explore other models in order to account for these different features of the data.

of the difference between v^A and v^I. Uncertainty over the margin of victory of the challenger is summarized by a cumulative density function which can differ according to the characteristics of the district $F_d\left(v_d^A - v_d^I\right)$. We assume for simplicity that the probability density function $f_d\left(v_d^A - v_d^I\right)$ is continuous and differentiable. In the absence of contributions and voter support by interest groups[39] the incumbent wins the election whenever $v_d^A - v_d^I \leq 0$ [40], so the probability of winning for the incumbent is $F_d(0)$.

Through bargaining with interest groups, the incumbent ensures a certain amount of contributions and votes by interest group members (the *informed* voters). Indicate by v_{sd}^I the number of informed voters in interest group s who vote for the incumbent and by C_{sd} the contributions by interest group s to the incumbent. The incumbent's probability of winning is then:

$$\Pr\left(W_d^I\right) = \Pr\left(v_d^A - v_d^I \leq \sum_{s=1}^{S} \alpha_d C_{sd} + v_{sd}^I\right) = F_d\left(\sum_{s=1}^{S} \alpha_d C_{sd} + v_{sd}^I\right)$$

3.2 The political game

We model the interaction between candidates and interest groups as a multiple bilateral bargaining problem. Each political candidate engages in simultaneous bilateral bargaining with each of the S special interest groups in her district. The structure of the game is therefore similar to the one analyzed by Chipty and Snyder (1999) and Raskovich (2003). Both papers analyze a game where one seller simultaneously negotiates with several buyers. This modeling approach offers the advantage of allowing us to find a unique solution in the level of contributions offered by each lobby provided we make some assumptions about the structure of uncertainty.[41]

We assume simultaneity in bargaining for two reasons. First, there is no obvious order in which negotiations should take place since the each candidate could approach any interest group or vice versa at any point in time. Second, as Raskovich (2003) argues, imposing an order of negotiations implies that every interest group and candidate can observe whether negotiations of other players have broken down. Since the negotiations between lobbyists and politicians can simply consist of a phone call, it seems plausible that they could be resumed at any time and therefore any bargaining

[39] For simplicity we assume that voters represented by interest groups would cast their vote randomly for the two candidates in the absence of successful bargaining with the incumbent, so that on average their vote would not have an impact on the electoral prospect of both candidates.

[40] A tie is resolved in favor of the incumbent for simplicity

[41] The politican economy literature has recently employed other modeling devices such as common agency (Grossman and Helpman (1994)). These models, under the assumption of quasi-linear preferences, lead to a unique equilibrium policy, but to a multiplicity of equilibrium contributions. Another interesting example of bilateral barganing between lobbies and politicians is Drazen and Limão (2007).

could not be considered terminated by other lobbies at any point in time.

As a result of the structure imposed, all the lobbies and the legislator can contract upon is the favorable vote by the legislator, not the final outcome of the legislature vote, since the politician can only decide on his own vote. Let us indicate the action of legislator d to support policy y_s by a_{ds}: if the politician supports the policy then $a_{sd} = 1$ and $a_{sd} = 0$ otherwise. For simplicity supporting each policy y_s entails no cost for the politician[42][43].

The game is played in two stages:

1. In the first stage the incumbent legislator d enters into simultaneous negotiations with each lobby s separately. Bargaining between the incumbent and each lobby s determines the amount of votes promised $v^I_{sd} \leq v_{sd}$, the amount of contributions C_{sd} and the position of the candidate, a_{sd}. We assume that the order in which negotiations are made and whether they succeed or not is not observable by other lobbies until the second stage.

2. In the second stage the legislature votes on the set of proposed policies y, the contributions obtained by each candidate are spent in an electoral campaign to sway the IU voters and the election takes place.

We assume that the outcome of the negotiations between lobby s and the incumbent is given by the Nash bargaining solution, taking as given the behavior of other lobbies $j \neq s$ in the district. Define $V_{-sd} = \sum_{j \neq s} \alpha_d C_{jd} + v^I_{jd}$. The reaction function of each lobby in terms of other lobbies' votes and contributions and the decision by the politician to support the policy, a_{sd}, are determined by

[42] Introducing a cost of supporting policies would entail no difference in the results of this analysis, unless two specific cases are introduced. First, if the marginal cost of supporting a policy increases with the number of "favors" then a politician will not decide to support every policy. Second, in the case the total amount of resources (e.g. effort) a politician can devote to supporting policies is limited, the legislator will again decide not to support every piece of legislation. Both cases would introduce competition among lobbies. Since it is not immediate to us the extent to which these effects would interact with the mechanisms we intend to illustrate in this paper, we abstract from competition among lobbies.

[43] The main reason for excluding competition between special interests is data-driven. We tested extensively for competition effects by looking at obvious competititors such as upstream and downstream producers employing input-output tables. We could not find any empirical regularity of sort. We believe that, although competition between special interests is relevant for specific bills and earmarks, it is unlikely to have such a systematic component across all districts and special interests (so various ranging from tobacco to steel to hospitals) to be picked up precisely in our empirical design.

the solution to the following problem:

$$\left(v_{sd}^{I}, C_{sd}, a_{sd}\right) = \underset{\left(\widetilde{v}_{sd}^{I}, \widetilde{C}_{sd}, \widetilde{a}_{sd}\right)}{\arg\max}\ \widetilde{a}_{sd}\left[\gamma_d + \rho_d v_{sd} + \varepsilon_{sd} - \widetilde{C}_{sd}\right]^{\frac{1}{2}} \times \tag{2}$$

$$\left[E_d F_d\left(\alpha_d \widetilde{C}_{sd} + \widetilde{v}_{sd}^{I} + V_{-sd}\right) - E_d F_d\left(V_{-sd}\right)\right]^{\frac{1}{2}} \tag{3}$$

$$s.t.\ v_{sd}^{I} \leq v_{sd}\ and\ 0 \leq C_{sd} \leq \gamma_d + \rho_d v_{sd} + \varepsilon_{sd}$$

Assumption 1 We assume that $f_d(\cdot)$ is decreasing.[44]

Under *Assumption1* (2) is a concave problem and therefore delivers a unique choice of C_{sd} for a given behavior of other lobbies.

Definition 1 *A Nash Equilibrium of the political game is represented by a vector of votes* $\left(v_{sd}^{I*}\right)$*, a vector of contributions* $\left(C_{sd}^{*}\right)$ *and a vector of legislator positions* $\left(a_{sd}^{*}\right)$ *that satisfy (2) for politician* d *and each interest group* $s = 1, ..., S$*.*

Two simple predictions of this framework are stated in the following lemmas.

Lemma 2 *In equilibrium each lobby s promises the support of all voters it represents:* $v_{sd}^{I*} = v_{sd}$ $\forall s$

Proof. By inspection. ■

Lemma 3 *In equilibrium the politician supports each piece of legislation* y_s*.*

Proof. The absence of costs of supporting policy y_s guarantees the politician always chooses to support the policy. ■

We see these two lemmas as relatively unrealistic but useful simplifications. Given the robustness checks of Appendix Tables A1 and A2, we know that relaxing them produces minimal consequences for estimation purposes (the main goal of the model). At the same time these lemmas allow us to focus on the first-order theoretical mechanism.

Consider for now the case of an interior solution to problem (2) in terms of C_{sd}. Such solution delivers the following first order condition for C_{sd}:

$$C_{sd} = \overbrace{\rho_d v_{sd}}^{\text{Surplus Effect}} + \gamma_d + \varepsilon_{sd} - \frac{\overbrace{F_d\left(\alpha_d C_{sd} + v_{sd} + V_{-sd}\right) - F_d\left(V_{-sd}\right)}^{\text{Substitution Effect}}}{\underbrace{\alpha_d f_d\left(\alpha_d C_{sd} + v_{sd} + V_{-sd}\right)}_{\text{Marginal Impact Effect}}} \tag{4}$$

[44] This assumption is needed to guarantee the concavity of the maximization problem, but for the main result to hold we just need $f_d(\cdot)$ to be decreasing over its positive support.

Everything else equal, the size of lobby s affects the amount of its contributions through three effects:

1. *Surplus Effect*: a larger v_{sd} means that the interest group benefits more from legislation y_s. This effect tends to increase contributions as the increased surplus is shared between the legislator and the interest group. This effect is constant because of the linearity assumption in the benefit function.

2. *Substitution Effect*: as an interest group promises more votes, the amount of contributions needed to transfer a given surplus share to the legislator declines. This effect declines with v_{sd} due to the assumption of a decreasing $f_d(\cdot)$: an increase in v_{sd} yields progressively a smaller increase in the probability of winning. Therefore, this effect causes contributions to decline with v_{sd}, but at a declining rate.

3. *Marginal Impact Effect*: as the number of votes promised increases, the marginal value of contributions declines because of the assumption of a decreasing $f_d(\cdot)$. If an interest group promises a large number of votes, then it resolves most of the uncertainty. Extremely favorable events are less and less likely to happen. Therefore the marginal impact of a dollar of contributions is evaluated at a point where $f_d(\cdot)$ is low. Due to this effect contributions decrease with the size of the lobby[45]. The strength of this effect hinges on the degree at which $f_d(\cdot)$ declines.

The effects described above are implied by a comparative statics exercise that takes V_{-sd} as given. Therefore the discussion has ignored the impact that size has on contributions through the optimal response of other lobbies. This is because under a general distribution function it is difficult to determine the direction of such effects.[46] The non-monotonicity of the FOC (4) creates the possibility of multiple equilibria in contribution levels $C_d^* = (C_{1d}^*, ..., C_{Sd}^*)$, which makes it impossible to investigate the behavior of contributions unless we make further assumptions about the density function of the challenger margin. To close the model parametrically we consider the case in which the margin $v_d^A - v_d^I$ follows an exponential distribution. The assumption of an exponential distribution for the challenger margin greatly simplifies the analysis, as the optimal

[45] The effect can be interpreted as a microfoundation for the reduced-form assumption of decreasing returns to political contributions. See Drazen and Limão (2007).

[46] Reaction functions are generally non-linear.

amount of contributions is independent of the choice by other lobbies[47]. This is crucial in order to deliver uniqueness of the equilibrium contributions, without which it would not be possible to proceed to structural analysis.

Assumption 2 The margin of victory $v_d^A - v_d^I$ is distributed according to an exponential cumulative distribution function:

$$F_d\left(v_d^A - v_d^I\right) = 1 - \exp\left(\frac{\lambda_d - \left(v_d^A - v_d^I\right)}{\beta_d}\right)$$

In order to guarantee that contributions are positive when $\gamma_d = 0$ and $\varepsilon_{sd} = 0$ we also make the following assumption about ρ_d and α_d.

Assumption 3 By assumption: $\rho_d > \frac{1}{\alpha_d}$.

We will verify later that estimates of ρ_d and α_d confirm that the assumption is satisfied in the data.

Proposition 4 *Under* Assumption 2, *for each v_{sd}, the equilibrium amount of contributions is unique and is determined by the following expression:*

$$C_{sd}^* = \max\left\{\widehat{C}_{sd}, 0\right\} \quad (5)$$

$$\text{where } \widehat{C}_{sd} \text{ solves } \widehat{C}_{sd} = \rho_d v_{sd} + \gamma_d - \frac{\beta_d}{\alpha_d}\left(\exp\left(\frac{\alpha_d \widehat{C}_{sd} + v_{sd}}{\beta_d}\right) - 1\right) + \varepsilon_{sd} \quad (6)$$

Proof. See Appendix. ■

Proposition 5 *For given ε_{sd}, the equilibrium amount of contributions by lobby s,the relationship between C_{sd}^* and v_{sd} follows an inverted-U pattern: it increases with v_{sd} for $v_{sd} \leq \widehat{v}_{sd}$ and it decreases with v_{sd} for $v_{sd} > \widehat{v}_{sd}$ where $\widehat{v}_{sd}$ is the maximum of the implicit function $C_{sd}^*(v_{sd})$ in (5).*

Proof. See Appendix. ■

The exponential distribution presents some properties that are desirable in the context of our model. First, the pdf is always decreasing[48], as required in order to obtain a concave maximization problem. Second, it is decreasing at a rate such that the combination of the Marginal Benefit

[47] The intuition behind this assumption relies on the property of negative exponentials that "the future is independent of the past" (i.e. they are memoryless). Notice that this assumption is similar in spirit to the assumption of no economic interaction among lobbies made in several papers in the political bargaining literature, see Drazen and Limâo (2007).

[48] This property also implies that, if the location parameter λ is negative, then for the incumbent victory by a larger margin is more likely than victory by a smaller margin, up to margin $v_d^I - v_d^A = \lambda$, but larger margins have zero probability. We recognize this might not be a fully realistic representation of the ex-ante form of uncertainty.

Effect and the Substitution Effect dominate over the Surplus effect for large values of v_{sd}, which is consistent with the empirical regularity found in the data in Section 2. Third, the exponential is parametrically parsimonious, in that it is identified by just two parameters. This is an important technical condition that we need to keep in mind when bringing the model to the data.

Since we cannot solve explicitly for C^*_{sd} we show the inverted-U shape by means of a numerical example. Figure 2 illustrates the behavior of the contribution function for the indicated values of the parameters.

Given the simple structure of C^*_{sd} it is possible to assess the effect of changes in the parameters (β, α, γ, ρ) on the shape of the inverted-U relation. Such effects are described in the following proposition.

Proposition 6 *Setting for simplicity* $\varepsilon_{sd} = 0$

(i) the maximum amount of contributions in district d is given by the interest group of size:

$$v^{\max}_{sd} = \frac{\beta_d \left(\ln \alpha_d \rho_d + \alpha_d \rho_d - 1\right) - \alpha_d \gamma_d}{1 + \alpha_d \rho_d} \tag{7}$$

and the level of contributions by that group is:

$$C^{\max}_{sd} = \frac{\alpha_d \gamma_d + \beta_d \left(1 - \alpha_d \rho_d + \alpha_d \rho_d \ln \alpha_d \rho_d\right)}{\alpha_d \left(1 + \alpha_d \rho_d\right)} \tag{8}$$

(ii) as uncertainty of the electoral race increases, i.e. β_d *increases,* $v^{\max}_{sd}$ *increases and* $C^{\max}_{sd}$ *increases under the condition that* $\ln \alpha_d \rho_d > 1$

Proof. See Appendix ■

The intuition for this result relies on the fact that when elections are more uncertain the marginal benefit of contributions does not decline as rapidly so the *surplus effect* dominates for a larger range of values of v_{sd}, which makes the 'hump' shift to the right. In this section we have presented a model of the interaction between a legislator and several lobbies that, under some assumptions, delivers the observed inverted-U relationship between votes and contributions[49].

In Section 4 we estimate the structural parameters of the model: the electoral impact of a dollar, α_d, the uncertainty of the race, β_d and the effectiveness of the politician ρ_d.

[49] Although this framework provides a possible explanation for the observed hump-shaped pattern, an alternative explanation could be developed along the following lines. Imagine that, as in Grossman and Helpman (1994), politician d cares about contributions, but also about the welfare of its constituents (in this case all voters in district d). The proposed policy y_s causes an overall distortion in welfare, but also benefits the group of voters v_{sd}. In this case contributions might increase with the size of the group for the same reason as in our model (the politician obtains a fraction of a larger surplus), but might decrease because the welfare loss caused by a given policy y_s in the district decreases with the size of the group v_{sd}. For simplicity, let the welfare loss at the national level be constant. Then

4 Estimation

This section presents a Maximum Likelihood estimator of the structural parameters of the model. In order to implement ML we impose the distributional assumption that ε_{sd} be i.i.d. within district d and normally distributed with mean zero and variance σ_d^2. We account for the censored nature of political contributions[50] (which cannot be negative) through specifying a latent contribution equation:

$$\widehat{C}_{sd} = \rho_d v_{sd} + \gamma_d - \frac{\beta_d}{\alpha_d}\left(\exp\left(\frac{\alpha_d \widehat{C}_{sd} + v_{sd}}{\beta_d}\right) - 1\right) + \varepsilon_{sd}$$

and a realized (observed) contribution equation:

$$C_{sd} = C_{sd}^* = \begin{cases} 0 \text{ if } \widehat{C}_{sd} \leq 0 \\ \widehat{C}_{sd} \text{ if } \widehat{C}_{sd} > 0 \end{cases}.$$

With the substantial exception of the nonlinear nature of the model, the problem is a common censoring framework, that is nicely accommodated by MLE. Notice that while ε_{sd} is normally distributed, $\widehat{C}_{sd}$, which is a nonlinear transformation, is not. Now define

$$\omega_{sd} = \frac{1}{\sigma_d}\left[\widehat{C}_{sd} - \rho_d v_{sd} - \gamma_d + \frac{\beta_d}{\alpha_d}\left(\exp\left(\frac{\alpha_d \widehat{C}_{sd} + v_{sd}}{\beta_d}\right) - 1\right)\right].$$

It follows that for given d the log-likelihood of the problem is:

$$\begin{aligned} & \ln L(\theta_d | v_{1d,\ldots,} v_{Sd}) \qquad (9) \\ = & \sum_{s=1}^{S} (1 - Z_{sd}) \ln\left(1 + \exp\left(\frac{\alpha_d C_{sd} + v_{sd}}{\beta_d}\right)\right) \\ & - \sum_{s=1}^{S} (1 - Z_{sd}) \frac{1}{2}\left(\ln \sigma_d^2 + \ln 2\pi + \omega_{sd}^2\right) \\ & + \sum_{s=1}^{S} Z_{sd} \ln \int_{-\infty}^{0} \left(1 + \exp\left(\frac{\alpha_d \widehat{C}_{sd} + v_{sd}}{\beta_d}\right)\right) \frac{1}{\sigma_d \sqrt{2\pi}} \exp\left[-\frac{1}{2}\omega_{sd}^2\right] d\widehat{C}_{sd}, \end{aligned}$$

a district with a larger fraction of voters in sector s experiences a relatively lower welfare loss and therefore the politician d might ask for a lower level of contributions to partially compensate for the welfare loss. In order for these forces to yield an hump-shaped pattern of contributions, this second effect must get stronger as the voter groups size v_{sd} increases, i.e. the benefit from policy y_s must be increasing more than linearly with group size v_{sd}. It is not obvious on which grounds to justify such a functional form assumption and our explanation, which relies on a decreasing probability of larger defeat margins (i.e. a declining $f(\cdot)$) might be easier to rationalize. To se why, consider that a functional form assumption on diminishing welfare losses would be required to operate similarly for sectors completely different in terms of technology or market characteristics.

We discuss and test in Appendix B a series competing hypothesis.

[50] Notice that ML approach allows to incorporate this feature of the data in a natural way. In the reduced-form analysis of the previous section we have opted for OLS as a simpler (and rougher) approximation.

where we employ the indicator function $Z_{sd} = I[C_{sd} = 0]$ and denote by θ_d the vector of parameters of interest to be estimated for each district d:

$$\theta_d = (\alpha_d, \beta_d, \gamma_d, \rho_d, \sigma_d).$$

The argument of the logarithm in the first element of (9) is the Jacobian of the transformation[51]. Finally, in the estimation procedure we will impose certain inequality constraints requested by the model ($\alpha_d > 0$, $\beta_d > 0, \sigma_d > 0$).

In the next sections we first report the quantitative results obtained from estimating the bargaining model. We then provide an interpretation of the structural parameters and we compare them to previous politico-economic studies.

4.1 Results

This section presents the ML estimates of θ_d district by district, in a fashion similar to the analysis in (1). Given the reassuring consistency of the reduced-form analysis across Congressional branches and years, in the structural analysis we will focus on the set of incumbents of the 106th House, specifically those running for reelection in November 2000.

From a computational standpoint, the main issues in maximizing (9) involve the ratios of the α_d and β_d parameters, the highly nonlinear (exponential) components in the Jacobian, and the numerical computation of the integral in the last line of (9). The likelihood function turns out to be relatively well behaved after opportune reparameterization. We confirm this through model-specific Monte-Carlo simulations. Specifically, when performing simulations of the data from known distributions and parameters, the maximum likelihood estimator of the model performs well in delivering back the original parameters, even in samples of size 100 (the effective per-district sample sizes are 86 and 84 for 2000 and 1990 respectively). However, according to the Monte-Carlo evidence the parameters α_d and, especially, β_d exhibit a certain degree of sensitivity to miss-specifications in the underlying distribution[52]. Finally, in the following analysis the maximization proceeds from a set of initial values that is randomly sampled $1,200$ times, reassuring on the presence of a unique maximum.

Table 5 presents the distribution of the maximum likelihood parameters by Congressional district race. Since the nonlinear model is unit-dependent, we perform the analysis employing contributions in dollars for C_{sd} and number of employees, v_{sd}, adjusted for average voter turnout of

[51] That is $\left|\partial\varepsilon_{sd}/\partial\widehat{C}_{sd}\right|$.

[52] See the rest of this section for further discussion of this issue.

voting age population in the 2000 electoral cycle, 51.3% (FEC)[53]. For the sake of exposition and for consistency with much of the literature we report the inverse of the parameter α_d, whose natural interpretation is the amount of money necessary to buy one vote. This approach has the additional implication of allowing us to employ \$1 as the unit of analysis for all parameters with the exception of β_d (expressed in number of votes). A relatively coarse[54] grid-search has to be applied to the transformed parameter $1/\alpha_d$. For completeness we also include in the bottom part of Table 5 the distribution of the maximum likelihood parameters by Congressional district race including the districts where we obtain a maximum on the bounds of the grid of $1/\alpha_d$ (i.e. at \$0 and \$1,000). These figures are less informative within the framework of our model, since it is problematic to interpret the results on the bounds (at \$0 the value of α_d is not finite and at \$1,000 the maximum of the likelihood function might not have been achieved). The upper part of Table 5 excludes these districts.

Overall both the SIG's and the politician's parameters are precisely estimated when looking at the frequency of the z-test rejections at 0.05 confidence level (computed with robust standard errors) across races. Only the parameter γ_d is statistically zero in less than 1/3 of the districts, indicating that policy benefits seem to be related to SIG's size without any constant benefit. The SIG's policy benefit per worker ρ_d is on average \$347.9, and its median is \$113.2. Notice however the substantial variation in the estimates of the per-worker benefit. The standard deviation across Congressional races is \$342.66. We observe higher figures for ρ_d when focusing on the districts where the maximum likelihood estimates are not necessarily interior to the bounds of the grid for $1/\alpha_d$. Particularly, the mean benefit per worker increases to around \$547.9 and the median to \$703.8. The standard deviation of the distribution of the idiosyncratic random component ε_{sd}, representing the specific ability of a politician to support a particular sector, is precisely estimated. The mean value of σ_d is \$22,223.6 with a standard deviation across all districts of \$11,799.9. Including districts on the bounds of $1/\alpha_d$ does not substantially affect the moments of the estimates of σ_d.

Focusing on the politician's parameters, the estimated monetary value of a vote, $1/\alpha_d$, is on average \$339.33 with a median[55] of \$100. Similarly to the case of ρ_d, the variation across district is substantial, with a standard deviation of \$341. When focusing on the districts where the maximum is not necessarily interior to the bounds of $1/\alpha_d$ (where the model does not perform accurately) we

[53] Given the nonlinearity of the model, the use of the appropriate unit for votes and contributions is necessary in order to obtain consistent estimates of the marginal effect of contributions. In the linear regression models of the reduced-form section the estimates of the peak are independent of the unit.

[54] The grid search ranges on $1/\alpha_d \in \{0, 10, 25, 50, 75, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000\}$.

[55] The median value of $1/\alpha_d$ falls on a point of the grid.of as a result of its discreteness.

find both higher mean and median (\$536.8 and \$700 respectively). Notice that 67 percent of the sample falls within the bounds and only 8 observations out of 401 actually reach a maximum of the likelihood at $1/\alpha_d = 0$.

The scale parameter of the ex ante distribution of adversary versus favorable voters to the incumbent, β_d, is significantly estimated in more than half the districts/races. The location parameter of the distribution, λ_d, is not identified in the model and not estimated. The mean number of votes of the scale parameter is $334,503.4$, and $369,048.3$ when we include districts with estimates on the boundary of the grid of $1/\alpha_d$. More interestingly, the median number of votes of the scale parameter is $121,918.2$, and $250,189.0$ when we include districts with estimates on the boundary of the grid of $1/\alpha_d$. To interpret the estimates recall that the mean and median of the distribution are not identified without λ_d, but that the scale of an exponential distribution is its standard deviation and, more informatively for an asymmetric distribution, approximates the size of the interquartile range (i.e.$\beta_d \simeq \beta_d (\ln 4 - \ln 4/3)$). Therefore we can attribute to β_d's estimates the interpretation of ex ante electoral uncertainty. It is interesting to notice that the results obtained from estimating ex ante electoral uncertainty from the money-votes curve compare in magnitude to the ex post electoral margins observed in the data. In the 2000 electoral cycle the average vote margin was $87,168$ votes, with an aggregate standard deviation of $45,996$ votes. These figures confirm that β_d's fall within a reasonable quantitative range, albeit with the caveat of aggregating ex post electoral uncertainty across Congressional races. Along this line of reasoning in the next section we go in further depth in analyzing the predictive power of the model by comparing its estimates to data not explicitly included in the empirical design. We will interpret such results as a validation of the predictive capacity of the model.

4.2 Validation of the estimates employing information external to the model

The simplicity of the empirical approach that we follow (essentially based on SIG's voters and contributions only) should not sacrifice excessively to realism of prediction. In this section we present validation exercises for the estimated parameters of the model. We confront the district-level estimates of the parameters with out-of-sample information regarding the ex post tightness of the electoral races and the specific characteristics of the constituency.

Table 6 reports the results of regressing the district/politician-specific parameters on a set of covariates. In columns (1) and (2) the vector of parameters $1/\alpha_d$, proxying for the estimated cost of swaying an additional voter, is regressed on the ex post vote margin[56] of the electoral race (in

[56]The ex post vote margin is defined as the difference between the votes accrued to the elected candidate minus

the first column) and on the population density (number of inhabitants per land square mile) in the second column. In principle we would expect races that are ex ante electorally more uncertain to be also more expensive. It is however challenging to measure ex ante electoral uncertainty. Poll surveys, for instance, are extremely volatile and change radically (and endogenously to contributions) over time. We therefore inversely approximate ex ante uncertainty with the ex post vote margins. On a different token, we would expect that more densely populated areas where media markets charge higher advertisement fees to be also associated with higher $1/\alpha_d$. In columns (3) the vector of parameters β_d (proxying for ex ante dispersion of electoral margins) is regressed on the ex post vote margin of the electoral race. Estimated ex ante uncertain races should be negatively associated with ex post vote margins. We verify that these three hypotheses seem confirmed by the data (in sign and statistical significance for $1/\alpha_d$ and sign only for β_d).

A check on the comparative statics of the model is reported in column (4). Proposition 6 predicts a positive correlation between the size of the SIG with largest contributions and the degree of uncertainty of the race. The intuition is that more uncertain races should present a peak at a larger lobby size since the marginal impact of a dollar of contributions is relatively more valuable in tighter races. This is clearly embedded in the estimated parameters (higher β_d's imply larger $\hat{v}_{sd}$). The data on ex post vote margins confirm this result as well. In column (4) we regress the reduced-form estimates of $\hat{v}_{sd}$ on the size of the vote margin and we find the expected negative sign (statistically significant at 5 percent confidence level). This further supports the interpretation of column (3) on electoral uncertainty.

Considering that information about the specific electoral outcomes or geographic characteristics of the constituency is not directly incorporated in our estimation, we find these results reassuring.

4.3 Previous estimates of the cost of an additional vote

Our estimates of $1/\alpha$ can be compared to the results of previous studies on the impact of campaign spending on electoral outcomes. In particular these studies have obtained estimates of campaign spending by the incumbent and the main challenger on the realized vote shares. Levitt (1994) presents estimates of the effect of a $\$100,000$ (in 1990 dollars) increase in spending on the vote share. The general conclusion of that study is that campaign spending has no statistically significant effect on the election outcome, when one controls for unobserved candidate quality and district characteristics. At most those effects are very small, implying that votes are very costly to obtain

those accrued to the second, divided by the sum of the two numbers. This measure is inversely proportional to the tightness of the race.

though campaign spending. The estimates vary according to the specification, but we consider the numbers reported in column (1) of Table 5 of Levitt (1994) as an example.[57] Levitt finds that an increase of $\$100,000$ gives the challenger 0.3% more of the vote, while it gives the incumbent only roughly an extra 0.1% of the vote. In 2000 the number of U.S. citizens who had the right to vote was about 186 millions, of whom 59.5% voted.[58] A typical district would have therefore about $427,600$ eligible voters, of whom only $256,500$ vote on average. This means that $\$100,000$ would buy about 770 extra votes using the challenger estimate, which amounts to a price of about \$130 per vote. The price would be \$390 per vote using the incumbent estimate for the spending coefficient. These numbers are compatible with the estimates that we report for the $1/\alpha_d$ in our model. The implied cost of a vote is on average \$339.3 with a median of \$100 according to our estimates.

Levitt (1994) also reports estimates by Jacobson (1980) and Green and Krasno (1988) of the same effect but employing different empirical designs. In these studies the effects are larger[59]: the 2SLS estimates of Green and Krasno (1988)[60] imply an effect of 2.4% (for the challenger) and 2.2% (for the incumbent), which imply a cost of \$16.25 and \$18 per vote.

It is worth emphasizing that the estimate of $1/\alpha_d$ that we obtain reflects the ex-ante evaluation by a politician of the cost of buying an extra *certain* vote. In the studies mentioned above, the estimates refer to the ex-post realization of the effect of votes on contributions. With this distinction in mind, our estimates are more in line with the cost implied by Levitt (1994) results.

4.4 Estimating returns to political contributions: Tullock's puzzle

In this section we present a calibration of the model's results aiming at quantitatively addressing what in the political economy literature is commonly referred to as the Tullock's puzzle[61]. Simply stated, the puzzle is that the amount of political contributions is too low relative to the substantial amount of public resources that special interests seem able to obtain through bargaining with politi-

[57] The individual coefficients in this column are not individually statistically significant, but we use the estimate to illustrate the order of magnitude.

[58] See Jamieson et al. (2002). This is the ratio between the number of voters and the the number of citizens who have the right to vote aged 18 and over. Notice that this is different from the ratio between the number of voters and the number of individuals in the country aged 18 and over (51.3%) due to the presence of foreigners and individuals who cannot vote. We use the latter percentage when assessing the percentage of voting workers in each sector.

[59] See Table 3 in Levitt (1994).

[60] These are the estimates that most closely compare to Levitt (1994) as they include an index of quality of the challenger.

[61] In Tullock (1972). See Ansolabehere, et al. (2003) for a detailed overview of the topic.

cians. This implies absurdly high rates of return from political investments that seem unjustifiable in any other competitive market. Alternatively the puzzle can be restated as the politicians being unreasonably cheap.

A natural interpretation of our model is that politicians and special interest groups exchange more than political contributions, they also bargain over votes. The "missing money" may be due to the omission from the rate of return calculation of the votes that the lobby supplies the politician at the moment of the election. In order to (roughly) gauge quantitatively the magnitude of such an omission consider the following example (one of the most striking they present) from Ansolabehere, de Figueiredo, Snyder (2003, p. 111). In 2000 total USDA subsidies to agriculture amounted to \$22.1 billion[62] vis-a-vis total political contributions in the amount of \$3.3 million. Taken at face value these two numbers imply an astronomical rate of return. About \$6,665 for every \$1 of political contributions. However, this computation disregards the value of the about 2 million U.S. working-age voting farmers and the implied value of one of their votes (\$400). Consider now the rate of return that correcting for this additional component would imply. The rate of return adjusts to a still very high, but more reasonable figure, about \$26 for every \$1 of political contributions (\$12 for an average year)[63]. This correction produces a reduction of the estimate of more than 2 orders of magnitude, indicating that accounting for the substitution between contributions and votes may substantially help in reducing the apparent paradox behind Tullock's puzzle.

The structural estimates of the model can also help shedding light on the quantitative relevance of the votes/money interaction and their effect on the estimates of the return to "political investment". In Table 7 we report the estimated average rates of return for political contributions across SIGs (106th House) computed in two different ways. The first line of the table computes the district-SIG specific rate of return as the ratio of monetary benefit from the policy and political contributions, that is

$$RR_{sd} = \frac{\gamma_d + \rho_d v_{sd}}{C_{sd}} - 1. \qquad (10)$$

The average rate of return across all districts and lobbies is \$431 for every \$1 of political contributions with a large standard deviation across districts of \$1542. The mean value is surprisingly close to estimates obtained using actual subsidy data. We can now compare the average RR to the

[62] This amount is the highest figure of the all 1995-2004 decade of subsidies paid by the USDA. The average yearly figure ranges around \$11 billion.

[63] Notice that although votes do not 'cost' anything to farming interest groups, it is nevertheless necessary to include them in the calculations to find the correct marginal return to contributions, that is the return the next dollar of contributions would earn the interest group.

measure implied by the model:

$$RR'_{sd} = \frac{\gamma_d + \rho_d v_{sd}}{C_{sd} + \alpha_d v_{sd}} - 1. \tag{11}$$

The results employing (11) appear on the second and third rows of Table 7. The model-implied average rate of return RR' across all districts and all lobbies is a reasonable \$0.33 for every \$1 of political contributions[64] (\$0.12 employing the same sample as row 1). The standard deviation across districts reads around \$12, a larger figure which may well encompass cases like the agricultural example we have just presented.

Table 8 reports all the moments of the lobby-specific estimated rates of return. Part (a) of the table reports the statistics computed with the definition in (10), while part (b) of Table 8 employs the definition in (11) for estimating returns. As expected, part (b) reports values of the rates of return that are quantitatively reasonable.

In synthesis we believe the inclusion of the electoral dimension to the bargaining problem over political contributions sheds substantial light on the rationale behind the observed figures. The level of political contributions in the data does not appear unreasonably low once the role of SIG's votes is also taken into account.

5 Conclusion

This paper models and empirically tests a series of predictions concerning the bargaining of politicians and local special interest groups. We uncover a novel pattern in the data concerning the relationship between votes and money in US congressional politics that follows an inverted-U relationship. A simultaneous bilateral bargaining game with heterogenous special interest groups rationalizes the data appropriately[65], emphasizing the pattern of substitution between votes and money that emerges when lobbies tend to be large in terms of workers/voters. The estimates also provide a valid alternative to present studies of the amount of money necessary to sway one voter and of the rates of return of political contributions.

An avenue of future research is to explore how the approach developed in this paper may be extended to formal treatment of the coordination of local and national special interests. While the pattern of contribution operates mostly at the level of local interactions, national coordination of

[64] We restrict our attention to the sample with positive political benefit, as required by the model. About 5 percent of the observations violate this constraint. However including such observations would have the effect of reducing the rate of return of political contributions even more, not increasing it.

[65] In Appendix B we explore alternative hypotheses that might be consistent with the pattern observed and show evidence that points toward an interpretation of the results that is closer to our model.

SIG's is essential. Relatively few studies in political science and in political economy have tried to address this issue systematically, mostly focusing on the SIG as a national entity.

This paper contributes to the literature concerned with modeling the interaction between economic and political interests from a rational choice perspective[66]. Relative to standard reduced-form approaches in the literature the more structured approach followed in the paper allows to simultaneously gauge the role of electoral uncertainty and politicians effectiveness as perceived by the interest groups.

[66] The paper therefore is also related to a well established literature on how economic interests influence political policy-making. See Peltzman (1984, 1985).

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6 Appendix A

To simplify expressions we are going to drop the subscript d in the following proofs.

Proof of Proposition 4

Substituting the expression for the probability density function and the cumulative density function in (4) and setting, WLOG, $\gamma = 0$ and $\varepsilon_s = 0$, delivers the following FOC:

$$C_s + \frac{\beta}{\alpha} \exp\left(\frac{\alpha C_s + v_s}{\beta}\right) - \rho v_s - \frac{\beta}{\alpha} = 0$$

We can rewrite this equation as $g(C_s) = 0$. Function $g(\cdot)$ is continuous and differentiable on $\mathbb{R}$. Since $\lim_{C_s \to -\infty} = -\infty$ and $\lim_{C_s \to \infty} = \infty$ then by the Intermediate Value Theorem, there exists a real number C_s^*, such that $g(C_s^*) = 0$

In order to prove uniqueness let us assume that the root of $g(\cdot)$ is not unique, i.e. there are two roots C_s^1 and C_s^2 , $C_s^1 < C_s^2$ such that $g\left(C_s^1\right) = g\left(C_s^2\right) = 0$. Then by the Mean Value Theorem, there must be a real number C^0 such that:

$$g'\left(C^0\right) = \frac{g\left(C_s^2\right) - g\left(C_s^1\right)}{C_s^2 - C_s^1} = 0$$

However $g'(\cdot) = 1 + \exp\left(\frac{\alpha C_s + v_s}{\beta}\right) > 0$ so, by contradiction there must be only one real number that solves $g(C_s) = 0$. If such solution is negative then contributions are set to be equal to zero.

Proof of Proposition 5

We are interested in the behavior of the function C_s^*. By applying the implicit function theorem we can derive:

$$\frac{dC_s^*}{dv_s} = \frac{\rho - \frac{1}{\alpha}\exp\left(\frac{\alpha C_s^* + v_s}{\beta}\right)}{1 + \exp\left(\frac{\alpha C_s^* + v_s}{\beta}\right)} \tag{12}$$

Substituting FOC (5) in (12) we find:

$$\frac{dC_s^*}{dv_s} = \frac{\rho\beta + C_s^* - \rho v_s - \gamma - \varepsilon_s - \frac{\beta}{\alpha}}{\beta\left(1 + \exp\left(\frac{\alpha C_s^* + v_s}{\beta}\right)\right)}$$

The slope of the contribution function is positive whenever $C_s^* > \rho v_s + \gamma + \varepsilon_s + \frac{\beta}{\alpha} - \rho\beta$, it is zero when

$$C_s^* = \rho v_s + \gamma + \varepsilon_s + \frac{\beta}{\alpha} - \rho\beta \tag{13}$$

and it is negative otherwise.

It must be the case that contributions are not larger than total income of the lobby. In Figure A1 this means that the contribution function must be always below the line $C_s^* = \rho v_s + \gamma + \varepsilon_s$.

At $v_s = 0$ contributions $C_s^*(0)$ can be found by solving the following equation:

$$C_s^*(0) + \frac{\beta}{\alpha} \exp\left(\frac{\alpha C_s^*(0)}{\beta}\right) = \gamma + \varepsilon_s + \frac{\beta}{\alpha}$$

We need to show that $C_s^*(0) > \gamma + \varepsilon_s$. Figure A2 shows that in order to prove this, we need to evaluate the function $C_s^* + \frac{\beta}{\alpha} \exp\left(\frac{\alpha C_s^*}{\beta}\right)$ at $\gamma + \varepsilon_s$ and show that it is larger than $\gamma + \varepsilon_s + \frac{\beta}{\alpha}$:

$$\gamma + \varepsilon_s + \frac{\beta}{\alpha} \exp\left(\frac{\alpha(\gamma + \varepsilon_s)}{\beta}\right) > \gamma + \varepsilon_s + \frac{\beta}{\alpha} \tag{14}$$

Inequality (14) is satisfied for $\varepsilon_s > -\gamma$, a condition that we assume holds (this means ε_s is not "too" negative). Since we have established that under certain conditions at $v_s = 0$ contributions are strictly smaller than income, we only need to show that the contribution function increases at a lower rate than income to complete the proof that the contribution function is in between the two parallel lines in Figure A1 when it is increasing. This amounts to showing that $\frac{dC_s^*}{dv_s} < \rho$ which is satisfied since:

$$\frac{\rho - \frac{1}{\alpha} \exp\left(\frac{\alpha C_s^* + v_s}{\beta}\right)}{1 + \exp\left(\frac{\alpha C_s^* + v_s}{\beta}\right)} < \rho$$

Proof of Proposition 6

From the proof of Proposition 4 we know that the point $(v_s^{\max}, C_s^{\max})$ is located at the intersection of the function describing the FOC in (5) and (13). By solving the system of two equations in two unknowns, we find a unique solution as in (7) and (8). To prove (ii) we calculate the first derivative:

$$\frac{dv_s^{\max}}{d\beta} = \frac{\ln \alpha\rho + \alpha\rho - 1}{1 + \alpha\rho}$$

which is positive by Assumption 3. We do the same for contributions:

$$C_{sd}^{\max} = \frac{1 - \alpha\rho + \alpha\rho \ln \alpha\rho}{\alpha(1 + \alpha\rho)}$$

which is positive if and only if $\ln \alpha\rho > 1$.

7 Appendix B: Alternative Hypotheses

The analysis so far has only briefly considered alternative explanations that might be consistent with the pattern that we uncover in the data. Here we decide to discuss two interesting hypotheses that could potentially explain the hump-shaped relationship between votes and contributions. We find evidence that points against these explanations and leaves the hypothesis proposed in this paper as the more convincing alternative.

A first hypothesis, which we refer to as "free-riding", finds an explanation for the declining section of the relationship in the following observation, by Mancur Olson (1965) about larger groups: "Though all of the members of the group therefore have a common interest in obtaining this collective benefit, they have no common interest in paying the cost of providing that collective good." Free riding would imply that as the size of the group increases, the incentive to contribute declines. Although we cannot formally test our model against this alternative we attempt to address this issue in two ways.

First, we employ data on number of establishments per sector in a district to control for the extent of free-riding. If the Olsonian view were correct, then for a given number of employees in a sector, we should observe that the smaller the number of firms (approximated by the number of establishments), the larger each firm and the larger the incentive to contribute towards the common favorable policy. So we should observe a negative relationship between the amount of contributions and the number of firms/establishments, given the size of the sector (i.e. size of the labor force). Denote number of establishments in sector s in district d by e_{sd}. The district-level regression results reported in Table A3 refer to the following specification:

$$C_{sd} = \kappa_d + \delta_{d,1} v_{sd} + \delta_{d,2} v_{sd}^2 + \xi_d e_{sd} + \mu_{sd}$$

We find that in many districts, contrary to the free-riding hypothesis, for a given sector size, the amount of political contributions rises the more dispersed the sector is, that is the larger the number of establishments. In 403 districts out of 435 the coefficient ξ_d on establishment number is positive and in 105 also significant, pointing to the fact that this data does not seem to indicate the presence of free-riding and that, even controlling for this dimension, the district-level hump shape, documented in Table 3 remains unchanged.

The second piece of evidence suggesting that free-riding cannot explain certain features of the data is found in Table 5 where we show that the hump moves to the right when election margins are closer (i.e. less predictable). There is no unambiguous reason for why free-riding should decrease when elections are more uncertain. This is in contrast with our intuitive interpretation that contributions become more important in uncertain elections because their marginal impact is higher. Although we cannot nest formally the collective action problem within our model, we believe these two pieces of evidence point against an Olsonian interpretation of the pattern found in this paper.

A second hypothesis that we consider is summarized by the following simple example. Imagine a politician cares equally about votes and contributions and bears a cost m when supporting a policy favorable to interest group s (it might be because of the welfare loss or private effort in arguing in favor of a piece of legislation). Also assume that the interest group s benefits v_s from such legislation and makes a take-or-leave offer in terms of contributions and electoral support (v_s) to the politician to solicit support of the policy. Such simple game yields the simple prediction that contributions by sector s:

$$C_s = \begin{cases} 0 & \text{if } v_s \leq m \\ m - v_s & \text{if } v_s > m \end{cases}$$

This simple example would imply that contributions are negligible up to a certain size of the interest group, they then increase discretely and then decline. Such pattern is not confirmed in the data where we notice that the relationship between votes and contributions is characterized by a significant increasing section and about 1 dollar out of 3 of political contributions within a district are paid by the SIG's below the median. This seems to suggest that the hypothesis is not sufficient to explain the hump-shaped pattern.

TABLE 1

Definition of Special Interests and number of employees for 106th Congress (House).

OSID	Definition	Mean	Std. Dev.	Min	Max
6	Forestry & Forest Products	1600.774	1890.797	18.3855	17640.01
7	Agricultural Services & Production	263.0234	418.6269	0	4565.465
8	Oil & Gas	171.6477	424.3744	0	2530.822
9	Mining	806.4858	1501.08	2.622	12571.5
10	Coal Mining	172.6079	852.6048	0	11258.5
11	Electric Utilities	1288.346	842.5555	5.4245	5954.603
12	Natural Gas Pipelines	281.465	305.3758	0	1928.5
13	Construction Services	2988.811	2098.047	125.388	17816.61
14	General Contractors	3790.737	1690.637	954.99	19602.02
15	Building Trade Unions	3790.737	1690.637	954.99	19602.02
16	Home Builders	1834.398	816.7879	373.984	6305.734
17	Special Trade Contractors	6644.215	2653.552	2120.248	20260.6
18	Food Processing & Sales	10205.9	3698.206	3651.561	37717.5
19	Food Products Manufacturing	2306.02	1598.204	193	9917.988
20	Meat processing & products	1227.074	2393.117	0	24158.5
21	Tobacco	76.65347	439.246	0	6232.55
22	Textiles	1388.488	3482.393	41.344	41151.9
23	Clothing Manufacturing	1242.382	1909.777	22.5435	12138.29
24	Printing & Publishing	3673.303	2303.484	356.967	25079.53
25	Chemical & Related Manufacturing	1640.49	1927.645	67.901	19408.71
26	Pharmaceuticals / Health Products	1289.976	1407.634	47.26	10972.17
27	Pharmaceutical Manufacturing	563.7434	1100.758	0	9732.198
28	Building Materials & Equipment	1298.678	1208.794	27.408	8409
30	Steel Production	1098.956	1819.361	0	23669.44
31	Telecom Services & Equipment	638.6521	1180.519	0	15302.03
32	Defense Electronics	1087.843	1572.09	0	11892.87
33	Transportation Unions	11137.59	6338.314	841.752	42422.91
34	Automotive	6194.012	5095.358	359.64	36013.28
35	Auto Manufacturers	3050.275	4982.112	15.01	32731.62
36	Defense Aerospace	1126.361	2995.349	0	40780.5
37	Medical Supplies	726.2326	678.4132	42.282	4182.918
38	Car Dealers	3143.737	868.8899	326.106	5843.848
39	Retail Sales	17256.11	3776.982	5958.36	33773.91
40	Food Stores	6672.805	1573.148	2784.362	13160.99
41	Beer, Wine & Liquor	473.9975	497.6569	88.7165	7296.957
42	Air Transport Unions	1511.263	2724.186	0	26866.83
43	Air Transport	1511.263	2724.186	0	26866.83
45	Sea Transport	116.6885	355.5107	0	4147.58
46	Trucking	3315.628	1817.451	482.112	13248.5
48	Books, Magazines & Newspapers	1771.081	1556.84	169.456	20656.77
49	Computers/Internet	3183.758	4891.093	13.851	51180.5

TABLE 1 *(cont.)*

Definition of Special Interests and number of employees for 106th Congress (House).

OSID	Definition	Mean	Std. Dev.	Min	Max
50	Computer Software	773.1745	1457.821	4.617	12025.71
51	TV / Movies / Music	1890.093	1737.901	242.998	20868.35
52	Motion Picture Prod. & Distr.	664.0962	851.4915	91.8855	6584.293
53	TV Production & Distribution	1197.087	1145.744	194.987	9716.751
54	Recorded Music & Music Prod.	70.44736	181.7367	0	2343.38
55	Commercial TV & Radio Stations	622.5587	656.3843	4.617	8808.215
56	Cable & Satellite TV Prod. & Distr.	532.9909	519.0946	10.945	5123.996
57	Telephone Utilities	2762.673	2399.578	476.4955	18075.83
58	Commercial Banks	4493.89	2537.401	775.656	29970.92
59	Finance / Credit Companies	1455.047	1326.288	55.89	8998
60	Securities & Investment	2053.609	5276.703	33.534	72306.61
61	Insurance	5335.83	4047.251	345.303	33270.47
62	Real Estate	3545.89	2262.202	672.6205	22452.7
63	Lawyers / Law Firms	2439.902	2193.965	484.056	27134.4
64	Accountants	2680.414	2628.266	566.321	15356.94
65	Architectural Services	2790.666	2041.217	84.078	17622.39
66	Business Services	4364.555	3071.728	399	20300.56
67	Advertising/Public Relations	1371.45	1853.434	87.237	24603
68	Waste Management	743.6629	368.9448	166.86	4836.013
69	Teachers Unions	1682.749	796.674	258.5	5622.129
70	Education	5920.725	4476.681	616.5	33856.88
71	Health Professionals	7052.444	1734.837	2482.245	13481.56
72	Dentists	1640.643	457.2083	538.974	3101.65
73	Health Services/HMOs	3508.377	1967.299	796.5	19131.1
74	Hospitals & Nursing Homes	17926.79	5090.785	4536.234	43214.27
75	Recreation / Live Entertainment	783.5836	908.7351	80.693	11383.91
76	Pro. Sports, Arenas & Services	255.4357	294.7838	3.57	2950
77	Casinos / Gambling	490.8453	1291.754	0	17499.5
78	Lodging / Tourism	4243.569	8069.158	118.341	118111.2
79	Food & Beverage	18871.83	5041.846	3970.863	41557.07
80	Restaurants & Drinking Estab.	17506.03	4821.89	3545.37	37134
81	Funeral Services	406.5309	148.0021	86.5	965
82	Clergy & Religious Org.	3604.952	1439.032	666.999	13692.06
85	Dairy	329.5306	465.9284	0	3360.06
86	Credit Unions	473.7558	261.2535	9.72	1979.561
87	Chiropractors	245.7761	94.97468	67.592	558.5
88	Alternative Energy Prod. & Serv.	38.96531	104.5054	0	978.723
89	Nutritional & Dietary Suppl.	73.85015	268.7844	0	3755.029
90	Miscellaneous Defense	15.6081	97.49768	0	1749.5
91	Airlines	1306.594	2540.237	0	26371.38
92	Cruise Ships & Lines	29.58883	212.2318	0	2942.45
93	Savings & Loans	589.7094	487.3434	8.8425	2755.505
94	Mortgage Bankers & Brokers	562.6269	526.3119	21.384	3998.392
95	Venture Capital	94.85496	110.2757	2.261	1116
96	Nurses	5818.742	1991.377	2155.5	12931

TABLE 2 *(House)*

Political contributions and employment size of special interest group.

	(1)		(2)		(3)		(4)	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
106th House	*Dep. var.= Political contributions (thousands $)*							
Fraction Employed	287.895	14.691	361.462	28.317	1030.464	43.747	681.284	48.805
(Fraction Employed)^2	--		--		-28245.750	1617.395	-11207.240	1590.591
District F.E.	No		Yes		No		Yes	
Lobby F.E.	No		Yes		No		Yes	
Adj. R^2	0.032		0.467		0.061		0.469	
Peak Fraction Employed	--		--		0.018		0.030	
# Obs. Above Peak	--		--		2214		668	
106th House	*Dep. var.= Fraction of total contributions (*100)*							
Fraction Employed	0.481	0.013	0.629	0.038	1.837	0.045	1.234	0.066
(Fraction Employed)^2	--		--		-51.594	1.786	-21.173	2.017
District F.E.	No		Yes		No		Yes	
Lobby F.E.	No		Yes		No		Yes	
Adj. R^2	0.037		0.434		0.078		0.437	
Peak Fraction Employed	--		--		0.017		0.029	
# Obs. Above Peak	--		--		2257		806	
101st House	*Dep. var.= Political contributions (thousands $)*							
Fraction Employed	134.406	8.359	189.868	14.744	500.155	24.004	324.890	26.756
(Fraction Employed)^2	--		--		-16742.460	1009.938	-5707.463	972.730
District F.E.	No		Yes		No		Yes	
Lobby F.E.	No		Yes		No		Yes	
Adj. R^2	0.017		0.447		0.037		0.448	
Peak Fraction Employed	--		--		0.014		0.028	
# Obs. Above Peak	--		--		2241		413	
101st House	*Dep. var.= Fraction of total contributions (*100)*							
Fraction Employed	0.431	0.018	0.631	0.041	1.618	0.057	1.084	0.083
(Fraction Employed)^2	--		--		-54.350	2.675	-19.136	2.969
District F.E.	No		Yes		No		Yes	
Lobby F.E.	No		Yes		No		Yes	
Adj. R^2	0.020		0.416		0.045		0.417	
Peak Fraction Employed	--		--		0.014		0.028	
# Obs. Above Peak	--		--		2254		422	

Note: The 106th Congress refers to the electoral cycle of year 2000, 101th to 1990. Fraction employed is the total number of workers employed in a SIG divided by congressional district's (State's for the Senate) population. Total number of observations for 106th House is 37410 (no. House seats 435 * no. SIG 86). Total number of observations for 106th Senate is 8600 (no. Senate seats 100 * no. SIG 86). Total number of observations for 101st House is 36540 (no. seats 435 * no. SIG 84). Total number of observations for 101st Senate is 8400 (no. seats 100 * no. SIG 84). Standard errors clustered at the electoral district level (congressional district for House and State for Senate). All regressions include a constant, not reported.

TABLE 2 *(Senate)*

Political contributions and employment size of special interest group.

	(5)		(6)		(7)		(8)	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
106th Senate	*Dep. var.= Political contributions (thousands $)*							
Fraction Employed	450.076	71.632	987.190	169.554	1877.105	245.403	1893.516	299.606
(Fraction Employed)^2	--		--		-55299.620	7487.957	-35816.140	7070.151
District F.E.	No		Yes		No		Yes	
Lobby F.E.	No		Yes		No		Yes	
Adj. R^2	0.014		0.499		0.034		0.502	
Peak Fraction Employed	--		--		0.016		0.026	
# Obs. Above Peak	--		--		506		296	
106th Senate	*Dep. var.= Fraction of total contributions (*100)*							
Fraction Employed	0.366	0.034	0.969	0.112	1.658	0.109	1.843	0.224
(Fraction Employed)^2	--		--		-50.039	3.698	-34.528	7.195
District F.E.	No		Yes		No		Yes	
Lobby F.E.	No		Yes		No		Yes	
Adj. R^2	0.016		0.383		0.043		0.386	
Peak Fraction Employed	--		--		0.016		0.026	
# Obs. Above Peak	--		--		516		288	
101st Senate	*Dep. var.= Political contributions (thousands $)*							
Fraction Employed	322.960	53.730	760.431	129.252	1351.827	193.209	991.311	207.566
(Fraction Employed)^2	--		--		-55066.850	8176.226	-12454.240	7963.837
District F.E.	No		Yes		No		Yes	
Lobby F.E.	No		Yes		No		Yes	
Adj. R^2	0.010		0.496		0.025		0.497	
Peak Fraction Employed	--		--		0.012		0.397	
# Obs. Above Peak	--		--		492		0	
101st Senate	*Dep. var.= Fraction of total contributions (*100)*							
Fraction Employed	0.436	0.052	1.264	0.173	2.061	0.128	1.960	0.277
(Fraction Employed)^2	--		--		-86.938	6.431	-37.550	9.695
District F.E.	No		Yes		No		Yes	
Lobby F.E.	No		Yes		No		Yes	
Adj. R^2	0.010		0.411		0.032		0.412	
Peak Fraction Employed	--		--		0.011		0.260	
# Obs. Above Peak	--		--		522		0	

Note: The 106th Congress refers to the electoral cycle of year 2000, 101th to 1990. Fraction employed is the total number of workers employed in a SIG divided by congressional district's (State's for the Senate) population. Total number of observations for 106th House is 37410 (no. House seats 435 * no. SIG 86). Total number of observations for 106th Senate is 8600 (no. Senate seats 100 * no. SIG 86). Total number of observations for 101st House is 36540 (no. seats 435 * no. SIG 84). Total number of observations for 101st Senate is 8400 (no. seats 100 * no. SIG 84). Standard errors clustered at the electoral district level (congressional district for House and State for Senate). All regressions include a constant, not reported.

TABLE 2 *(Senate - Class I and Class II)*

Political contributions and employment size of special interest group.

	(9)		(10)		(11)		(12)	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
106th Senate Class I	*Dep. var.= Political contributions (thousands $)*							
Fraction Employed	1086.119	148.988	1771.210	294.353	4037.228	400.327	3637.811	0.464
(Fraction Employed)^2	--		--		-113540.700	11739.630	-70819.900	11187.770
District F.E.	No		Yes		No		Yes	
Lobby F.E.	No		Yes		No		Yes	
Adj. R^2	0.044		0.624		0.085		0.628	
Peak Fraction Employed	--		--		0.017		0.025	
# Obs. Above Peak	--		--		142		93	
106th Senate Class I	*Dep. var.= Fraction of total contributions (*100)*							
Fraction Employed	0.449	0.045	0.965	0.176	1.873	0.151	2.066	0.324
(Fraction Employed)^2	--		--		-54.784	4.968	-39.891	9.508
District F.E.	No		Yes		No		Yes	
Lobby F.E.	No		Yes		No		Yes	
Adj. R^2	0.033		0.561		0.076		0.567	
Peak Fraction Employed	--		--		0.017		0.025	
# Obs. Above Peak	--		--		144		99	
101st Senate Class II	*Dep. var.= Political contributions (thousands $)*							
Fraction Employed	769.101	111.141	1602.916	224.778	3236.441	368.586	2283.231	354.845
(Fraction Employed)^2	--		--		-131506.000	16090.280	-36407.150	17042.020
District F.E.	No		Yes		No		Yes	
Lobby F.E.	No		Yes		No		Yes	
Adj. R^2	0.026		0.666		0.068		0.667	
Peak Fraction Employed	--		--		0.012		0.313	
# Obs. Above Peak	--		--		158		0	
101st Senate Class II	*Dep. var.= Fraction of total contributions (*100)*							
Fraction Employed	0.451	0.047	1.192	0.143	2.137	0.158	1.960	0.301
(Fraction Employed)^2	--		--		-89.865	7.541	-41.105	11.470
District F.E.	No		Yes		No		Yes	
Lobby F.E.	No		Yes		No		Yes	
Adj. R^2	0.016		0.662		0.049		0.665	
Peak Fraction Employed	--		--		0.011		0.023	
# Obs. Above Peak	--		--		166		27	

Note: Class I senators were elected in Nov. 2000 (2408 observations) and Class II in Nov. 1990 (2688 observations).

TABLE 3 (a)

Political contributions and Special Interest Group employment size: Number of district-specific tests supporting the inverse-U hypothesis in reduced form.

$C_{sd} = \kappa_d + \delta_{d,1} v_{sd} + \delta_{d,2} v_{sd}^2 + \mu_{sd}$	(1) All SIG		(2) Controlling for value added of s.		(3) Excluding OSID 39, 74, 79, 80.	
Tests within district d:	*106th House*		*106th House*		*106th House*	
Sign: $\delta_1 > 0$; $\delta_2 < 0$	413	out of 435	420	out of 435	363	out of 435
F-test (0.05) Ho: $\delta_1 = \delta_2 = 0$	251	out of 435	312	out of 435	238	out of 435
t-test (0.05) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	218	out of 435	251	out of 435	117	out of 435
t-test (0.10) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	271	out of 435	309	out of 435	157	out of 435
Mean Peak Fraction Employed (st.d.)	0.018	(0.013)	0.021	(0.055)	0.039	(0.179)
Mean # Obs. Above Peak (st.d.)	5.382	(2.169)	5.066	(1.745)	3.702	(4.493)
Tests within district d:	*101st House*		*101st House*		*101st House*	
Sign: $\delta_1 > 0$; $\delta_2 < 0$	402	out of 435	401	out of 435	374	out of 435
F-test (0.05) Ho: $\delta_1 = \delta_2 = 0$	188	out of 435	231	out of 435	179	out of 435
t-test (0.05) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	161	out of 435	191	out of 435	122	out of 435
t-test (0.10) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	220	out of 435	235	out of 435	175	out of 435
Mean Peak Fraction Employed (st.d.)	0.045	(0.601)	0.017	(0.023)	0.018	(0.070)
Mean # Obs. Above Peak (st.d.)	6.248	(3.649)	5.431	(2.675)	4.363	(3.440)
Tests within district d:	*106th Senate*		*106th Senate*		*106th Senate*	
Sign: $\delta_1 > 0$; $\delta_2 < 0$	89	out of 100	91	out of 100	89	out of 100
F-test (0.05) Ho: $\delta_1 = \delta_2 = 0$	53	out of 100	62	out of 100	46	out of 100
t-test (0.05) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	40	out of 100	46	out of 100	36	out of 100
t-test (0.10) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	53	out of 100	59	out of 100	44	out of 100
Mean Peak Fraction Employed (st.d.)	0.016	(.004)	0.017	(0.004)	0.015	(0.017)
Mean # Obs. Above Peak (st.d.)	5.741	(1.921)	5.681	(3.428)	5.224	(4.179)
Tests within district d:	*101st Senate*		*101st Senate*		*101st Senate*	
Sign: $\delta_1 > 0$; $\delta_2 < 0$	90	out of 100	90	out of 100	85	out of 100
F-test (0.05) Ho: $\delta_1 = \delta_2 = 0$	35	out of 100	49	out of 100	34	out of 100
t-test (0.05) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	30	out of 100	40	out of 100	29	out of 100
t-test (0.10) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	52	out of 100	53	out of 100	44	out of 100
Mean Peak Fraction Employed (st.d.)	0.011	(0.003)	0.012	(0.005)	0.010	(0.011)
Mean # Obs. Above Peak (st.d.)	6.200	(3.295)	5.177	(2.216)	4.976	(3.387)

Note: Standard errors robust at the electoral district level (congressional district for House and for Senate). Number of SIG for 101st Congress is 84. Number of SIG for 106th Congress is 86. The number of total regressions is equal to the number of seats in the House or the Senate. Excluded OSID are: 39 (Retail Sales); 74 (Hospitals and Nursing Homes); 79 (Food and Beverage); 80 (Restaurants and Drinking Estab.). The numbers in parentheses next to the mean peak of the fraction of population employed and the mean number of observations above the peak of the parabola are the corresponding std. deviations.

TABLE 3 (b)

Political contributions and Special Interest Group employment size: Number of SIG-specific tests supporting the inverse-U hypothesis in reduced form.

$C_{sd} = b_s + \delta_{d,1} v_{sd} + \delta_{d,2} v_{sd}^2 + \mu_{sd}$	(1) All SIG	
Tests within district *d*:	*106th House*	
Sign: $\delta_1 > 0; \delta_2 < 0$	55	out of 86
F-test (0.05) Ho: $\delta_1 = \delta_2 = 0$	41	out of 86
t-test (0.05) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	16	out of 86
t-test (0.10) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	20	out of 86
Mean Peak Fraction Employed (st.d.)	0.106*	(0.546)*
Mean # Obs. Above Peak (st.d.)	18.636	(49.681)
Tests within district *d*:	*101st House*	
Sign: $\delta_1 > 0; \delta_2 < 0$	59	out of 84
F-test (0.05) Ho: $\delta_1 = \delta_2 = 0$	38	out of 84
t-test (0.05) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	23	out of 84
t-test (0.10) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	26	out of 84
Mean Peak Fraction Employed (st.d.)	0.021	(0.034)
Mean # Obs. Above Peak (st.d.)	25.966	(61.238)
Tests within district *d*:	*106th Senate*	
Sign: $\delta_1 > 0; \delta_2 < 0$	62	out of 86
F-test (0.05) Ho: $\delta_1 = \delta_2 = 0$	23	out of 86
t-test (0.05) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	8	out of 86
t-test (0.10) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	12	out of 86
Mean Peak Fraction Employed (st.d.)	0.008	(0.012)
Mean # Obs. Above Peak (st.d.)	15.645	(23.632)
Tests within district *d*:	*101st Senate*	
Sign: $\delta_1 > 0; \delta_2 < 0$	41	out of 84
F-test (0.05) Ho: $\delta_1 = \delta_2 = 0$	15	out of 84
t-test (0.05) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	8	out of 84
t-test (0.10) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	12	out of 84
Mean Peak Fraction Employed (st.d.)	0.009	(0.011)
Mean # Obs. Above Peak (st.d.)	19.951	(25.916)

Note: Robust standard errors at the SIG level. Number of observation for each within-SIG regression is 435 for the House and 100 for the Senate. The number of total regressions is equal to the number of SIGs (86 for 106th Congress and 84 for 101st Congress). The numbers in parentheses next to the mean peak of the fraction of population employed and the mean number of observations above the peak of the parabola are the corresponding std. deviations. *Excluding OSID 58 (commercial banks) the mean peak fraction employed is 0.033 (0.107).

TABLE 4

Special interest groups with largest number of employees do not pay the largest amount of political contributions.

	106th House		101st House		106th Senate		101st Senate	
Samples:	*Within each district (Congressional district or State)*							
Frac. largest employer is top payer	0.014	[6 out of 435]	0.016	[7 out of 435]	0.000	[0 out of 100]	0.010	[1 out of 100]
Frac. largest 5 percentile of employers are top payers	0.039	[17 out of 435]	0.039	[17 out of 435]	0.020	[2 out of 100]	0.030	[3 out of 100]
Samples:	*Within each industry (OSID)*							
Frac. largest employer is top payer	0.000	[0 out of 86]	0.024	[2 out of 84]	0.058	[5 out of 86]	0.071	[6 out of 84]
Frac. largest 5 percentile of employers are top payers	0.372	[32 out of 86]	0.298	[25 out of 84]	0.198	[17 out of 86]	0.179	[15 out of 84]

Note: The within-district analysis is performed in 435 districts for the House and 100 Senate races. The largest and largest 5 percent of employers in the district are considered. The largest 5 percent of employers' total amounts are averaged and compared with the mean total contributions at all 5-centiles. In each district there are either 86 (106th Congress) or 84 industries (101st). The within-industry analysis is performed in each of the 86 (for 106th Congress) and 84 (for 101st Congress) industries. The largest and the largest 5 percent of employers in the industry are considered. For each industry we consider 435 congressional districts or 100 Senate seats.

TABLE 5

Distribution of Maximum Likelihood estimates of structural parameters by Congressional district race.

Parameters	*Interpretation*	*106th House* All races by House incumbent on November 2000			
		Frac. p-value < 0.05	Median	Mean	Standard Deviation
SIG					
γ	Const. pol. benefit to SIG ($)	14.81%	-1825.7	-1935.0	6659.5
ρ	Per vote policy benefit ($)	48.89%	113.2	347.9	342.6
σ	Std. dev. pol. benefit ($)	99.62%	20216.8	22223.6	11799.9
Politician					
$1/\alpha$	Value of a vote ($)	48.88%	100.0	339.3	341.0
β	Ex ante elect. uncert. (# votes)	49.62%	121918.2	334503.4	534490.4
log Likelihood			-632.1	-629.7	119.0
Bounds		No. Obs.			
$1/\alpha = 0$		8			
$1/\alpha = 1000$		124			
Total		401			
SIG			Including districts on bounds of $1/\alpha$		
γ	Const. pol. benefit to SIG ($)	20.15%	-3215.7	-3069.8	7846.8
ρ	Per vote policy benefit ($)	58.96%	703.8	547.9	423.7
σ	Std. dev. pol. benefit ($)	99.75%	22724.3	25464.5	13279.4
Politician					
$1/\alpha$	Value of a vote ($)	59.20%	700.0	536.8	419.8
β	Ex ante elect. uncert. (# votes)	62.69%	250189.0	369048.3	510938.7
log Likelihood			-655.1	-650.5	125.2

Note: Number of SIG for 106th Congress is 86. The number of total regressions is equal to the number of seats in the House in which incumbent runs in the November 2000 elections, 401. P-values are constructed from z-stats using robust standard errors. The range of the grid search includes values of α between 0 and 1000.

TABLE 6

Validation of estimates of model's parameters by Congressional district race.

	106th House			
	All races by House incumbent on November 2000			
	(1)	(2)	(3)	(4)
Dependent variable	$1/\alpha$	$1/\alpha$	β	Estimated *v* at peak
Ex post vote difference	-175.440		-80136.580	-0.006
	(82.219)		(96477.73)	(0.0027)
Population Density		0.234		
		(0.126)		
Constant	608.631	528.830	406102.000	0.021
	(41.905)	(21.519)	(57079.83)	(0.02)
Obs.	391	401	383	378

Note: Robust standard errors in parentheses. The regression in column (3) excludes observations with $1/\alpha = 0$. The dependent variable in column (4) is the estimated fraction of voters at the peak as estimated in the reduced form of Table 2. The regression in column (4) constrains the sample to the districts where the reduced-form inverse-U relationship holds at least in sign. Reduced-form peak and β correlate positively with $p = 0.002$.

TABLE 7

Estimated average rates of return for political contributions across SIG (106th House)

Variable		Median	Mean	Std. Dev.	Max	Min	Obs
Contribution-only average rate of return of political contributions	$(\gamma_d+\rho_d v_{sd})/C_{sd}$ - 1	63.117	431.333	1542.233	38220.180	-0.995	22516
Model's generated average rate of return of political contributions (C_{sd} > 0)	$(\gamma_d+\rho_d v_{sd})/(C_{sd}+v_{sd}/\alpha_d)$ - 1	0.005	0.119	1.943	123.994	-0.999	22516
Model's generated average rate of return of political contributions (whole sample)	$(\gamma_d+\rho_d v_{sd})/(C_{sd}+v_{sd}/\alpha_d)$ - 1	0.005	0.337	12.666	1275.236	-0.999	31002

Notes: Moments of the rates of return distribution are computed across all SIG/districts. Sample includes all observations verifying the model's restriction $(\gamma_d+\rho_d v_{ds}) > 0$, 93.4 percent of the overall sample.

TABLE 8 (a)

Contributions-only estimated rates of return of Special Interests for incumbent races of 106th Congress (House).

OSID	Definition	Median	Mean	Std. Dev.	Max	Min
6	Forestry & Forest Products	69.46621	453.8693	2383.075	36316.64	0.210778
7	Agricultural Services & Production	9.496587	50.99666	156.212	1843.249	-0.96136
8	Oil & Gas	-0.21673	10.73857	79.73958	1221.669	-0.98812
9	Mining	38.40978	199.153	667.3774	8204.909	-0.79511
10	Coal Mining	12.78226	78.28989	239.4523	1636.127	-0.75832
11	Electric Utilities	30.2248	117.45	286.8087	3324.877	-0.9068
12	Natural Gas Pipelines	14.20873	83.91908	192.3033	1557.883	-0.8574
13	Construction Services	168.9036	658.8242	1678.305	16269.25	-0.60993
14	General Contractors	92.90437	597.1642	1663.384	13312.08	-0.79697
15	Building Trade Unions	57.70707	194.1319	649.4268	7826.718	-0.88241
16	Home Builders	80.82034	315.3867	740.2063	7096.734	-0.03668
17	Special Trade Contractors	432.3758	1973.299	4291.23	39354.91	-0.33609
18	Food Processing & Sales	512.0051	1670.271	2915.977	17513.38	1.318849
19	Food Products Manufacturing	262.6566	721.3017	1098.121	7183.199	-0.30274
20	Meat processing & products	118.0243	528.0966	1141.818	7229.768	-0.51141
21	Tobacco	-0.15526	20.27398	138.0791	1453.143	-0.98779
22	Textiles	105.449	341.5649	596.4384	3908.865	0.118846
23	Clothing Manufacturing	179.9449	868.8335	1957.984	11296.6	-0.76136
24	Printing & Publishing	341.1616	1234.84	2365.281	17384.74	-0.16561
25	Chemical & Related Manufacturing	73.57719	373.199	971.6295	11805.29	-0.65575
26	Pharmaceuticals / Health Products	42.60455	193.1848	591.4776	8404.143	-0.94573
27	Pharmaceutical Manufacturing	13.49886	92.18169	225.4475	2539.451	-0.9872
28	Building Materials & Equipment	51.22651	192.8596	485.8517	7095.993	-0.06815
30	Steel Production	93.37337	500.0529	1134.437	7492.563	0.47473
31	Telecom Services & Equipment	16.11716	197.6582	720.7256	9125.971	-0.99747
32	Defense Electronics	47.48808	325.4713	840.4836	7584.881	-0.98734
33	Transportation Unions	166.8247	1006.595	4688.982	76990.7	-0.74124
34	Automotive	140.7527	472.9585	1195.004	10206.25	-0.44205
35	Auto Manufacturers	142.4302	551.2143	995.6761	6399.827	-0.67491
36	Defense Aerospace	11.42735	254.0812	1057.238	13048.08	-0.99486
37	Medical Supplies	89.55594	311.3733	577.66	4183.752	-0.87175
38	Car Dealers	133.2182	418.3943	971.7947	9687.272	-0.45888
39	Retail Sales	805.1422	2520.978	4665.285	46538.04	1.11792
40	Food Stores	758.6516	2049.16	3310.386	28956.47	5.602664
41	Beer, Wine & Liquor	13.14069	90.17342	300.5895	3560.262	-0.91008
42	Air Transport Unions	47.75562	427.6841	1293.236	15747.05	-0.81687
43	Air Transport	10.22997	178.082	671.9977	7491.157	-0.95499
45	Sea Transport	8.450643	47.21568	104.906	972.2959	-0.97508
46	Trucking	238.9747	799.1642	1540.206	14230.61	0.516753
48	Books, Magazines & Newspapers	232.7946	757.7194	1328.634	8883.293	-0.68706
49	Computers/Internet	70.15534	316.1216	741.8246	8235.989	-0.64065

TABLE 8 (a) *(cont.)*

Contributions-only estimated rates of return of Special Interests for incumbent races of 106th Congress (House).

OSID	Definition	Median	Mean	Std. Dev.	Max	Min
50	Computer Software	38.89904	222.041	713.5065	9165.441	-0.82763
51	TV / Movies / Music	80.3492	313.5523	668.0061	6229.084	-0.94661
52	Motion Picture Prod. & Distr.	133.6984	521.3942	1976.397	17241.19	-0.64619
53	TV Production & Distribution	610.3671	1186.362	1634.773	9638.371	0.420149
54	Recorded Music & Music Prod.	14.349	59.50835	159.3225	1352.87	-0.92964
55	Commercial TV & Radio Stations	76.04497	251.2142	451.3586	2646.756	-0.32975
56	Cable & Satellite TV Prod. & Distr.	49.13436	173.2418	317.4409	2908.691	-0.74214
57	Telephone Utilities	73.20511	231.4016	465.9969	4869.236	-0.86981
58	Commercial Banks	82.41708	381.2558	1446.082	23686.1	-0.36678
59	Finance / Credit Companies	97.81245	500.2325	1338.404	14497.59	-0.85493
60	Securities & Investment	23.67031	154.8254	810.0807	14059.45	-0.95324
61	Insurance	70.41142	467.1666	2160.954	33774.64	-0.64271
62	Real Estate	40.57536	98.41199	271.6332	4163.127	-0.84685
63	Lawyers / Law Firms	18.8536	39.66926	56.08577	368.8455	-0.91201
64	Accountants	67.53531	450.77	1303.956	16010.73	-0.94806
65	Architectural Services	556.7852	1385.388	2870.658	35429.96	0.802569
66	Business Services	146.6403	419.0515	1047.078	15776.4	-0.78808
67	Advertising/Public Relations	157.6044	584.105	1192.58	10893.24	-0.81832
68	Waste Management	116.0646	375.1598	638.2673	4277.786	0.550825
69	Teachers Unions	93.6469	194.3956	405.9865	3087.458	-0.80666
70	Education	317.4011	1086.09	2510.305	24294.09	-0.12979
71	Health Professionals	61.59924	159.1317	302.8274	3612.677	-0.76301
72	Dentists	126.0545	300.414	697.0682	8680.082	-0.66499
73	Health Services/HMOs	309.6185	1039.802	3069.483	46195.36	-0.94865
74	Hospitals & Nursing Homes	807.1793	2040.14	3737.314	40830.58	1.32598
75	Recreation / Live Entertainment	148.6769	475.9849	934.5978	7953.858	-0.83767
76	Pro. Sports, Arenas & Services	70.31291	161.1648	246.6464	1243.228	-0.39465
77	Casinos / Gambling	24.99148	129.0252	281.6628	2511.563	-0.97414
78	Lodging / Tourism	370.5891	1427.752	3026.602	20337.62	-0.67287
79	Food & Beverage	852.5618	3888.731	9154.868	81250.91	5.8998
80	Restaurants & Drinking Estab.	1057.463	3733.099	7543.469	61947.9	6.40774
81	Funeral Services	116.99	253.6301	387.0642	2604.662	-0.40937
82	Clergy & Religious Org.	1267.447	3020.99	4087.778	21775.92	2.118608
85	Dairy	21.63052	68.86308	117.7111	779.3773	-0.94286
86	Credit Unions	36.32233	101.4991	201.34	2314.969	-0.63828
87	Chiropractors	90.31703	142.6112	174.6534	1200.412	0.033784
88	Alternative Energy Prod. & Serv.	15.78063	80.3858	190.7887	926.6316	-0.52527
89	Nutritional & Dietary Suppl.	29.24471	90.25188	124.9661	381.242	0.026233
90	Miscellaneous Defense	0.432111	4.110336	10.73269	68.69561	-0.96819
91	Airlines	41.17789	435.1534	1200.766	9800.691	-0.88979
92	Cruise Ships & Lines	4.21104	45.64794	85.6865	376.4198	-0.81159
93	Savings & Loans	67.72684	225.9444	446.2162	4013.262	-0.71818
94	Mortgage Bankers & Brokers	67.91869	246.4069	561.7087	6482.101	-0.72403
95	Venture Capital	10.22499	33.26382	80.29157	714.3822	-0.892
96	Nurses	789.6308	2095.617	4148.486	32928.39	2.079814

TABLE 8 (b)

Model estimated rates of return of Special Interests for incumbent races of 106th Congress (House).

OSID	Definition	Median	Mean	Std. Dev.	Max	Min
6	Forestry & Forest Products	0.000783	0.001179	0.342323	5.903375	-0.92143
7	Agricultural Services & Production	-0.08923	-0.12623	0.412095	3.282604	-0.99334
8	Oil & Gas	-0.50251	-0.46178	0.344932	1.622594	-0.99181
9	Mining	-0.01042	0.099619	1.645732	26.20708	-0.97703
10	Coal Mining	0.052053	5.580978	26.9863	260.2688	-0.86422
11	Electric Utilities	-0.02369	-0.10387	0.171128	0.373101	-0.93068
12	Natural Gas Pipelines	-0.03685	0.228985	3.597146	62.92948	-0.98393
13	Construction Services	0.006331	0.137617	1.373248	23.33605	-0.60993
14	General Contractors	0.0042	0.037658	0.297339	4.16176	-0.79697
15	Building Trade Unions	0.003632	0.004703	0.157345	1.195145	-0.88241
16	Home Builders	0.000935	0.037917	0.823348	16.18748	-0.73341
17	Special Trade Contractors	0.011523	0.254944	2.263721	37.07743	-0.33609
18	Food Processing & Sales	0.011699	0.241305	1.765248	21.43826	-0.01871
19	Food Products Manufacturing	0.006594	0.123698	1.181093	21.37253	-0.68408
20	Meat processing & products	0.003537	0.225605	2.087895	32.15586	-0.84829
21	Tobacco	-0.28614	7.949999	86.4309	1021.937	-0.98779
22	Textiles	-0.0001	0.105736	0.956037	13.56907	-0.95062
23	Clothing Manufacturing	0.004343	0.094038	0.801144	8.633419	-0.93199
24	Printing & Publishing	0.009326	0.141638	0.993152	14.07649	-0.16561
25	Chemical & Related Manufacturing	-0.00169	-0.00866	0.260895	4.02383	-0.81055
26	Pharmaceuticals / Health Products	-0.01553	-0.06543	0.332393	5.157692	-0.94573
27	Pharmaceutical Manufacturing	-0.05805	-0.09106	0.924078	15.29241	-0.99459
28	Building Materials & Equipment	-0.00512	-0.00799	0.26435	2.956425	-0.87546
30	Steel Production	0.000323	0.2315	2.954573	53.07651	-0.98768
31	Telecom Services & Equipment	-0.0254	-0.06578	0.379865	2.40166	-0.99862
32	Defense Electronics	-0.00269	0.199681	3.043492	57.3824	-0.99498
33	Transportation Unions	0.008895	0.079814	0.675873	9.637922	-0.81682
34	Automotive	0.005951	0.049336	0.456579	8.528609	-0.44205
35	Auto Manufacturers	0.005694	0.072626	0.811028	11.75462	-0.97395
36	Defense Aerospace	-0.02719	0.009899	1.142638	12.58425	-0.99489
37	Medical Supplies	-0.00135	0.122243	1.737848	32.83991	-0.98513
38	Car Dealers	0.004915	0.233525	3.564881	69.98215	-0.45888
39	Retail Sales	0.013228	0.221981	1.588019	25.28973	0.001675
40	Food Stores	0.012679	0.239249	1.87505	26.66551	-0.03513
41	Beer, Wine & Liquor	-0.05913	-0.14104	0.249383	1.232289	-0.92819
42	Air Transport Unions	0.002764	0.435672	4.213728	73.7752	-0.99346
43	Air Transport	-0.0677	-0.19024	0.375316	4.12642	-0.99346
45	Sea Transport	-0.05649	1.079242	5.390622	62.92948	-0.99172
46	Trucking	0.008952	0.093066	0.73325	12.27187	-0.72668
48	Books, Magazines & Newspapers	0.005716	0.339868	4.098285	70.54661	-0.68706
49	Computers/Internet	0.00226	-0.01447	0.153995	1.149622	-0.6706

TABLE 8 (b) *(cont.)*

Model estimated rates of return of Special Interests for incumbent races of 106th Congress (House).

OSID	Definition	Median	Mean	Std. Dev.	Max	Min
50	Computer Software	-0.00583	0.03086	0.558439	6.437755	-0.9503
51	TV / Movies / Music	-0.00058	0.012657	0.597521	11.33115	-0.94661
52	Motion Picture Prod. & Distr.	-0.00323	0.051488	0.482558	6.495958	-0.99125
53	TV Production & Distribution	0.006142	0.092904	0.815439	13.32496	-0.84709
54	Recorded Music & Music Prod.	-0.05839	1.285114	5.26448	46.78766	-0.97887
55	Commercial TV & Radio Stations	-0.0058	0.056157	0.799273	11.16988	-0.97515
56	Cable & Satellite TV Prod. & Distr.	-0.01331	0.01207	0.899595	16.01649	-0.97528
57	Telephone Utilities	-0.00083	-0.03067	0.137429	1.243481	-0.86981
58	Commercial Banks	0.002677	0.001151	0.092676	1.119453	-0.41331
59	Finance / Credit Companies	0.003188	0.026501	0.331694	5.394055	-0.86577
60	Securities & Investment	-0.02326	-0.10539	0.196043	0.680236	-0.95324
61	Insurance	0.002155	-0.01532	0.098983	0.693106	-0.64271
62	Real Estate	-0.00946	-0.06006	0.123471	0.105636	-0.84685
63	Lawyers / Law Firms	-0.03418	-0.12447	0.185367	0.134634	-0.91201
64	Accountants	-9.9E-05	-0.01564	0.193899	2.928047	-0.94806
65	Architectural Services	0.010207	0.172632	1.366102	22.61286	-0.40136
66	Business Services	0.005684	0.018978	0.128005	1.23553	-0.78808
67	Advertising/Public Relations	0.003705	0.101549	0.847323	14.32794	-0.95756
68	Waste Management	0.000877	0.067974	0.85569	16.21008	-0.87628
69	Teachers Unions	0.002484	0.019014	0.177652	1.914057	-0.80666
70	Education	0.010899	0.153151	1.205444	20.17204	-0.22696
71	Health Professionals	0.002254	-0.002	0.091657	0.49664	-0.76301
72	Dentists	0.0021	0.04042	0.401378	7.265724	-0.66499
73	Health Services/HMOs	0.009239	0.05844	0.311722	5.130782	-0.94865
74	Hospitals & Nursing Homes	0.013065	0.143302	0.786524	12.84946	0.003027
75	Recreation / Live Entertainment	0.001076	0.227285	2.159787	33.67901	-0.96086
76	Pro. Sports, Arenas & Services	-0.01044	0.317798	1.6888	18.29463	-0.98352
77	Casinos / Gambling	-0.01418	0.997428	6.230898	73.7752	-0.99182
78	Lodging / Tourism	0.010332	0.120068	0.967639	18.06948	-0.67287
79	Food & Beverage	0.013242	0.747813	7.556043	123.9897	-0.00915
80	Restaurants & Drinking Estab.	0.013072	0.572412	5.953539	109.9623	-0.01678
81	Funeral Services	-0.00935	0.040275	0.558351	8.920427	-0.95182
82	Clergy & Religious Org.	0.012264	0.194785	2.239342	43.40306	-0.38699
85	Dairy	-0.05071	-0.02621	0.761762	7.915258	-0.95061
86	Credit Unions	-0.02153	-0.02887	0.283135	2.524062	-0.93198
87	Chiropractors	-0.02329	0.128114	1.055957	16.09229	-0.86591
88	Alternative Energy Prod. & Serv.	0.004994	5.081104	22.52629	252.5624	-0.92382
89	Nutritional & Dietary Suppl.	-0.00925	11.75602	88.1422	1142.806	-0.9906
90	Miscellaneous Defense	-0.1663	3.234659	23.43151	257.0058	-0.99121
91	Airlines	-0.00021	0.217039	1.317019	11.8743	-0.9523
92	Cruise Ships & Lines	-0.05962	17.6573	115.008	1021.937	-0.86756
93	Savings & Loans	-0.00504	0.068769	0.680088	11.04968	-0.89532
94	Mortgage Bankers & Brokers	-0.01088	0.063211	0.642486	7.040508	-0.9238
95	Venture Capital	-0.06702	0.297896	1.650266	15.34071	-0.99829
96	Nurses	0.012487	0.176465	1.220056	20.76419	-0.05182

TABLE A1

Number of district-specific tests supporting the inverse-U hypothesis in reduced form using contributions to main candidate-contributions to challenger (net contributions, *NC*).

$NC_{sd} = \kappa_d + \delta_{d,1} v_{sd} + \delta_{d,2} v_{sd}^2 + \mu_{sd}$	All SIG	
Tests within district *d*:	*106th House*	
Sign: $\delta_1 > 0$; $\delta_2 < 0$	387	out of 435
F-test (0.05) Ho: $\delta_1 = \delta_2 = 0$	222	out of 435
t-test (0.05) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	178	out of 435
t-test (0.10) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	226	out of 435
Mean Peak Fraction Employed (st.d.)	0.023	(0.060)
Mean # Obs. Above Peak (st.d.)	5.429	(3.493)

Note: Standard errors robust at the electoral district level (congressional district for House). Number of SIG for 106th Congress is 86. The number of total regressions is equal to the number of seats in the House. The numbers in parentheses next to the mean peak of the fraction of population employed and the mean number of observations above the peak of the parabola are the corresponding std. deviations.

TABLE A2

Number of district-specific tests supporting the inverse-U hypothesis in reduced form controlling for vote splitting.

$C_{sd} = \kappa_d + \delta_{d,1} x_{sd} + \delta_{d,2} x_{sd}^2 + \mu_{sd}$	All SIG	
Tests within district d:	*106th House*	
Sign: $\delta_1 > 0$; $\delta_2 < 0$	420	out of 435
F-test (0.05) Ho: $\delta_1 = \delta_2 = 0$	273	out of 435
t-test (0.05) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	216	out of 435
t-test (0.10) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	275	out of 435
Mean Peak Fraction Employed (st.d.)	0.019	(0.016)
Mean # Obs. Above Peak (st.d.)	5.026	(2.013)

Note: $x = v$ *deflated by fraction of contributions going to challenger*. Standard errors robust at the electoral district level (congressional district for House). Number of SIG for 106th Congress is 86. The number of total regressions is equal to the number of seats in the House. The numbers in parentheses next to the mean peak of the fraction of population employed and the mean number of observations above the peak of the parabola are the corresponding std. deviations.

TABLE A3

Number of district-specific tests supporting the inverse-U hypothesis in reduced form controlling for number of establishments.

$C_{sd} = \kappa_d + \delta_{d,1} v_{sd} + \delta_{d,2} v_{sd}^2 + \xi_d e_{sd} + \mu_{sd}$	All SIG	
Tests within district *d*:	*106th House*	
Sign: $\delta_1 > 0; \delta_2 < 0$	374	out of 435
F-test (0.05) Ho: $\delta_1 = \delta_2 = 0$	121	out of 435
t-test (0.05) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	76	out of 435
t-test (0.10) Ho: $\delta_1 = 0$ & Ho: $\delta_2 = 0$	124	out of 435
Mean Peak Fraction Employed (st.d.)	0.016	(0.057)
Mean # Obs. Above Peak (st.d.)	11.125	(8.767)
Sign: $\xi > 0$	403	out of 435
t-test (0.05) Ho: $\xi = 0$	105	out of 435

Note: Standard errors robust at the electoral district level (congressional district for House). Number of SIG for 106th Congress is 86. The number of total regressions is equal to the number of seats in the House. The numbers in parentheses next to the mean peak of the fraction of population employed and the mean number of observations above the peak of the parabola are the corresponding std. deviations. Number of establishment data are collected by the Economic Census and apportioned by district employing population weights.

Figure 1 (a)

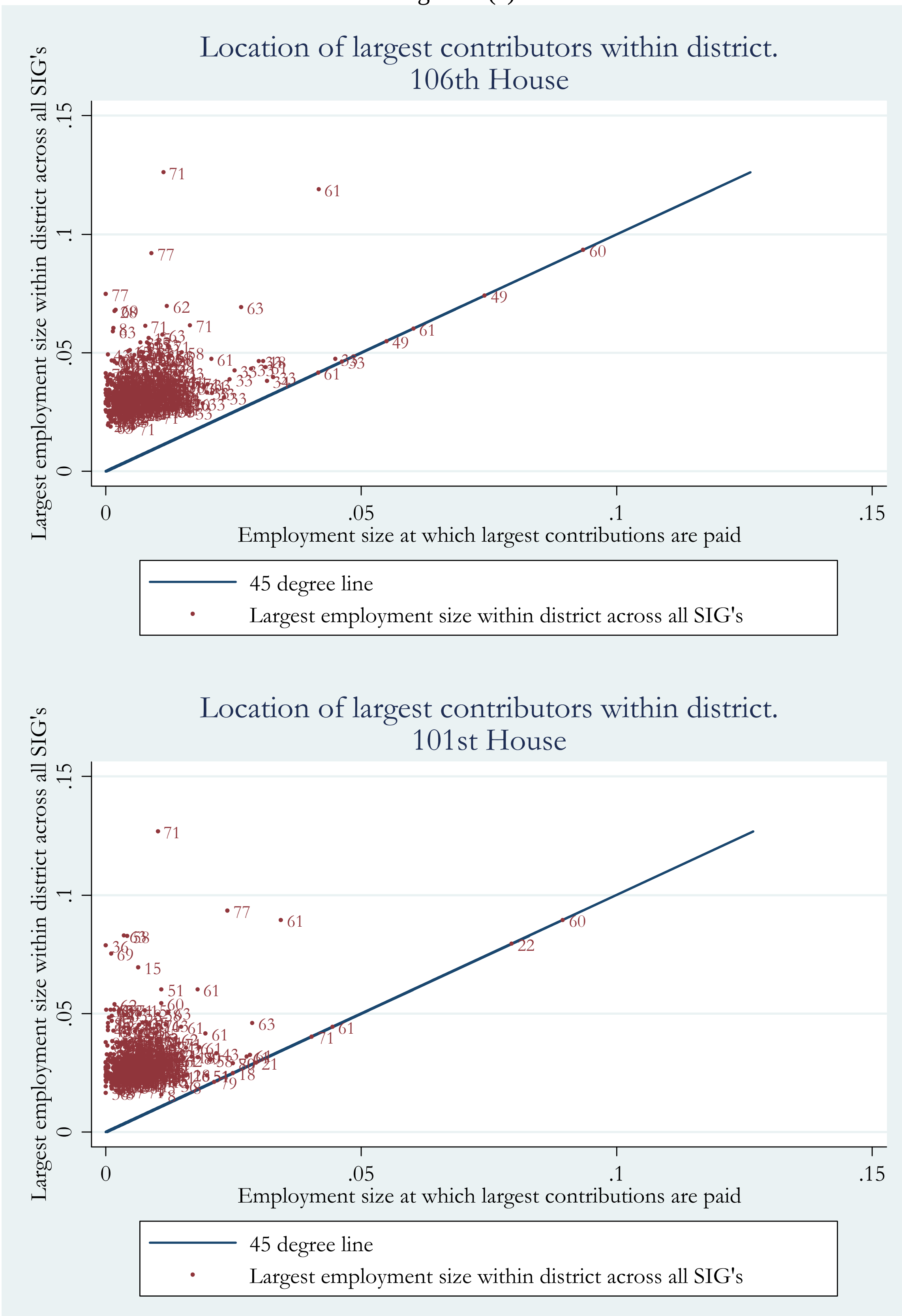
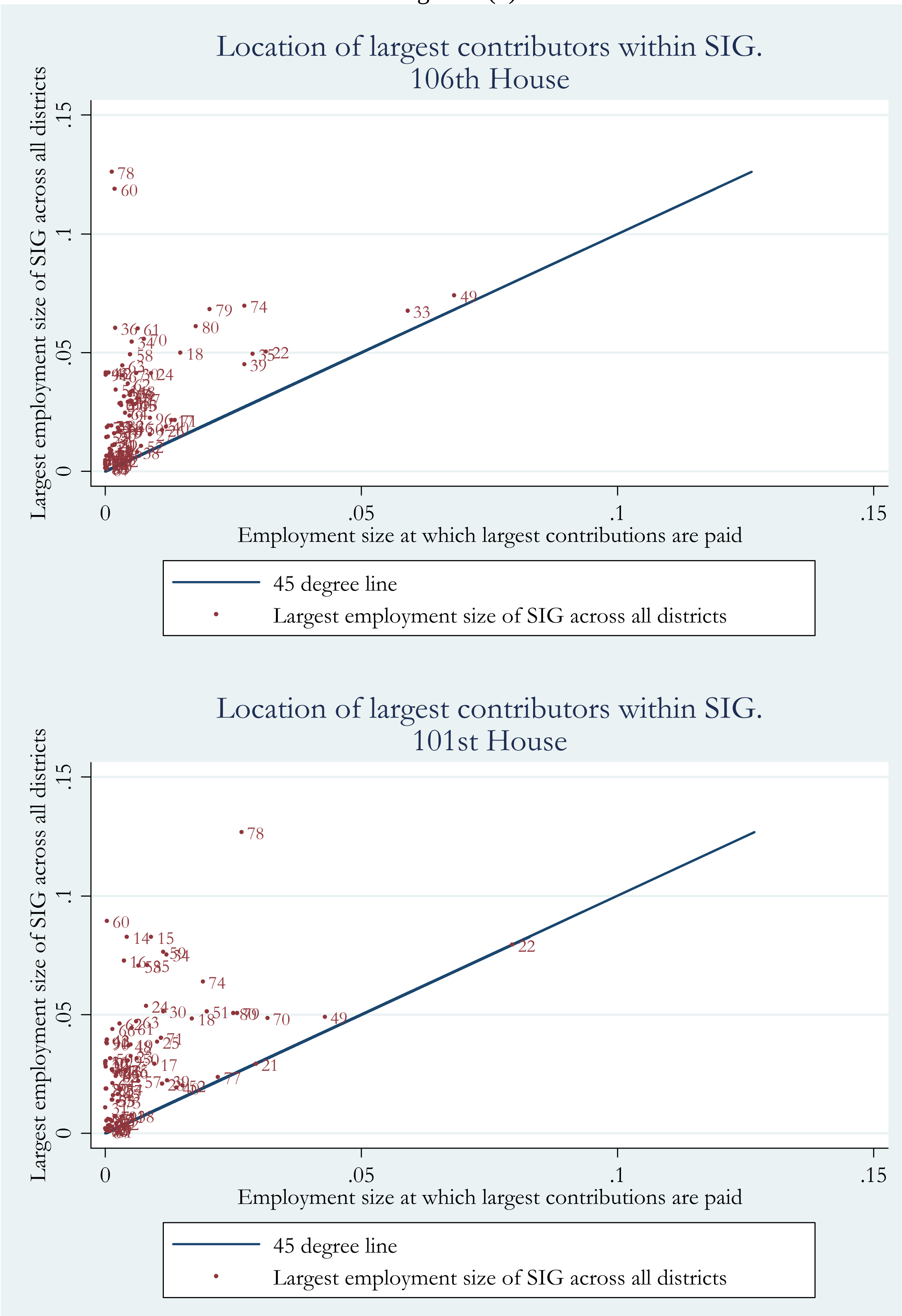

Location of largest contributors within district.
106th House
Largest employment size within district across all SIG's
Employment size at which largest contributions are paid
0
.05
.1
.15
45 degree line
Largest employment size within district across all SIG's
Location of largest contributors within district.
101st House
Largest employment size within district across all SIG's
Employment size at which largest contributions are paid
45 degree line
Largest employment size within district across all SIG's

Figure 1 (b)


Location of largest contributors within SIG.
106th House
Largest employment size of SIG across all districts
0
.05
.1
.15
Employment size at which largest contributions are paid
45 degree line
Largest employment size of SIG across all districts
Location of largest contributors within SIG.
101st House
Largest employment size of SIG across all districts
0
.05
.1
.15
Employment size at which largest contributions are paid
45 degree line
Largest employment size of SIG across all districts

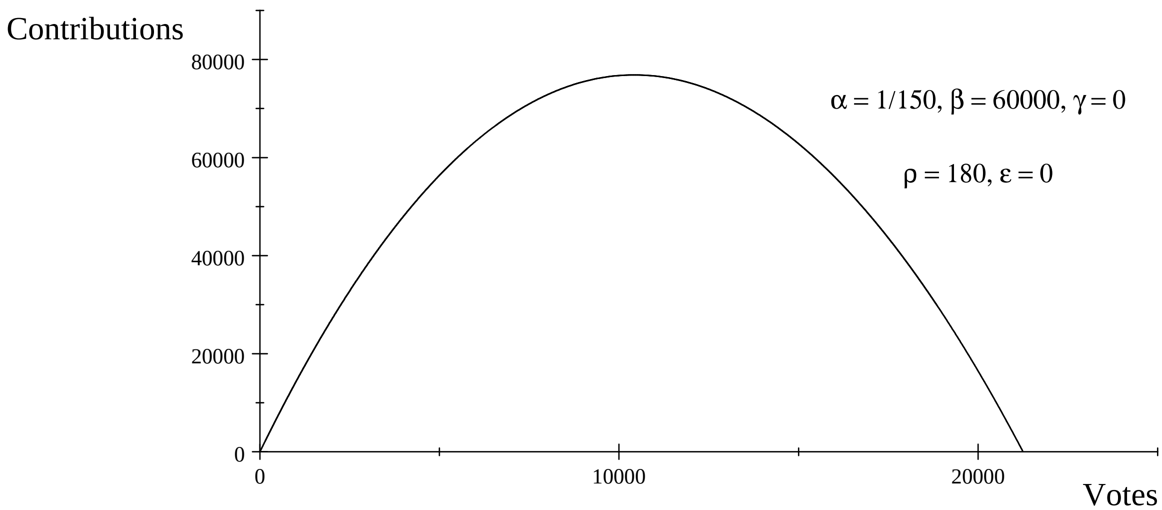


Figure 2 : Inverse-U relationship between votes and contributions

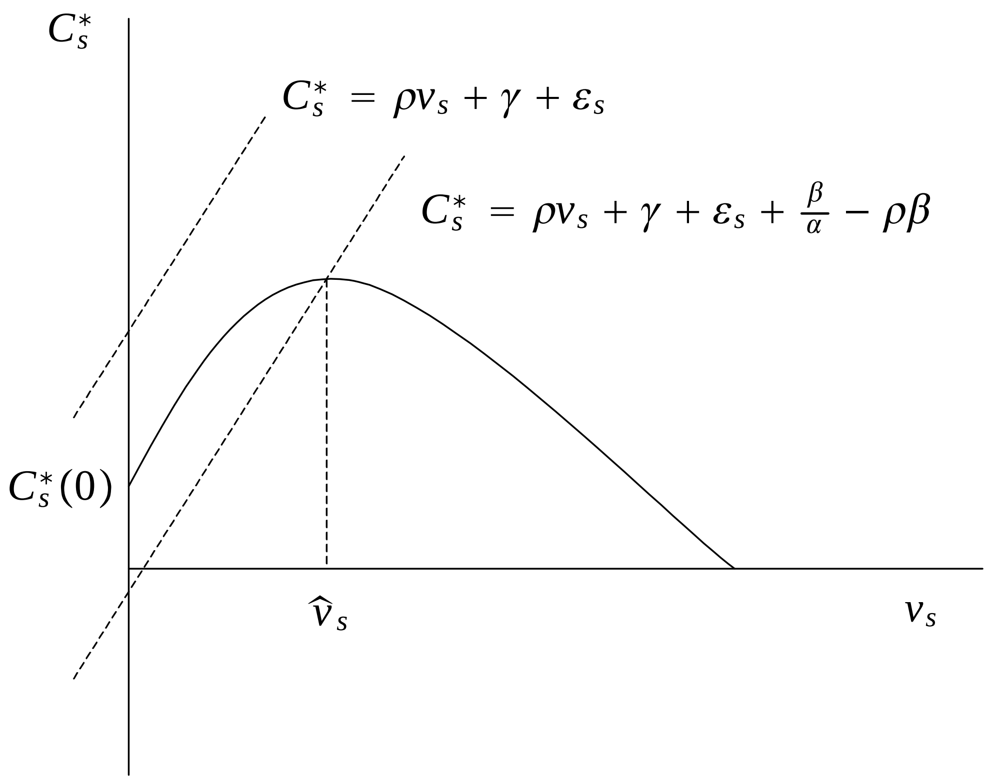


Figure A1

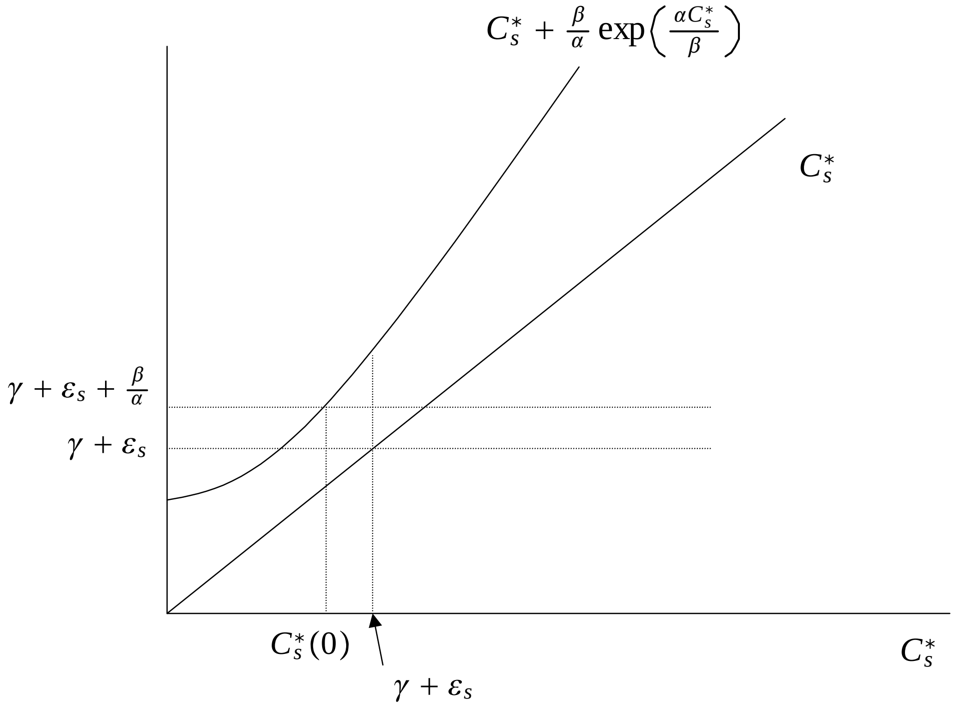

$C_s^* + \frac{\beta}{\alpha}\exp\left(\frac{\alpha C_s^*}{\beta}\right)$
C_s^*
$\gamma + \varepsilon_s + \frac{\beta}{\alpha}$
$\gamma + \varepsilon_s$
$C_s^*(0)$
$\gamma + \varepsilon_s$
C_s^*

Figure A2